GEOGRAPHICAL SEGREGATION ON FERTILITY OF WOMEN IN KISUMU EAST SUB COUNTY, KISUMU COUNTY, KENYA.

BY

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DECLARATION

Declaration by Student

I, Loy Kinda Oduor hereby declare that this thesis is my own original work and that it has never been presented for any academic award in this university or any other institution of higher learning elsewhere.

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DEDICATION

I dedicate this work to the Almighty God for being my provider all through my study and to my Parents Evaline Ogallo and Leo Ogallo.

To my siblings Don, Carl, Ella and Angela, when you read this thesis let it be an inspiration for your thirst of Education.

ABSTRACT

Fertility and geographical segregation are some of the major factors influencing human population growth. The fertility rate of Kisumu East Sub County is rated at 4.8 per woman exceeding the average for the county, national and the global which is 4.2, 3.4 and 2.3 respectively per woman. It has been established that the segregation may influence fertility, however, it was not well understood how various aspects of segregation influence fertility. The purpose of this study was to assess the influence of geographical segregation on fertility of women. Specific objectives were to: establish the influence of exposure on the number of children; determine the influence of concentration on the number of children; determine the influence of centralization on the number of children; and establish the influence of clustering on the number of children born per woman. This study was guided by Becker's economics theory of fertility and Hägerstrand theory of Spatial diffusion. A minimum sample size of 384 women respondents aged between 18-49 years were obtained as determined by the Fisher's formula and selected using stratified random sampling, cluster and snowball sampling techniques. Purposive sampling was employed to identify key informants. Primary data were gathered by questionnaires, KI interviews and FGDs. Secondary data were collected from DHS reports, census reports, and un-published media. Quantitative data were analysed using descriptive statistics and inferential statistics: gamma statistics, spearman's rank correlation coefficients, multiple logistic regressions, multiple correlation coefficient and multinomial logistic regression. Qualitative data were analysed by coding, creating categories, themes and patterns then evaluating the usefulness of the information in answering the research questions. The results showed that sharing common centres and mean number of children born per woman, had a strong significant positive relationship (r=0.675). Daily and weekly social interactions showed a strong positive significant linear correlation with fertility (r =0.732, p = 0.03). Cultural norm was a major factor likely to influence the first and the last childbirth. Moreover, there is a strong positive and statistically significant linear correlation (r =0.50, p = 0.04) between social interactions and number of children born. Gamma statistic coefficient of 0.493 indicated moderately strong positive association between levels of geographical concentrations and number of children born. Number of children born correlated negatively (r =-0.612, p=0.02) with low geographical concentration. The results showed that the correlations between centralization and number of children born was strong and positive (r=0.625, p=0.026). Multiple linear regression analysis showed that 81.5% of variation of number of children born per woman could be predicted from the combined influence of length of stay in the neighbourhood and mean monthly income. The study recommended that productive social interactions like seminars, conferences and group meetings should be highly encouraged among women through setting up public arenas for social gathering where women can meet for exchange of vital reproductive information. Emphasis should be put on women empowerment and reproductive health.

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ABBREVIATION AND ACRONYMS

CBD	Central Business District
FLFP	Female Labor Force Participation
KCIDP	Kisumu County Integrated Development plan
KDHS	Kenya Demographic Health Survey
KNBS	Kenya National Bureau of Statistics
MDGs	Millennium Development Goals
MOH	Ministry of Heath
NCPD	National Council for Population Development
SDGs	Sustainable Development Goals
SSA	Sub Saharan Africa
TFR	Total Fertility Rate
UN	United Nations
UNDP	United Nations Development Program
UNFPA	United Nation Population Foundation
USAID	United States Agency for International Development
WDHS	World Demographic Health Survey
WHO	World Health Organization
WPP	World Population Prospect

WORKING DEFINITIONS OF TERMS

Centralization - This is the measure of spatial location and position of two or more social groups of people with respect to an urban centre, this dimension consider how population groups are distributed relative to the urban centre or the Central Business District. This was measured by percentage of respondents living near Kisumu city CBD compared to those that are far away.

Clustering- This is the degree of contact between people interacting in social groups. It is the tendency of neighbourhoods with similar demographic profile to be located near one another. In this study clustering was measured by the percentage of women involved in labour force aged between 18-49 years.

Concentration -A measure of relative of amount of physical space occupied by a social group in a metropolitan area and the degree to which a group is concentrated in a particular area. In this study, concentration was measured by percentage of respondents residing in various wards and the relative population densities of those wards.

Exposure- This is the measure of potential contact and possibility of interactions between women of two or more geographically segregated social groups of varied characteristics who share common centres. In this study exposure was measured by the percentage of women aged between 18-49 who share common centres such as markets, churches, water points, health facilities and any other common facility.

Fertility- It is defined as the total number of live births per female throughout her fertile age. In this study, fertility was measured by the number of children born alive to a woman which serves as a benchmark for a woman's lifelong fertility up to the time of data collection.

Geographical Segregation-This is the spatial separation of social groups within a geographical area which can be either a county, city, municipality, or sub county based on a certain physical, social, or economic process. The measures of geographical segregations used in this study are exposure, concentration, centralization, and clustering.

CHAPTER ONE: INTRODUCTION

1.1 Background to the Study

Fertility is among the fundamental components of population dynamics that affect the global population trends in terms of growth, structure and composition (UN, 2012). Global fertility has decreased from 3.2 in 1990 to 2.5 children born per woman in 2019 and is forecast to decline to 1.9 in 2100 (World Population Projects, 2018). The fertility decline trends across the globe are not consistent but vary across regions based on various factors among which include geographical segregation (United Nations, 2020). World population data report, (2020) affirms that a woman's fertility bears a significant national and societal consequences, its variation across regions is as a result of spatial differences and disparities inclined to dimensions of geographical segregation. The most disadvantaged groups tend to be segregated on areas where there is low quality housing and hard access to essential public services which is in contrary to the economically able groups (World Population Projections, 2021). Reduced fertility stimulates economic development by reducing the number of dependents, however, continued increasing population obstructs the 2030 Agenda for SDGs (United Nations, 2021). The studies recognized geographical segregation and its general influence on fertility differences among women, the reports however have not explored on specific ways in which such dimensions influence women's fertility.

Measures of geographical segregation have the potential to explain differences in fertility between women (Wilson, 2017). World Population Data Sheet, (2010) indicates that in Europe, rates of fertility are significantly below replacement levels but regional fertility is varied. North and West European regions have greater rate of fertility of 2.0 than South and East Europe with 1.50. Studies conducted in Sweden showed that negatively segregated groups portrayed high levels of fertility

due to norms of high fertility which easily assimilated by others during their social interactions at common centres (Scott, 2011). Similar reports in UK indicated that fertility levels of the negatively geographically segregated groups grow higher than that of the geographically favoured (Coleman, 2013). However, in Germany, Milewski (2014) concludes that levels of fertility were low among those people who hardly met at common centres and were geographically advantaged. Studies in England and Wales done by Kahu (2017) showed that fertility of African women is low if they live in less segregated areas and high in highly segregated areas. These researchers have tried to understand the underlying causes of fertility variation based on exposure as a dimension of segregation, high fertility among women in social groups could also be characterized by cultural beliefs and practices including patriarchal norms which needs to be assessed.

Studies in Pakistan found that daily interaction and contact with people of the same origin, ethnic or economic status background promotes sustaining of cultural environment which may be responsible for high fertility (Simpson, 2009). In India, Tulsi (2010) noted that the frequent contact between people of low socio-economic class hinders education and occupational aspirations. A study conducted in Roma Siberia showed that people in less-segregated areas may face higher returns to education and therefore prefer to invest in quality rather than quantity of children (Galor 2012). Notwithstanding, Compton and Pollak, (2014) showed that people in segregated areas may be closer to the grandparents' who mostly live in rural location and raising children would consequently be less costly. Women in less-segregated areas may have access to better employment possibilities and therefore have a higher opportunity cost of time (Doepke, 2015). The cost of space could be lower in segregated areas as fewer people desire to live there thus facilitating a higher fertility.

Fertility rate in Africa has been declining at a lower rate than in other areas undergoing demographic transition over the same period (Bongaatrs, 2012). Sub-Saharan Africa will be the most populous of the eight global regions by 2062 (medium variation prediction, 2019). The UN (2020) reported that fertility rates in Africa vary greatly by geographical regions. In South Africa, spatial segregation of the poor occurs in informal settlements which eventually divides the cities into zones of inclusions and exclusions, the informal settlements are in turn overpowered by inequalities and overall income poverty which poses challenges in fertility control (Parry, 2021). In Ethiopia, fertility varied greatly among different segregated regions based on religion, areas dominated by Muslims showed high levels of fertility compared to the Christian dominated areas (Ethiopia Demographic Health Survey, 2021). In Nigeria, the southern region had a lower fertility rate of 5.5 children per woman compared to the Northern Region which was highly concentrated with a fertility rate of 6.7 (NDHS, 2022). Majority of the uneducated women were found in the northern region and were more prone to early marriages with less access to family planning methods (NDHS, 2022). The findings from the researchers imply that Africa's future population growth will dependent on fertility patterns of regions and measures of segregation such as concentration which needed to be clearly assessed.

Kenya's population trend has a fertility history of 8.1 in 1978 (World Fertility Survey, 1978). The rate of fertility declined gradually over time to 3.42 children per woman in 2019 (Kenya National Bureau of Statistics, 2019). Despite a record of decline in national fertility rate, high fertility rates still thrive at sub regional levels (Population Policy for National Development Sessional Paper 3, 2020). Government of Kenya has committed to providing its citizen with decent high-quality life to attain national development goals, however there are extensive sub regional inequalities and

disparities as a result of geographical segregation which leads to high fertility (National Council for Population Development, 2020). The persistent high fertility has resulted into increasing youthful population who are marked with reproductive age groups and hence slow economic development (Kenya National Bureau of Statistics report, 2019/2020). The Kenyan government passed a policy on population that aims at fertility of 2.6 babies per fertile female by 2030 (National Population Policy, 2018-2021). Kenyans Vision 2030 acknowledge that rapid population increase could hinder the plan of achieving high HDI (Kenya Vision 2030 Report, 2007).

In Kenya, the forces that contribute to geographical segregations range from legal, voluntary, economic, ethnic and cultural factors (Olima, 2010). The quick growth of population has made segregation of social groups to be majorly based on economic status (Majale, 2012). Fifty-five percent of total population living in major cities in Kenya are geographically segregated to informal settlements that makes such settlements most densely populated (Republic of Kenya, 2013). High income groups live in lavish geographical areas characterized by closeness to the Central Business District, developed infrastructure and quality services (Republic of Kenya, 2013). The level of concentration of members of a particular group in a given settlement results into social and cultural factors that in turn influence fertility (Maina, 2015). The negatively geographically segregated areas are characterized by uneven spatial distribution of public services such as schools, healthcare, security and transport system (Maina, 2015). Disparities have led to increased fertility among the low social class minorities as a result of centralization (Shilgtz, 2017). The previous studies have attempted to establish the relationship between centralization and fertility, nonetheless, a deeper understanding of the influence centralization on women's fertility was necessary in this current study.

Kisumu county has a diverse background of urban, rural and peri urban set up which is comprised of ethnics, racial, economic and cultural diversity (Kisumu County Government, 2019). The current fertility rate for Kisumu County stands at 4.2 children per woman (Ministry of Health Kisumu County, 2021). The sub-county population is primarily composed of children aged between 0-15 years, which makes up 46% of the population and it is estimated to continue growing (Ministry of Health Kisumu County, 2021). Most of the youthful population of Kisumu East are in urban areas seeking employment and education (Kenya National Bureau of Statistics, 2019). Rapid population growth in the area is partly due to increased fertility that has reached 4.8 babies per fertile female (Kisumu County Government, 2019). The reliable rainfall and nature of good soils has supported subsistence agriculture to sustain the household food requirement, however, the high population adds pressure on environmental resources and economic development (Kisumu County Environmental Policy, 2019). Food insecurity is increasing as a result of climate change and rapid population development, posing major issues in the sub-county by depleting economic resources (Kisumu County Environmental Policy, 2019). These reports highlight on the negative consequences of high fertility in Kisumu East, if the birth rates would decline, the age structure of the population would change to more working age group compared to dependents resulting into economic reforms. This called for a clear understanding on dimensions of geographical segregation on fertility,

Kisumu East sub county is known to be overcrowded and dominated by informal settlements as a result of immigration, high fertility has been considered to be a defining feature around the area (KCIDP, 2018-2022). Geographical segregations in this city have been based on changes in land use patterns and housing shortages (KCIDP, 2018-2022). The sub county forms a ground for major

informal settlements in the county such as Nyalenda, manyatta, Nyamasria that have been growing for decades (KCIDP, 2018-2022). The sub county host social groups comprising of people of low socio-economic status with high number of children and few scattered middle-income earners (Ogot, 2016). Rural parts of Kisumu East are located far away from the CBD and therefore means hard access to good social services and information which can influence the fertility behaviour of women in such areas (Michel, 2018). The reports centred on the residential segregations within the area and its resultant fertility trends, the pathways that link segregation to fertility and the mechanism responsible for this correlation remains unclear, understanding a better link between segregation and fertility was crucial as policies favouring social diversity may target access to different amenities especially in Kisumu East which can help forecasts better future demographic trends.

1.2 Statement of the Problem.

Global fertility trends are declining gradually although the decline trends are not consistent across all regions of the world. Fertility rate in Africa has been declining at a lower rate than other areas undergoing demographic transition over the same period. Current trends of increased fertility are a major concern for the Kenyan government and other population management bodies. The Kenyan Government passed a population policy that aims at fertility 2.6 babies per fertile woman by 2030. This is because Kenya's population has doubled over the last two decades and keeps growing despite different plans and initiatives to lower fertility. Kisumu East Sub County has a smaller geographical coverage but is highly concentrated with a population of 210,190 and a considerable high fertility rate of 4.8. The fertility rate of this sub county is greater than that of the Kisumu County which is at

4.2 with a national rate of 3.4 and the global level of 2.3. About 46 % of the sub county's population is dominated by children under the age of 15 years.

The fertility rate of this sub county is not the highest, however, its total population is the highest compared to the other six sub-counties of Kisumu County. Kisumu East is geographically segregated into major informal settlements such as Nyalenda, Manyatta and Nyamasaria which are characterized by too close neighborhood contacts and low economic status. Further segregation is observed through urban rural disparities with low levels of exposure to other positively segregated social groups. Most households in Kisumu East are segregated far away from the town center with a few centralized close to the Central Business District. The rising fertility trend and high population in this sub county as compared to others could have been be as a result of geographical segregation which called for further investigations. Geographical exposure, concentration, centralization and clustering are components of geographical segregation which may contribute to fertility and yet much had not been clearly documented.

The existing studies focused majorly on other factors which influence fertility like education, marital age and cultural therefore there was little evidence regarding the influence of geographical segregation on women fertility in Kisumu East Sub County. If fertility is checked, the nation may achieve demographic dividend for economic development rather than meeting the needs of the youngest age groups. Therefore, more knowledge is required in order to clearly establish the influence of geographical segregation in Kisumu East Subcounty, and thus, the purpose of this study was to examine the influence of geographical segregation on fertility of women in Kisumu East Sub County, Kisumu County.

1.3 Objectives of the Study

The general objective of the study was to examine the influence of geographical Segregation on fertility of women in Kisumu East Sub County, Kisumu County Kenya.

1.4 Specific objectives

The specific objectives were to:

1. Establish the influence of exposure on the number of children ever born in Kisumu East Sub County.
2. Determine the influence of concentration on the number of ever born in Kisumu East Sub County.
3. Determine the influence of centralization on the number of ever born in Kisumu East Sub County.
4. Establish the influence of Clustering on the number of children ever born in Kisumu East Sub County.

1.5 Research Questions

The research was steered by the following research questions:

1. What influence does exposure have on number of children ever born in Kisumu East sub-county?
2. How does concentration influence the number of children ever born in Kisumu East Sub County?
3. What influence does centralization have on the number of children ever born in Kisumu East sub-County?
4. what extent does clustering influence the number of children ever born in Kisumu East sub county?

1.6 Justification of the study

Population explosion is one of the major global issues today. Regional Population trends, structure and size is majorly driven by trends in fertility. Societies with high fertility face greater demands for service and resources from the working population hence lagging in most development indicators. Moreover, most women who have several children find it difficult to work outside home hence having fewer opportunities to improve economic and social status. The separation of social groups in a particular geographical area brings about spatial inequality which results into unequal distribution of income and resources across geographical regions. Fertility variation across regions is as a result of spatial differences and disparities inclined to dimensions of geographical segregation. The fertility levels of Kisumu East sub county have doubled over the last two decades and keeps growing despite different plans and initiatives to lower fertility. If fertility declines, the proportion of children in the population will fall and the working population age increase resulting into a lower dependency ration. Kisumu East can therefore reap benefits of increased production hence economic growth and poverty reduction.

The sustainable development goal (3) for vision 2030 advocates for low fertility compounded by informed decision based on increased knowledge to achieve the desired family size. Comprehensive examination of geographical segregation on fertility of women will provide an additional information to women, policy makers and reproductive health planners on how they can combat the high fertility rates in Kisumu East Sub County. The study will as well act as an indicator on the responsibility and the extent to which the national and the county government have played in regard to assisting women realize their intended fertility. This study findings will be of great help to Kenyans government and

the county government as well as the family planning bodies in designing suitable reproductive programs in order to improve the degree at which the population achieves the fertility preference.

1.7 Significance of the Study

The outcomes of this study will benefit all women globally by raising knowledge on how geographical segregation can affect their fertility thus allowing them to make proper fertility decisions. Additionally, this study will benefit other researchers globally by bridging the knowledge gap and providing information on the segregation dimensions such as exposure, concentration, centralization and clustering that influence number of births per woman. The confront to the issue of geographical segregation will help in fertility reduction especially in areas where its most prevalent in regions across the world. The outcomes of this research will help enhance existing measures aimed at reducing high fertility and current efforts to manage programs related to fertility control among women nationwide. Knowledge on the factors influencing fertility is critical for achieving sustainable population growth in Kenya.

This study will make contribution to the advancement of knowledge in female fertility in Kisumu East and factors that limit its regulation. Kisumu County government, various NGOs, reproductive health program planners, policymakers, urban planners, researchers, and other relevant agencies will benefit from this study by gaining an insightful information on fertility issues among women based on the geographical segregation in Kisumu East Sub County and the county at large. This will enable them to formulate strategies for fertility control among women through the development of appropriate policies and countermeasures. Finally, the research will be of great importance to women in Kisumu East sub county, the findings from this study will provide insightful information to the

women in this area on how dimensions of geographical segregation have been at work in influencing their fertility thus enabling them to sought for measures and strategies that can help control fertility.

The findings from this study will pose questions to legal policy makers whether people from different cultures and socio-economic class can mix in one geographical area for cultural interactions and exchange and not small separate worlds within a geographical area. The findings will thus enable them to eliminate quality of life differences between neighbourhoods and aiming to achieve social mix by changing regulatory frameworks. Civic life requires settings in which people of all social groups can meet as equals without regard to race, economic class or national origins.

1.8 The Scope and Limitations of the Study

This research was confined to Kisumu East Sub County in Kisumu County, Kenya. The study was focused on studying four dimensions of geographical segregation which included exposure, concentration, centralization and clustering and how they influence fertility of women in the sub county's five wards. Evenness was not included in this study because it involves differential distributions of population based on measures of exposure, concentration, centralization and clustering, and so, it encompasses the four dimensions. Intervening variables influencing women fertility, such as socio economic and demographic factors were not explored in this study. This is because, diverse variables influence fertility and it is not feasible to explore them all in a study of this nature, furthermore, the proximate determinants of fertility have been exhaustively studied and so the research focused only on the dimensions of geographical segregations on fertility as identified in the background to the study. While some respondents requested for monetary remuneration, others suffered changing emotions and external factors such as illness which impaired their ability to reply

appropriately. The researcher overcame these challenges by informing respondents about the study's academic aim and the advantages they would get due to participation. Respondents were urged to engage in the research willingly and not be coerced.

1.9 Theoretical Framework.

A theoretical framework comprises of theories, concepts, principles, generalizations, and research results about the current topic (Kombo, 2006). The theoretical frameworks for this study were Gary Becker's 1960 Economic theory of fertility and Spatial Diffusion theory by Hagerstrand, 1953. The theories address the fertility situation in Kisumu East which cuts across the dimensions of geographical segregation.

According to the idea in Becker's theory, Children are linked with home commodities. This implies that children are often considered as liabilities that compete with entities to the point that couples are obliged to make sensible judgments about whether or not to have another child depending on their economic circumstances at the time (Becker, 1960; Caldwell, 1976). Better income individuals would acquire fewer children of higher quality, who are costlier. The level of income determines a woman's spatial location and fertility declines when per capita income increases. Location of residence whether close to the city or far away from the city affects women's economic circumstances by either boosting or decreasing economic opportunities; areas close to the urban centres are characterized by an ample labour supply, which promotes economic levels and influences women's choice on the number of children to be born (Banister, 1987). This theory supported centralization as a variable for the geographical segregation when explaining the location of women in reference to the urban centre.

Hagerstrand theory of spatial diffusion was developed in 1953. This framework considered diffusion of an idea to be a fundamental geographic process, He argued that for an idea to diffuse over space and time there must be a mechanism of contact and persuasion to transmit the information. Peoples points of interaction such as work area, market centres, churches, residential units and many more are the agents of contact. And so, the spread of diffusion reflects the pattern of contact among women thus geographical exposure. Hägerstrand believed that knowledge about the diffusion phenomena is gained by information from the media or more pervasive interpersonal mode of communication such as frequent interactions. People vary in their resistance to adopting the diffusing phenomena. This resistance may be attributable to cultural, economic, ethnicity, voluntary or even religious barriers. The diffusion pattern unfolding over space and time then depends upon the spatial distribution of social groups people and their concentration from one point to another. This believe proves that the degree of concentration of social groups in a geographical space can influence fertility decision.

Marble and Nyatuen (1963) showed that one could incorporate distance and directional bias in acquaintance fields that mirrored real settlement patterns such as city sectors. Spatial interaction models also proven their usefulness in a variety of settings, including forecasting patterns of communication, work and shopping trip behaviour, and the distribution of population and other activities. Spatial interaction described the normal pattern of contact among individuals while spatial diffusion was the process of adoption or change that may result from those contacts when something new originates at a particular location. What happens at a further distance is dependent on what happened earlier in time and at other closer locations. For this, the degree of clustering, exposure and concentration among neighbourhoods was an important determinant on how knowledge and ideas

about fertility influence the number of children to be born. The Spatial diffusion theory, affirms that an idea spreads through a group of people and how they have been segregated in different geographical areas.

Gary Becker Economic theory of fertility traces back to work of Leibenstein and Becker, by the mid-1970.It has attracted many devotees and social scientists, including Warren C (1997), (Amie, 2008), Shapiro (2015), and Omondi (2017) among many more. This theory links geographical centralization to the study in reference to spatial location of woman's residence which in turn influence the number of children born. Hagerstrand theory of spatial diffusion theory has been cited in the works of Sauer (1952), Edmonson (1961), Jordan and Rowntree (1981), Askie (2000) among many more researchers. It has been significant in explaining fertility trends in different geographical segregated areas. These theories linked variables like exposure, concentration, clustering and centralization to the current study. Which are summarised in figure 1. By concentrating on the dimensions of geographical segregation, the models helped in explaining and forecasting different fertility outcomes, hence helping to understand fertility variance and differentials.

1.10 The Conceptual Framework

A conceptual framework is a diagrammatic depiction of the variables in research, their operational description, and interaction within the study (Ellis, 2014). This framework demonstrated how geographical segregation dimensions influenced women's fertility following study objectives. Exposure, Concentration, centralization and clustering all affected women fertility. In this research, geographical segregation was an independent variable, a stimulus that affects a response or a component that may be altered to affect a result. At the same time, fertility was a dependent variable, an outcome variable affected entirely or partially by the independent variables. Intervening

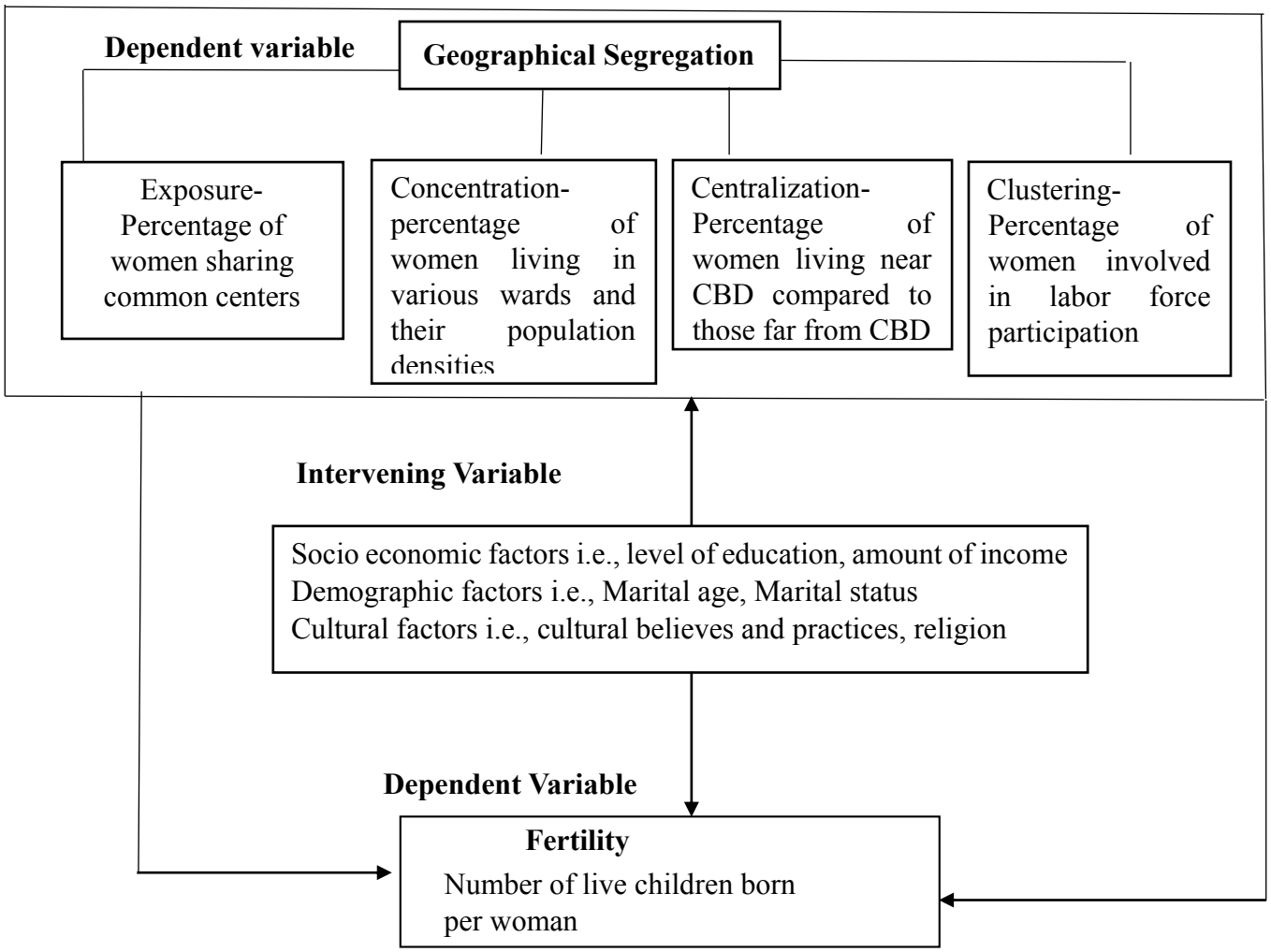

Figure 1: Conceptual Framework of the geographical segregation on fertility of women Source: Researcher, 2022

CHAPTER TWO LITERATURE REVIEW

2.1 Introduction

This section reviewed studies on the influence of exposure, concentration, centralization and clustering on number of children born per women. This section also provided the groundwork for comparing the results of earlier studies and also demonstrated the study's theoretical and conceptual foundation.

2.2 The Influence of Exposure on The Number of Children Ever Born.

Exposure is the measure of potential contact and possibility of interactions between women of two or more geographically segregated social groups of varied characteristics who share common centres or facilities (Echenique, 2005). It is the extent to which two groups share common residential units, work areas, health facility, shopping centre and so the extent to which a woman experiences segregation (Echenique, 2005). Exposure mainly entails social interactions and social isolations (Fryer, 2005). Social interactions reflect the chances of interactions between women of minority group and powerful groups while social isolation measures the extent to which women of minority group are only exposed to their fellow minority members or even none (Fryer, 2005). High quality social connections and interactions are essential to women fertility and reproductive well-being (United Nations, 2008). These researchers affirmed that women fertility can be influenced through social interactions and networks, however, clear understanding of the influence of social interaction and isolation on women fertility was not stated. This needed to be clearly established in the current study.

The rate at which women give birth has a vital impact on the world population's future age and size structure (United Nation, 2010). Most countries globally have had demographic transition which

are driven largely by trends in fertility (United Nations, 2013). Global reports agree that interactions among social groups help in transforming fertility decisions and behaviour among women (World population Data Sheet, 2013). Social interactions help in transforming ideas about family planning methods and fertility perceptions (Bongarts, 2013). Observing the fertility behaviours of others in common centres can also influence individuals' fertility decision (Wartkins, 2016). Through social interactions at the common centres, cultural norms and believes that relates to reproduction rate, childbearing, gender balance, age at first birth and completed fertility can be transmitted to individual women (Khuha, 2017). These studies focused on the relationship between social interactions and fertility. However, the manner in which social interactions occur between women of different social groups has not been understood hence there was need to clarify how exposure through social interactions influence the number of children born per woman.

A study conducted by Wilson (2017) use an example of family planning programs that aid in controlling fertility successfully among certain women in the same social group. The prevalence use of family planning by the neighbours or members of the same social group can influence an individual to start the same practice that help in controlling her fertility (Wilson, 2017). According to research done in Central and Southern Asia, fertility has decreased to an average of 2.4 births per fertile female in 2018 who are focused on the high level of social interactions (United Nation, 2019). Women in these nations have children later in life, owing to their pursuit of higher education economic activities and professional careers (Population Facts, 2019). In Northern Asia, daily social exchange that occurs in markets, churches, health facilities, or even workplaces have been studied to positively influence the fertility behaviour among women of minority groups in that the choices made by one individual depends on actions taken by others (Manski, 2019). Women

individuals in the same segregated social group sometimes behave similarly because they face the same similar institutional environment and have similar fertility characteristics (Manski, 2019). The reports confirm that social interactions among women of social groups truly influence fertility, still more clarification is needed to ascertain how social interactions within such segregated groups can negatively influence fertility level of women making it to rise above the expected.

In developing countries, decisions on the number of children to be born per woman occur within a specified social context (Adams, 2003). Women fertility decisions is mostly influenced by the social world (Adams, 2003). The current efforts geared towards promoting women reproductive health and rights have stressed the importance of understanding and addressing the broader social environment within which reproductive behaviour occur (Simon, 2003). In India for instance, the lower caste groups take on the characteristics, norms and customs of the upper caste to gain higher characteristic status of the Upper caste social system in matters to do with fertility levels (Srinivas, 2009). They argue that couple's fertility within a low society can be influenced by the level of women fertility of the other geographically segregated groups which depicts low fertility (Dasgupta, 2010). Social interactions between individuals of different social mix leads to assimilation of positive or negative fertility behaviour, this occurs depending on social practices which alter social environment thus influencing the personal decision about number of children to be born (Godley, 2011). These studies have confirmed the importance of social mix to fertility decisions, nevertheless, have not indicated the common areas where this social mix occurs between different geographically segregated groups.

High fertility in Sub Saharan Africa have been sustained by cultural norms within different geographically segregated groups (Dominque, 2009). A number of scholars in Sub Saharan Africa have proved that fertility is shaped by powerful social forces such as the education levels, income levels type of occupations within the segregated groups (Adams A; Castle, 2009). The potential effect of socio-economic status within a segregated group has an influence on fertility of such group (Madhavan, 2012). Moreover, Scheinkman (2010), gives an example of educated neighbours who may foster low fertility culture towards the other social group with low levels of education. Additionally, women of the same ethnic group locally tend to have similar number of Children ever born (Sangeetha, 2012). Social groups trigger social influence within the individuals to behave according to the dictated social norms (Guyer, 2012). In Ethiopia for instance, women decision on the number of children to be born and when to start and complete childbearing is greatly influenced by the cultural norms within a highly connected homogeneous network (Boulay, 2015). These studies expounded on the negative and positive effect of interactions within segregated groups on fertility but did not clearly address the influence of social isolation on women
fertility.

In Mali, most segregated groups are characterized by strong sense of cooperation within themselves (Birkel, 2010). Women place a high value on fertility and support is provided through social networks within the groups (Lookwood, 2015). A complex set of norms and sanctions guides the women fertility decision (Lookwood, 2015). Tight boundaries within geographically segregated groups controls and coordinates individuals' fertility behaviour, this in turn dictates their social capacity to use contraception or hold high the traditional fertility behaviour (Ibid, 2015). Most

geographically segregated groups in Mali experiences social isolation, this leads to social loneliness among the women hence preservation of cultures and believes due to lack of exposure to other groups. According demographic reports by United Nation (2015), social isolation was associated with 29% likelihood of increased fertility in an area. However, innovations in fertility control measures such as adoption of contraceptives and easy access to information on fertility control has made women fertility decision to be individualized rather than socially influenced (Granovetter, 2015). The researchers have stressed on the influence of social ties and social isolations on fertility, more information regarding role of social interactions on fertility control among women should be provided.

Kenya's population was 47.6 million in 2019 representing a 23 percent increase from 38.6 million in 2018 (Kenya National Bureau of Statistics, 2019). Kenya adopted a demographic strategy framework to reduce total reproduction from 4.6 childbirth per fertile female in 2009 to 2.6 childbirths per fertile woman by 2030 (National Council for Population Development, 2014). Female's fertility has continued to fall from 4.9 births per fertile woman in 2003 to 3.9 births per woman in 2019 (Kenya National Bureau of Statistic, 2019). Fertility difference by ethnic have been very large as Kenya displays a great deal of heterogeneity by ethnic, economic or religion (National Council for Population Development, 2019). Fertility in Kenya is influenced by social environment at which households operates (Broock, 2019). Social interactions and channels about fertility behaviour are important to Kenyan women as members of the same segregated groups adopt similar cultural practices (Poukouta, 2019). Cultural norms may encourage high fertility and interfere with education advancement among women (Watkins, 2019). The studies have focused

on role of cultural norms within the social groups, nevertheless, high birth rates cannot only be attributed just to cultural norms within the segregated groups as these studies suggest, but also to dimensions of geographical segregations such as exposure which needs to be explained explicitly in this study.

In Kisumu East, women fertility has proved to be so high at 4.8 births per woman (Ministry of Health Kisumu County, 2022). Administrative boundaries are mostly demarcated based on social stratification which are characterized by socio economic status ethnicity or on voluntary basis with households segregated in clusters in the rural areas (KCIDP, 2018-2022). Individual fertility decision and behaviour is mostly determined by social cultural norms and practices at large through observation and assimilation (Oloo, 2022). For instance, the fertility of women in areas of informal settlements are higher compared to those who are segregated in more decent areas (Kisumu County population statistics report, 2019). Fertility difference by ethnics have been very large and the desire for a large number of children was found to be higher among the Luo and luhyas compared to other ethnic groups within the sub county (Oloo, 2022). These helped us to understand the general influence of exposure on women's fertility, however how degree of exposure influences the number of children born in Kisumu East is not well known.

2.3 The Influence of Concentration on The Number of Children Ever Born.

Concentration is the relative amount of physical space occupied by a group of people in a geographical area or the degree to which a group is concentrated on a particular area (Massey, 1978). It has been established that concentration of a particular social group can shape the fertility behaviours and decision of women regarding the number of children to be born (Shenk, 2013).

According to the projections made by United Nations (2014), an area with high population density have higher income because of agglomeration and fertility rates are delayed as compared to regions with lower densities. According to Sadler (2015), income increases with population density while the number of children born decreases with increase in income. While these studies have helped us understand the relationship between high concentration and fertility, it is still not known the factors that plays a role in decreasing fertility in the highly populated areas.

Declining fertility among educated across the globe could be attributed to increasing concentration on various regions of the world (Sng, 2017). Low concentrated areas are often characterized by high resource availability and lower intrapopulation competition for resource, individuals therefore exploit resources at a faster rate, reproduce earlier and hence have more children (Daly, 2017). In harsh environment where there is higher risk of illness, high population density does not equate to high fertility rates because such environment women give birth at an earlier age and have more children (Oliver, 2017). In high density but safe places, people delay having children because they dwell in highly competitive environment and end up investing more time and resources on each child because they have to compete in a highly competitive environment (Oliver, 2017). Dense population have been associated with greater future time orientation like later maternal ages, delayed marriages, longer life expectancy, higher education attainment and in turn lower fertility (Jackson, 2019). These studies affirm that higher concentration results into low levels of fertility, however, the influence of low concentration on fertility has not been expounded.

The influence of high concentration on fertility is relatively weaker in areas characterized by hasher living conditions (Harington, 2014), Cultural factors within the population can moderate the

linkage between population densities and fertility through religion and social norms (Harington, 2014). In more concentrated geographical areas, there is greater competition for resources, one therefore needs to acquire knowledge and skills which in turn delays reproduction hence reducing fertility (Varnum, 2017). This is in contrast to harsh geographical areas where competition shows harsh condition and shift to favour hence higher densities (Sng, 2017). Analysis of 174 countries globally reveals a relationship between population concentration and fertility overtime, an observation on 166 countries showed that lower fertility was associated with higher population concentration, few countries showed a reverse result (World Population Data, 2019). These studies revealed several ways in which concentration can influence fertility however the influence of the socio-economic setting of the concentrated groups on fertility had not been well highlighted.

A study conducted in the US revealed that the spatial concentration influence fertility among black women, high concentration in an area sprout into black ghettos which restricts opportunities for education and employment thus increase in fertility (Harrison, 2012). The community composition has an influence on peer groups, role models and adult supervision which may be particularly important for the development of fertility perception (Brewter, 2014). The EROSTAT data report (2015) indicate that the higher the density in a geographical area the lower the number of children born per woman. In Indonesia, high concentration is found to be significantly and inversely correlated with fertility levels (Oliver, 2017). A report by Rotella and Colleagues (2021) revealed that in highly concentrated areas, people would opt to have fewer children and invest more resources per child. Harsh environments that are less stable and more unpredictable provide less incentive to invest in long term strategies that involves having more children and investing less

resources per child (Grossman, 2022). In Europe, it is so conspicuous that very low-density regions of the Northern Scandinavia have significantly lower fertility than the high-density areas of central and southern Europe (Rita, 2022). These studies indicated varying relationship between fertility and different degrees of concentration, however, the characteristics of people living in high geographical concentrated area had not been determined.

A study conducted in Sub Saharan Africa showed that low levels of education, rural residence and low income are key contributors to high fertility (Gobi, 2016). Countries with low population density and low fertility are known for scarcity of resources which limit women fertility (Lutz, 2016). Sub Saharan Africa fertility rate stands at 48 births per 1000 women and the average desired number of children is 6-9 children per woman (Population Division, 2019). Population densities in SSA remain as low as 0.01 inhabitants per km square except for areas where there is high soil fertility (Population Division, 2019). In Gambia, Nigeria, Israel and Uganda, lower population densities were associated with lower fertility rates, this was observed through densities and harshness of the environment (Rottela, 2022). Areas with high density and high fertility were characterized by low income (Rottela, 2022). The researchers have explained that high concentration in a geographical area is significant predictor of low fertility, however, the number of births per woman in various geographically concentrated has not been well established.

Rapid population growth in Kenya and high fertility impact negatively on economic development which results in decline of GNP, urban crowding and inadequate health system (Republic of Kenya, 2013). Kenya has one of the highest birth rates in East Africa with 54 children out of 1000 population (Republic of Kenya, 2013). The Kenyan population density is well above the sub-

Saharan Africa, where population is unequally distributed, regional densities are widely divergent (Scand, 2015). Urban growth has increased, for instance, Nairobi has 57% of urban population which has created population pressure and thus scarcity of jobs (Altern, 2017). The 2019 population density in Kenya was 92 per square km (Kenya National Bureau of Statistics, 2019). There is a casual relationship between population density and fertility such that rise in density from 10-100 inhabitants per square kilometre corresponds to an increase in fertility to about 0.7 children (Kenya population Situation Analysis repot, 2018- 2020). Researches have established the impact of high population density on women fertility, several ways in which geographical concentration influence the regional fertility differences among women across the country is still not well understood. It was therefore necessary to determine the extent to which varying degrees of geographical concentration influence women fertility.

Kisumu East sub-county is geographically segregated into five wards, the population densities for these wards vary (Kenya National Bureau of Statistics, 2019). The sub county covers approximately 141.6km² land area with a population density of 1560 people per square kilometre (Kenya National Bureau of Statistics, 2019). Kisumu East Sub County registered a high fertility rate of 4.8 children per woman and fertility rate is likely to increase (Kenya National Bureau of Statistics, 2019). Still, no study has been provided to establish the influence of geographical concentration on fertility of women in this sub county. As a result, there was a need to establish the influence of concentration on the increasing fertility of Kisumu East sub county in this research.

2.4 The Influence of Centralization on The Number of Children Ever Born

Centralization is the measure of geographical segregation that focus on spatial distribution and location of two or more social groups of people in reference to an urban centre (Folch, 2022). Centralization has been used as a global dimension of spatial segregation that quantify segregation in reference to urban centre of a region (Folch, 2022). Groups that settle near city centres tend to be spatially concentrated compared to those that are in rural areas (Boyle, 2019). Minority social groups tend to occupy the small share of the environment with most segregated to the suburban and rural areas (Boyle, 2019). The financial cost, effort required to raise and educate children as well as access to information, technology, quality education, quality health care, and employment are all determined by centralization which in turn influence the number of children born (Ushie MA, 2011). These reports showed that women's fertility is influenced by spatial location in reference to urban Centre, however, the significant characteristics of women in centralized social groups and their influence to the woman's fertility was not been established.

A study conducted in Northern Europe established that fertility varied by spatial location for reason that different people live in various colonies and zones in relation to the cities (Kulu, 2007). Suburban fertility continues to be high than in the city centres and sometimes higher than the rural areas (Kulu, 2007). This can be explained by difference in demographic and socio-economic characteristics of the geographically centralized groups (Andersson, 2009). The portion of highly educated people with few married is more significant in cities where birth rates tend to decline by high education levels and marital backgrounds (Garret, 2011). In Western Europe, the racial, economic and ethnic minority groups concentrate in city centres inhabiting the oldest and most substandard houses (Hank, 2012). In the US, Centralization is an obvious component of segregation as discrimination confines the minority social groups to declining central city areas and high fertility observed in the suburb areas (US National

Advisory Commission, 2019). These reports revealed the relationship between various degrees of centralization and fertility; however, fertility levels in the suburb's areas are not well known.

A study conducted in Finland by Hill (2010) showed that fertility levels are highest in the areas adjoining the city and those that are located far away from the urban areas but lowest in the capital city due to the high cost of residential units. This pattern was also observed in US, England and Wales where housing conditions and distance from the city explained significant portion of fertility variation across settlements (Moultrie, 2012). Economic possibilities and restraints, as well as cultural variables, may influence fertility as raising children is costlier in urban regions than rural ones (Kulu, 2016). Lower fertility recorded in areas close to the city is attributed to highly educated people and the larger share of students in urban centre with whom the rate of family formation is minimal (De Meester, 2019). Further reports revealed that women who live in areas far away from the urban areas retain traditional attitudes and lifestyle with a goal towards large families while cities promote individual autonomy and self-actualization thus individual choice (Synder, 2020).A number of factors influencing fertility of women in different centralized social groups have been clarified in these studies, however, other factors such as the maternal age, perceptions and housing of women in such centralized areas had not been clearly assessed.

Sub Saharan Africa is characterized by low levels of urbanization and so many social groups are centralized in areas far away from the urban centre (Corker J, 2016). Even though SSA has a low rate of urbanization, there has been a gradual fall in fertility from 6.6 to 5.3 children per woman between 2005 and 2010 (Bongaarts, 2017). Women who are located far away from the city have been proven to have more than 5 children and this has been attributed to the spatial characteristics

of location of the residence as well as the socio economic and cultural characteristics (UN, 2017). The discussion of contraceptive is common in areas close to the city than areas far away from the city, Urban women have more access to modern contraception, enabling them to successfully lower the number of births (Shapiro, 2017). The increasing fertility in areas located far away from the city could be attributed to varying time lag of fertility onset due fertility norms in such areas (Potts, 2018). Despite repeated documentation on fertility, knowledge on centralization and the number of children born in each setting remains scanty; moreover, the timing of residential stay to childbearing was not fully documented in these studies.

According to the NDHS (2008), Nigeria's more urbanized zones have an average birth of 4.6 children per woman. Olusanya, (2009) found that rural women were more fertile than urban women. The different segregated locations have a significant disparity in fertility between areas located near the city and those that are far away from the city owing to people's attitudes on fertility control (Olusanya, 2009). In Ghana, studies by Caldwell (2017) observed lower fertility in areas centralized close to the city which could be attributed to the fact that many migrants tend to leave their children in rural areas. In Tanzania, it was observed that parity for the different age groups were lowest in the city centre and higher in the rural areas then moderated in the small urban settlements (United Nations, 2014). In Ghana, there is a clear correlation between centralization and decreased fertility, women who reside close to the city have fewer children than their countryside counterparts (Ghana Statistical Service, 2010). In Rwanda women residing in metropolitan areas have a lower fertility rate than those who reside far away from the city (Kavende, 2013). While most of these studies found a reduction in birth rates in town areas and an increase in backyard areas, the effect of segregation based on centralization change can occur at

either the early or late stages of a woman's life, thereby affecting the number of births. Therefore, a clear distinction between the duration of residence exposure and fertility was necessary to be established.

According to Kenya Demographic Health Survey (2015), Kenya's fertility rate has decreased from 4.6 births per woman in 2009 to 3.9 in 2015. The continuing high fertility in Kenya is one of the considerable concerns resulting into high rate of population growth and thus makes the economic growth difficult. Areas located far away from the city have a total fertility rate of 4.5, whereas those close to urban areas have a fertility rate of 3.1. (Kenya National Bureau of Statistics, 2016). Areas close to the city are associated with increased access to various resources, including education, healthcare, and media exposure which encourage women to give birth to more children, fertility therefore declines as one moves away from town centres (Maina, 2017). Kenya, fertility differentials are experienced between various counties, areas that are located far away from the city, exhibit higher birth rates of 5.8 children per woman while area located close to the city shows a rate of 3.8 births per woman but the reverse has been true in few areas around the country (National Council for Population Development, 2018). The spatial location of the woman in reference to the urban centre can influence fertility in terms of shaping people's way of life and reproductive performance (Gris, 2018). Rural fertility has historically been higher than urban fertility; recent findings indicate that rural women have a total fertility rate of 5.8 children on average, compared to 3.4 for urban women and urban women were found to be 16% less fertile (Kenya National Bureau of Statistics, 2019). Nairobi had a total fertility rate of 4.1 while the total fertility rate of the surrounding area was 6.3 compared to 6.8 of rural areas found far away from

the city (Central Bureau statistics, 2020). While the research examined women's fertility in urban and rural locations, they did not demonstrate the degree to which specific socio-economic criteria such as levels of education and income influence the number of births in their respective places of residence.

Kisumu East Sub County is a peri-urban region with 17.5 percent of women residing in areas that are far away from city (KIRA, 2019). The urban region and its periphery are densely populated with around 1200 houses in each village and population of about 40% (KIRA, 2019). Women who reside in this Sub county's urban areas have an average of 4.3 children per mother compared to their rural counterparts who have an average fertility rate of 4.6 children per woman (KNBS, 2019). The overall fertility remains high in this sub-county, the slightly lower rates among urban women could be attributed to the higher cost of living in urban areas, improved access to medical and health services, and increased awareness of effective methods of controlling fertility (Kisumu East Coverage Report, 2020). These reports highlighted on spatial location of women in Kisumu East, however, none of the statistics explicitly accounted for the mean number of children born to women in connection their residential location.

2.5 The Influence of Clustering on The Number of Children Ever Born

Women network within adjoining neighbourhoods has been proven to influence fertility as they feel close and report neighbourhood frequent contact (Kalmijn, 2012). Globally, there has been an upward trend in female Labor force involvement and high degree of contact and socialization (Chaney, 2017). Between 1960 and 2018, the World Bank offered a consistent data on female workforce involvement, ranging from 90.67% to 3.29% (World Bank, 2018). During the close

contact, women may have opportunities to interact with other women in the neighbourhoods as they share fertility related experiences (Klarner, 2014). Neighbourhoods may exchange knowledge and perceptions through everyday interaction and share their fertility experiences (Becker, 2014). Through prolonged neighbourhood interactions with adjoining neighbourhoods' women acquire varied perceptions that in turn shape their decision on number of children to be born (Mollen horst, 2017). These reports have highlighted on various ways in which social interactions between women in clustered neighbourhoods can influence their fertility, not withstanding, social influence in the neighbourhoods stood to be examined through women contact during various activities that they involve themselves in such as Labor Force participation.

Geographical variation in fertility based on clustering is well recognized at the level of regions, nations and neighbourhoods (Kulu, 2010). Developed nations with the most significant rise in female Labor force participation rates also have the most fabulous fall in fertility rates due to the close contact between women of varied neighbourhoods (Kulu, 2010). The immediate effects of clustering on fertility among women who stayed in close apartments and shared laboured force involvement influenced the number of children born per woman (Lesthaeyne, 2010). United Nations (2011) indicated that in Nepal, increased female Labor force participation reflected high fertility. Reports showed that adjoining neighbourhoods characteristics was correlated with historically high fertility which influenced neighbourhoods' family size (Cools, 2020). Other findings in Europe however revealed that fertility was seen as highly individualized and couple based rather than neighbourhood choice because most households were far separated from each other (Rannveig, 2020). These studies have established a strong correlation between increasing

fertility and high level of clustering, a clear association between social interactions and frequency of contact between the women in the neighbourhoods remains unclear.

In the Netherlands, neighbourhoods and Labor force involvement form arena where women interact and influence each other fertility decision through emotional contagion, social learning and social pressure (Logan, 2012). Neighbourhoods form social network for fertility commencement and the total number of children to be born per a woman (Kiarnr, 2014). The Nordic countries are known for birth rates of 1.76 children per woman and fertility vary depending on the chosen neighbourhood scale and the percentage of women who share contacts through Labor force involvement (Logan, 2012). Individualized neighbourhoods of different sizes have the potential to shed light on the importance of neighbourhood context, residential sorting and social influence among neighbours (Logan, 2012). In Swiss, the rate of fertility among women is based on sharing of knowledge, behaviours imitation and social contagions (Reed, 2015). The above studies helped us understand the relationship between neighbourhoods contact and fertility, however the association between social economic and demographic characteristics of the neighbourhoods and fertility patterns had not been highlighted.

In India, fertility declines at a higher rate even though regional variation persist which indicate that space has a significant role in the ongoing fertility transition of the country (Guilkey, 2015). In few regions around India where fertility is high, higher level of clustering among neighbourhoods was observed especially around Rajasthan, Madhya (Guilkey, 2015). The high fertility in such areas is based on the kingship system which is characterized by strong subordination of women, strong cultural norms and high levels of interactions (Kabeer, 2015). The connection between cultural

practices and high levels of neighbourhood contacts in India results into high fertility Suddhasil, 2017). The researchers observed that clustering of neighbourhoods and fertility rate had a significant relationship. However, the period of stay in highly clustered or low clustered neighbourhood could also have an influence on a woman fertility and needs to be well assessed.

Neighbourhood characteristics and the fertility norms among women of the same ethnic groups can influence a woman's decision on childbearing (Boateng, 2013). The neighbourhood context characteristic influences the number of children to be born by a woman (Dodoo, 2015). Women who live in affluent neighbourhoods have a better living environment with high social status such as good education, income, employment which are the main determinants of low fertility among them (Tempenis, 2015). Women are more active economic agents in Africa contributing significantly to 70% of employees in the informal sectors (AFDB, 2015). Fertility level remain high in most sub-Saharan Africa despite recent decline globally (AFDB, 2015). In Mali, the explosion of Ghetto neighbourhood is characterized by defined and enforced norms as a result low occupation and income status which increase levels of fertility (Klasen, 2019). While these studies demonstrated an inverse relationship between Labor Force Participation and fertility, they did not clarify the influence of Labor force participation and occupation status on women fertility.

In Kenya, neighbourhood with close and constant interaction for a long period of time in Labor force allows for new ideas to diffuse between them, this may lead them to interline their neighbour's fertility preference (Askei, 2012). In traditional neighbourhoods that are lowly clustered, large family size norm and low media exposure are some of the determinants of high fertility, children are cultural imperative and high childbearing is the main role of being a wife

(Tsui, 2016). Another study conducted in Kenya revealed that neighbourhoods' characteristics of a social groups to which individual belong are among the factors that influence fertility (Banjo, 2019). Although individual characteristics may present fertility outcome, neighbourhood characteristics also have a higher level of influence on number of children to be born (Solanke, 2019). Further, if a woman with very low income and education resides in neighbourhoods for a long time or permanently where most women are educated and exposed to media, her perceptions on fertility will change (Odunayo, 2019). Kenyan women who engaged in the workforce had fewer children compared to those who did not participate in the Labor force (Ojiambo, 2020). Several reports have been provided concerning the underlying causes of fertility variation in clustered areas, nonetheless, the neighbourhood influence on woman's fertility was not well documented.

Women of fertile age account for 51% of the female population in the Kisumu East sub-county (Kenya National Bureau of Statistics, 2019). Fifty-eight percent of them are employed in formal and informal sectors and thus have close contact with women from other neighbourhoods (Kenya National Bureau of Statistics, 2019). The remainder relies self-employment or on their husband's income as they spend most of their time at home (Kenya National Bureau of Statistics, 2019). Fertility remains high among women who never work compared to those who work and spend most of their time interacting with their neighbours (Oyoo, 2020). High frequency of contact between these women could imply more social interactions and exchange of ideas concerning fertility (Oyoo, 2020). Much documentation on geographical clustering in connection to the number of children born per woman in this sub-county have not been conducted, this created a necessity for this current research.

CHAPTER THREE RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes in details the study area and its features, the research design, the study population and sample size, sampling procedure as well as the techniques that was utilized to guide the data collection process, data analysis and data presentation. It also describes the validity and reliability of the study and the ethical considerations.

3.2 Study Area

3.2.1 Location and Size

Kisumu East Sub County is one of the six sub counties in Kisumu County (Figure 2. It is elevated at an altitude of 1130 meters above the sea level. It lies between latitude 0° 12'N and 0°11'S of the equator and between longitude 34°43'E and 35° 57'E of Green which meridian. The sub county covers approximately 141.6km² land area with a population density of 1560 people per square kilometre. Kisumu East is made up of 5 Wards including West Kolwa, East Kolwa, Central Kolwa, West Kajulu and East Kajulu with 10 village units that include, Kajulu East, Kajulu west, Kasule, Nyalunya, Greater Kasewe, Chiga, Kuoyo, Kanyakwar, Dago and Kowino (Ministry of Devolution and Planning, 2017). The Sub County borders Muhoroni sub county to the East, Nyando sub county to the South East, Kisumu West sub county to the West and Kisumu Central to South West. Other neighbouring counties include Nandi and Vihiga.

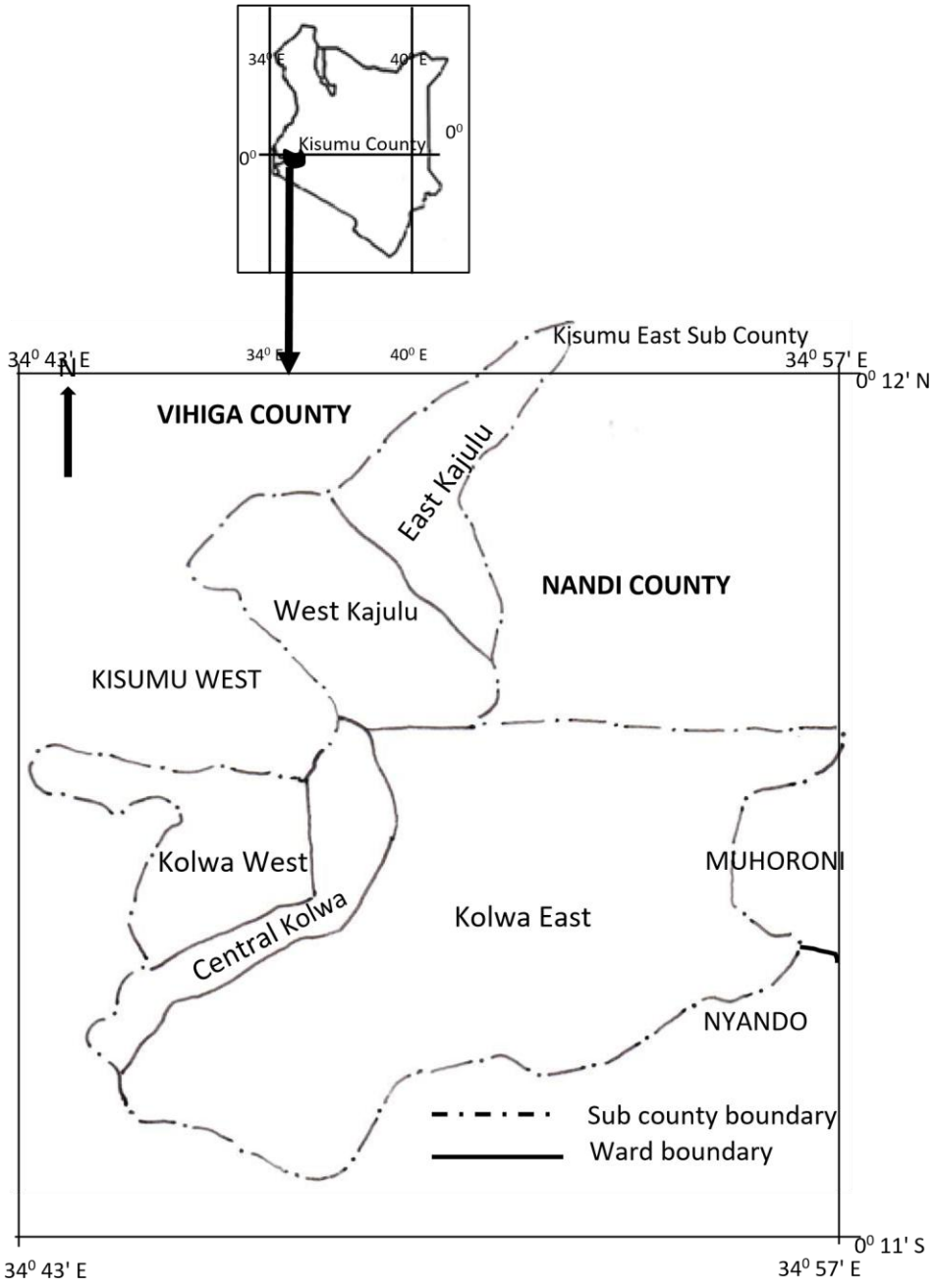

Figure 2: Map showing location of Kisumu east sub county in Kisumu County and within, Kenyan context.
Source: Adopted and modified from Ministry of Development and Planning (2017)

3.2.2 Climate

Kisumu East's (Figure 2) climate is typically warm, with little variance in monthly temperatures between 25°C and 35°C throughout the year. The rainfall is regulated by a modified tropical climate with prolonged rains from March to June and brief showers from November to December. Annual rainfall ranges from 1000 to 1800 millimetres during the long rains to 450 to 600 millimetres during the short rains. Kisumu East is warm all year round with a relatively high humidity level. Women are impacted by climates as a result of their social roles and obligations as home stewards. A conducive climate of Kisumu East has a significant influence on mother's fertility decision because it favors production of food through subsistence agriculture to that helps to feed the high number of children born.

3.2.3 Soils

Kisumu East Sub County is blessed with fertile alluvial soils that are ideal for agricultural activities. Lake sediments prevail, most notably sand and clay with granites which are necessary for building and construction. Generally, the lake borders are marshy providing good area for farming and fish rearing. This soil type dictates the range of income-generating activities that women engage in to support themselves. Quality fertile soils in Kisumu East are good for farming which encourages production of food to sustain the high fertility as well as creating a platform for Labor Force Participation through stone caving which help in earning household income to support the high number of children.

3.2.4 Economic Activities

In Kisumu East and its environs, human activities including farming, quarrying, livestock rearing, and motorbike riding prevail (CRA, 2012). While fishing is a significant source of revenue, individuals are increasingly turning to other forms of income generation activities. Majority of

women in Kisumu East Sub County are unemployed with most possessing low levels of education. This has resulted into geographical segregation based on socio economic class. Most women therefore engage in farming, quarrying, and small commercial ventures in order to meet the household requirement hence influencing their fertility decisions. Some of the minority groups live in areas of informal settlements and the rural parts of Kisumu East while the high economic class are segregated close to the city and the suburbs where there are more opportunities for Labor force compared to those in rural areas.

3.2.5 Population

Kisumu East Sub County has a total population of 220,997 people and 61,871 households (KNBS, 2019). The Luo dominates the study area. However, as a result of intermarriage, there are a few dispersed tribes from surrounding counties inside the region. This has led to geographical segregation based on ethnicity in some parts of Kisumu East. Although Luo is the primary language, parts of the population also speak Kiswahili and English. The growing population in Kisumu East has contributed greatly to women's increased fecundity and geographical segregation based on ethnicity.

3.3 Research Design

A research design is a blueprint for the methodologies and procedures used in doing research that incorporates both qualitative and quantitative analytic approaches. A cross-sectional descriptive research design, according to Polit and Beck (2008), analyses data collected at a single moment in time across a sample population. This research gathered data from a small sample of a larger population at a single moment in time over a brief period of time to answer questions about the current situation of the study region. Due to constraints of time and finance, this strategy was

suitable as it allowed the researcher to cut operating expenses by collecting data in a short period of time. The unit of analysis comprised of women aged between 18 and 49 years within the household who have childbirth experience.

3.4 Population and Sample Size of the Study

Kisumu East sub county has a total of 122,689 (Table 1) women and 67,871 households (KNBS, 2019). The sample size was calculated as shown in Table 1

Table 1: Table Showing sample size for women aged 18-49 years in Kisumu East sub-County

Wards	**Total women population**	**Women aged (18-49) Years**	**Formula**	**Sample size**
Central Kolwa	34,971	16,923	16,923/54,703×384	118
East Kajulu	9,304	3,814	3,814/54,703×384	27
West Kajulu	20,810	9,886	9,886/54,703×384	69
Kolwa East	15,988	6,604	6,604/54,703× 384	46
Kolwa West	31,616	17,476	17,476/54,703×384	124
TOTAL	**112,689**	**54,703**	**$(1.96)^2 \times 0.50 \times (0.5)/(0.05)^2$**	**384**

This research was limited to women aged between 18-49 years in Kisumu East sub county, the total number of women in this age category is 54,703 (KNBS VOL 3, 2019) which makes the study population. Because the study population exceeds 10,000, fishers et al. (1998) formula was used to determine the sample size. The standard deviation of 1.96(z) was used to determine the degree of accuracy at a 95 percent confidence level. (0.05).

$n=z^2pq/d^2$

n=the population's desired sample size if more than 10000

z = the standard normal deviate (Z Score) at a 95% confidence level.

p = proportion of the target population with the desired characteristics. If unknown was50%

q=1-p

d = the significance level at a given confidence level.

Because there is no estimated assumption to have the desired qualities, 50% where 0.5 was utilized as advised by Fisher's formula. As a result, at a 95% confidence level, the sample size is:

$$n = \frac{(1.96)^2 \times (0.5)(0.5)}{0.05^2} \qquad n = 384$$

This implies that a sample size of 384 individuals were interviewed to obtain data on the influence of geographical segregation on the number of children born per woman. However, this sample size was readjusted by 5-10% to cater for non-response that occurred during data collection.

3.4.1 Techniques and Procedures for Sampling

Sampling is the process of obtaining a statistically relevant sample of people from an underlying population (Islami, 2013). This study employed stratified random sampling, cluster sampling and snowball sampling procedures to obtain a minimum sample size of 384 female respondents aged between 18-49 years. This is because the age at which a person is legally defined as an adult with all of the associated rights and responsibilities is 18 years (Republic of Kenya, 2003). Stratified random sampling is a technique for sampling that groups a population into smaller subgroups called strata (Adams, 2016). This sample approach was employed since Kisumu East Sub County has a big population that is geographically distributed, and the administrative borders was used to determine the five strata, which are the wards. After that, the proportionate sample size of female respondents aged 18-49 in each ward was determined. To calculate the sample size for each stratum (Table 1), Stattrek's (2012) proportionate stratification formula was used.

nh=(Nh/N) ×n.

nh = the sample size for the ward,

Nh= the total number of women aged 18-49 in each ward,

N = the total number of women aged 18-49 in the sub county and n is the total sample size.

The technique entailed further stratification of wards into 10 villages, which were clusters of houses and buildings centred on a central point. The sample size for women in each village unit was then be determined. The researcher then employed cluster sampling technique whereby within the villages, the homesteads was divided into clusters based on buildings and houses around a common point example market centres or schools. From each cluster, proportionate number of women respondents aged between 18-49 was selected using snowballing sampling to make up 384 respondents. This procedure ensured high external validity by reflecting the characteristics of the larger population and allowing the researcher to obtain a sample representative of a specific subgroup.

This study also utilized purposive sampling to select the key informants such as an officer from National Council for Population Development, Kisumu East Kenya National Bureau of Statistic officer, Health Records officer at the Ministry of Health, and community leaders such as a chief who helped in providing information on detailed issues of interest in the study.

3.5 Data Collection Methods

To meet the study's objectives, quantitative and qualitative data were collected using primary and secondary data collection tools. Primary data were collected through questionnaires administration to 384 women respondents, key informant interviews, and focus group discussions with ten

members of the study population. Secondary data were gathered through a review of Census reports, existing data at ward-level, and Demographic Health survey reports.

3.5.1 Primary Data

3.5.1.1 Questionnaire

A questionnaire is a survey instrument comprising a set of questions meant to collect information from respondents. (Bhat, 2016). A researcher administered both open-ended and closed-ended questionnaires to 384 women respondents aged between 18-49 years. While open ended questions allow respondents to elaborate on their thoughts, close ended questions offered respondents with predetermined options that help eliminate irrelevant responses. Questionnaires aided in the collection of relevant data from various individuals in the study area. They were administered by help of two well-trained research assistants who translated the questions for a better understanding the respondents, as well as for illiterate respondents and those with disabilities such as blindness. The questionnaire was divided into 5 sections (see Appendix 1); the first section was collecting biodata of respondents; the second, third, fourth, and fifth sections elicited information about the dimensions of geographical segregation influencing fertility in the order specified by the objectives. The questionnaires were suitable for collecting huge amount of data from a sample population spread across a large area within a short time.

3.5.1.2 Key Informant Interviews

The Key Informant Interview is a strategy for eliciting a vivid image of a participant's viewpoint on the study issue (Mack et al., 2015). It was performed face-to-face with one interviewer and one participant at a time. The interviews were conducted in-person with key informants who are knowledgeable about the geographical segregation dimensions influencing female fertility. An

interview guide based on the specific objectives was utilized to elicit detailed information on the dimensions of geographical segregation influencing women fertility. Purposive sampling was used to choose key informants, who were an officer from the National Council for Population and Development at the county level who provided detailed information on population issues with reference to fertility, Kenya National Bureau of Statistic officer in Kisumu East who provided information about population statistical data in the sub county, a health records officer from the Ministry of Health in Kisumu who gave detailed information about women fertility in Kisumu East, and five area chiefs, one from each ward who addressed the women fertility levels within their administrative units as well as how geographical segregation has influenced their fertility.

There are a total of ten chiefs in Kisumu East sub county, five of the chiefs, one from each ward was selected by purposive sampling to serve as key informants since they are the source of expert knowledge. They assisted in the collection of data as knowledgeable individuals who have firsthand information of the study's subject.

3.5.1.3 Focus Group Discussions.

Focus Group Discussion is a qualitative data gathering technique that involves designed group discussions with the objective of eliciting participants' impressions of the study's subject (Mack et al., 2015). According to Krueger & Casey (2000), the usually recognized number of respondents is between six and eight; however, Rabiee (2004) proposes that researchers recruit an additional 10%–25% of respondents. Thus, ten participants are thought to be a sufficient number to gather a range of opinions while being small enough to avoid becoming chaotic or fragmented (Krueger, 1994). The researcher conducted five sessions of focus group discussions with eight to ten women aged between 18-49 years from each of the 5 wards within the study area. The participants were

chosen through purposive sampling because they were expected to provide highly accurate information and thus must be well informed individuals chosen at the researcher's discretion. They were guided by the researcher via discussion of particular guiding questions as per the objective of the study outlined before.

The guiding questions were open-ended in nature and were focused on particular dimensions of geographical segregations influencing women fertility as per the objectives of the study. The discussions took place in the chief's camp grounds due to their proximity and accessibility. The researcher facilitated the process as other two research assistants helped with note taking and audio recording to ensure that all important data was captured. The discussions lasted for around one and a quarter hour. This tool assisted in gaining knowledge on the research issue.

3.5.2 Secondary Data

Secondary data sources were used to collect both qualitative and quantitative data on geographical segregation influencing women fertility, they included; Census reports, Demographic Health Survey reports and pre-existing data at ward-level. Maseno University Library, Kenya National Bureau of Statistics offices, Government Information Documentation Centre, and the internet was used to collect information from these sources.

3.6 Data Analysis

Techniques for quantitative and qualitative data analysis were utilized. Quantitative data on the percentage of women sharing common points, percentage of women concentrated in a ward, percentage of women living near the urban centre compared to those far from urban centre and the percentage of women participating in Labor force were analysed using descriptive statistics such as frequencies, percentages, and mean. Additionally, inferential statistics such as simple linear

regression, multiple linear regression, spearman rank correlation and multiple linear correlation coefficient were used to determine the influence of exposure, concentration, centralization, and clustering on the number of children born per woman. In the end, the researcher ran Multiple linear regression on all the factors against the number of children born to establish the general relationship between geographical segregation and fertility.

Qualitative data collected through focus groups discussions, key informant interviews, and open-ended questionnaires were analysed by coding, creating categories, themes and patterns then evaluating the usefulness of the information in answering the research questions. These techniques ensured accurate and consistent data which aided in the tabulation of results.

3.7 Data Presentation

Qualitative data were synthesized and presented in narratives using statistical tables, charts, and graphs, whereas quantitative data were presented in frequency distribution tables, pie charts, and bar graphs to illustrate the relationship between various variables. The findings aided in increasing women's awareness on how geographical segregation influence their fertility.

3.8 Reliability and Validity

The proportion to which research assesses the variables meant to be measured is referred to as its validity (Bell, 2010). The degree to which a technique utilized in this study delivers comparable and consistent outcomes is referred to as its reliability (Bell, 2010).

3.8.1 Internal Validity

This metric indicates the degree to which research shows a credible causal association between a treatment and an outcome (Arlin, 2021). Piloting the research instruments was done to aid in ensuring internal validity and resolving instrument-related discrepancies. Connelly (2008)

recommends doing a pilot research on 10% of the sample size. Internal validity was assured by questionnaire administration to roughly 10% of the total sample size. This implies that 39 of the 384 respondents were used to help in piloting research instruments. They assisted in determining the appropriateness of the questions and their utility and relevance to the subject under inquiry. Additionally, it was helpful in determining how much time respondents spent answering the questions, as well as their desire and aptitude to answer the research questions.

3.8.2 Reliability

The term "reliability" relates to a measurement's constancy (Petty, 2009). This study used test-retest reliability to examine how well items on a test suggested to measure the same construct and yield comparable findings. This was accomplished by presenting the identical questionnaire to 10% of respondents at two distinct moments in time. Correlation of the test results allowed for the evaluation of the stability test. If the correlation indicates that the scores are stable, this is evidence of high dependability (McCaslin, 2009). The researcher worked to provide a high degree of dependability by ensuring that the questions are written in simple and straightforward language that the respondents would comprehend. Results on Cronbach's Alpha were presented in Table 2.

Table 2: Reliability Test coefficients

Cronbach's Alpha	Part 1	Value	40.000
		N of Items	20[a]
	Part 2	Value	40.000
		N of Items	20[b]
	Total N of Items	40	
Correlation Between Forms		[c]787	

Spearman-Brown Coefficient	Equal Length	.794
	Unequal Length	.794
Guttmann Split-Half Coefficient	.783	.783

A sample size of 40 households' heads equivalent to 10% of the total sample size was pretested, it was affected to support in refining the data collection apparatuses; this was done to ensure the conclusion achieved from the field have a factual demonstration of the real condition on the study area. The piloted respondents were omitted in the final survey, such exclusions contributed to elimination of sample bias. The piloted instrument was tested using the spearman's brown formular for prophecy. The formular uses split half reliability (r half) and generates the full-length estimation (r full). This reliability coefficient is suitable for the survey because it measures the noticeable variables and psychometric examination as cited by (Mazzetti, 2020). A strong consistency coefficient of α=.794 was accomplished after addressing language differences, the instrument was accepted devoid of additional modification.

3.9 Ethical Consideration

Research ethics refers to a set of ideals, standards, and institutional structures that contribute to the formation and regulation of scientific activity (NESH, 2016). The following ethical concepts and standards served as a guide for this study: Obtaining informed consent from authorities; permission was sought from Maseno University School of Graduate Studies, approval from Ethics Review Committee and NACOSTI to conduct research in the study region. Before collecting data, permission was also acquired from the area chief, stakeholders involved and each respondent by describing the goal of the research and the value of participation. Confidentiality and anonymity were ensured; the data collected from respondents was not used to identify people, confidentiality was maintained by giving pin codes to the research questionnaires to safeguard the participants' identities in the study. The security and privacy of research questions was addressed by storing data on a computer with a strong password. High levels of confidentiality were maintained especially for those discussing sensitive topics such as marital affairs and reproductive health. Willingness to participation; the study guaranteed willingness to participation and there was no form of coercion used to compel participants to participate in study. Participation in the research was optional and participants had the option of responding to or ignoring the questions.

CHAPTER FOUR: RESULTS AND DISCUSSION

4.1: Introduction

This chapter presents the results and also discusses the study findings on socio economic and demographic characteristics of respondents, the influence of exposure on the number of children born, the influence of concentration on the number of children born, the influence of centralization on the number of children born and the in fluence of clustering on the number of children born in Kisumu East sub county, Kisumu County as presented in Tables and figures respectively.

4.2 Demographic and Socio-Economic Characteristics of Respondents

The information on demographic and socio-economic characteristics of the respondents were obtained and presented in figures below.

4.2.1 Respondent's age

The information on the age of respondents who were women aged between 18 and 49 were obtained. The percentages of ages out of the total respondents are presented in Figure 3.

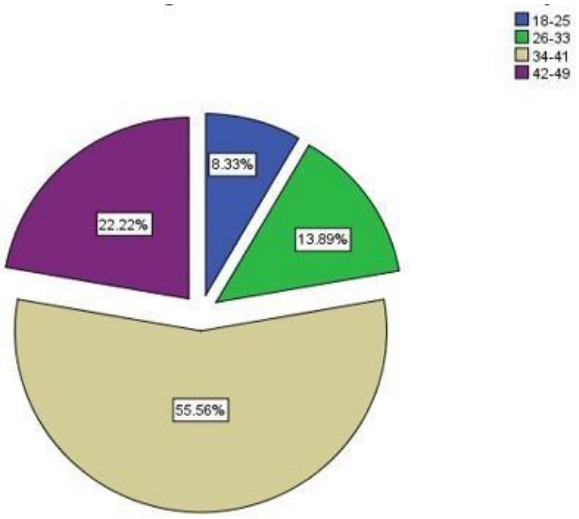

Figure 3: The Pie Chart showing women respondents age (in years) in households in Kisumu East Sub- County.

Majority of the women (55.56%) who were interviewed were aged between 34-41 years which formed the peak of maternal age in Kisumu East. This was followed by women within 42-49 years of age bracket, minority 18-25 years formed the lowest proportion of 8.33%. This is possible because, larger percentage of Kisumu East is rural setup. Many elderly people prefer to live in rural areas unlike the youths who prefer cities that offer many opportunities for career growth, personal development and recreation. Similar observations were made by Compton and Pollak (2014) who reported more elderly women in the rural set up. Most young women are either pursuing education or are migrating to other urban centres to seek better employment opportunities (Kenya National Bureau of Statistics, 2019). The outcome was a reflection of findings by Oliver (2017) which confirmed societal outlook, poverty, harsh environments, peer pressure, and culture as factors influencing maternal age among the women.

4.2.2 Marital Status

The women respondents were interviewed about their marital status which was categorized into married, divorced/separated, single and widowed. The percentages of total respondents of women belonging to various categories of marital status was presented as shown in Figure 4.

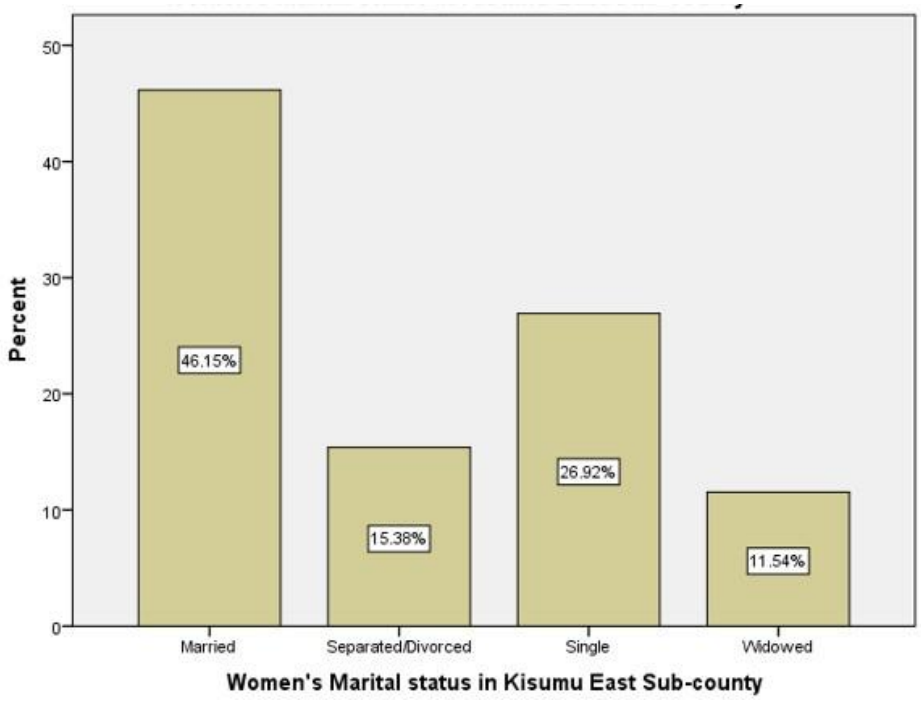

Figure 4: Bar chart showing percentage of various total respondents of women belonging to various categories of marital status in households in Kisumu East sub county

The results shows that married women (Figure 4) formed 46.15% of the total respondents. This was followed by single women at 26.92%, the separated were 15.38 % while the smallest comprised widows at 11.54%. This could be because most single women in Kisumu East are either pursuing education or are actively involved in the labor force hence not ready to bear children or be committed in marriages. Results on married women are similar to those in Nigeria where majority of the uneducated women in the northern region and were more prone to early marriages with less access to family planning methods (NDHS, 2022). However, the findings of Garret, (2011) reported a low number of married women in Northern Europe. The low number of married women in Kisumu East is possible because of the use of contraception among women, family planning methods helps in controlling fertility at the same time delaying the marital age of women.

4.2.3 Number of Children Born per Woman Respondent

The women respondents were asked on the number of children ever born to them by the time of the interview. The number of children and their frequencies are presented in Figure 5.

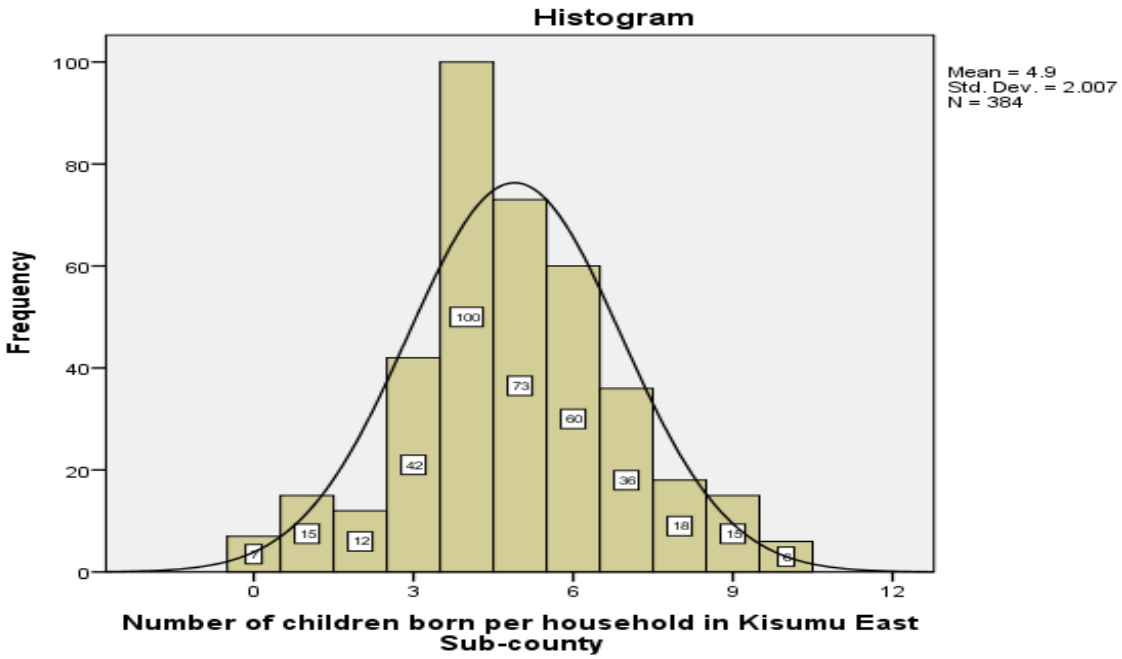

Figure 5: Histogram showing the frequencies of number of children born per woman respondent in households in Kisumu East Sub- County.

The distribution curve of number of children ever born to a woman is normal (Figure 5) with the mean of 4.9 children. The results shows that majority of the households had 3-7 children. Very few respondents had at least one child, similarly very few respondents had above 10 children. Most women in the study area recorded high number of children of 4. The increase in number of children born per woman in Kisumu East is an indication that poverty, economic hardship as well as low access to family planning programs curtail efforts of fertility control among most of the rural and slum dwellers in Kisumu East. Similar findings were reported in Kisumu East by Ogot, (2016)

whereby a larger number of households had relatively high number of children. The findings were however dissent with that of Ministry of Health Kisumu County (2021) which reported a fertility rate of 4.2 children per woman. The difference indicates an increase in fertility over time. The results are inconsistent with the findings by World Population Data Sheet, (2010) which indicates that in Europe, rates of fertility are significantly below replacement levels, North and West European regions have greater rate of fertility of 2.0 than South and East Europe with 1.50.

4.2.4 Occupation Status

The women respondents were asked about their occupation status which was categorized as formally employed, informally employed, and self-employed. The percentages of total respondents are presented in Figure 6.

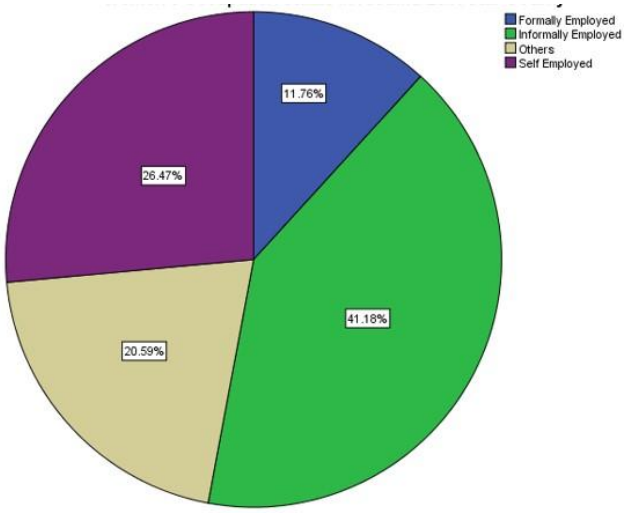

Figure 6: Pie chart showing percentages of total women respondents engaged in various categories of occupation.

Majority (41.81%) of the women respondents (Figure 6) were engaged in informal employment. This was followed by self-employment category at 26.47%, formal employment formed the smallest percentage of 11.76% and the rest 20.59% were occupied by other unspecified economic

activities. The high percentage of informal employment among women in Kisumu East is characterized by low levels of education, rural residentials and low economic status, most of them can therefore not be able to secure formal employment nor a decent self-employment. The outcome showed a close similarity to the findings in India by Tulsi (2010) which noted that the frequent contact between people of low socio-economic class hinders education and occupational aspirations. Kenya National Bureau of Statistics (2019) agreed on informal employment as a major source income among the rural and informal settlement dwellers. Compared to urban dwellers who are mostly self-employed or formally employed, rural lack enough formal employment opportunities (Michel, 2018). The outcome is however contradicting with the findings in Asia by Population Facts (2019) which noted that women in these developed nations have children later in life, owing to their pursuit of economic activities and professional careers.

4.2.5 Education level of Women Respondents

The women respondents were questioned about their education level which was categorized into primary, secondary, tertiary and others. The percentages of total respondents are presented in Figure 7.

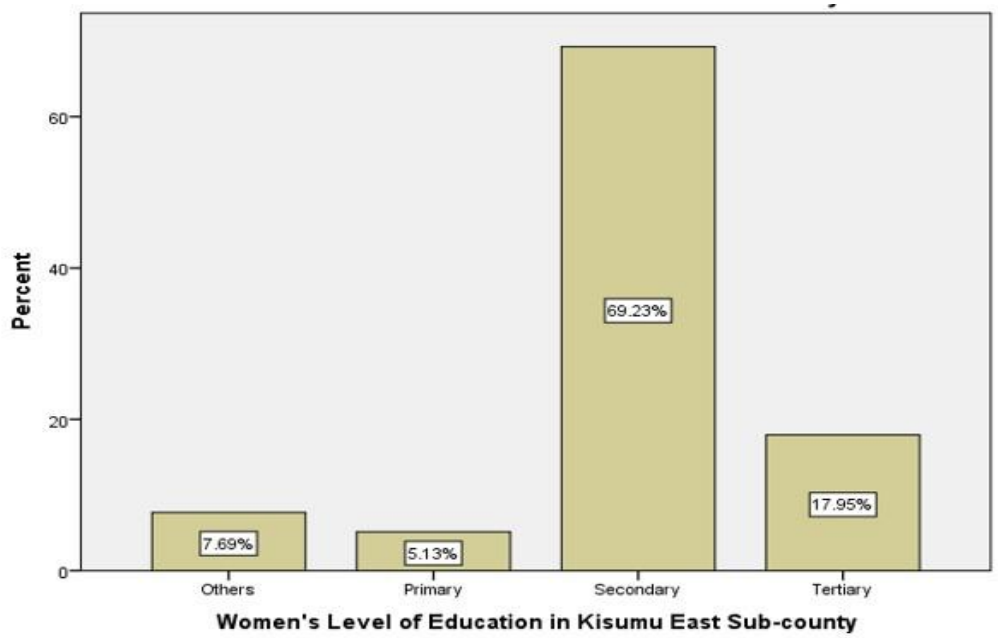

Figure 7: Bar chart showing percentages of total women respondents belonging to various categories of education level.

Most women (Figure 7) in Kisumu East Sub County had at least secondary level of education which accounted for 69.23%. Tertiary level of education comprised 17.59%, primary was 5.13% while the rest 7.69% respond other forms of education. Low levels of education among women in Kisumu East is majorly caused by poverty, child marriages and early pregnancies. Low-income families prefer investing in boy child education while the girls are left exposed to early marriages which in turn influence high fertility among them. Highly educated women tend to have fewer children, however their decision on the number of children born can also be influenced otherwise by the kind of social setting, nature of male spouse and levels of social interaction. Similarly, a study conducted in Sub Saharan Africa showed that low levels of education thrive among most Sub-Saharan women and is a key contributor to high fertility (Gobi, 2016). Such like findings were observed also by Watkins (2019) in Kenya that realized the role of culture and gender

discriminations on girl child education therefore most women especially in rural areas and informal settlements do not proceed past secondary education. However, in developed nations most women have children later in life, owing to their pursuit of higher education (Population Facts, 2019).

4.2.6 Duration of stay in Kisumu East Sub County

The women respondents were questioned about their duration of stay in Kisumu East Sub County which categorized into less than 10 years, more than 10 years and since childhood. The duration of stay of women respondents in Kisumu East are presented in Figure 8.

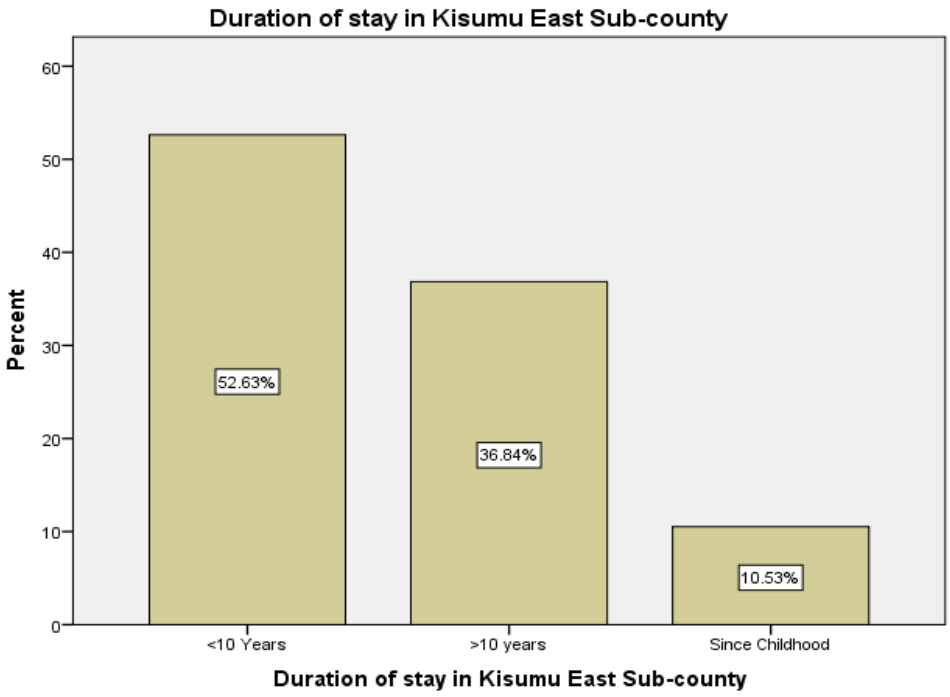

Figure 8: Bar chart showing percentages of total women respondents based on their Duration of Stay in the study locality

Majority of the women interviewed 52.63% had stayed in the sub county for less than 10 years on the other hand 36.64% of the respondents had 10 years of stay while 10.35% claimed to have been

there since childhood (Figure 8). Most women reported having stayed in an area for less years. Women by nature relocate from motherland upon marriage or even to seek employment. According to the discussion held with an area chief at Kolwa chiefs camp, most women settle in areas around Kisumu East on employment or marriage basis, there are few natives as most have moved to other cities in search of education, employment or marital affairs.

4.2.7 Other Determinants of Fertility Within Social Groups in Kisumu East Sub County

Women respondents were interviewed about other determinants of fertility within their social group, other determinants of fertility were grouped into marital status, nature of male spouse, peer pressure and social stigma. The percentages of total respondents of women belonging to various categories of other determinants of fertility within a social group are presented in Figure 10.

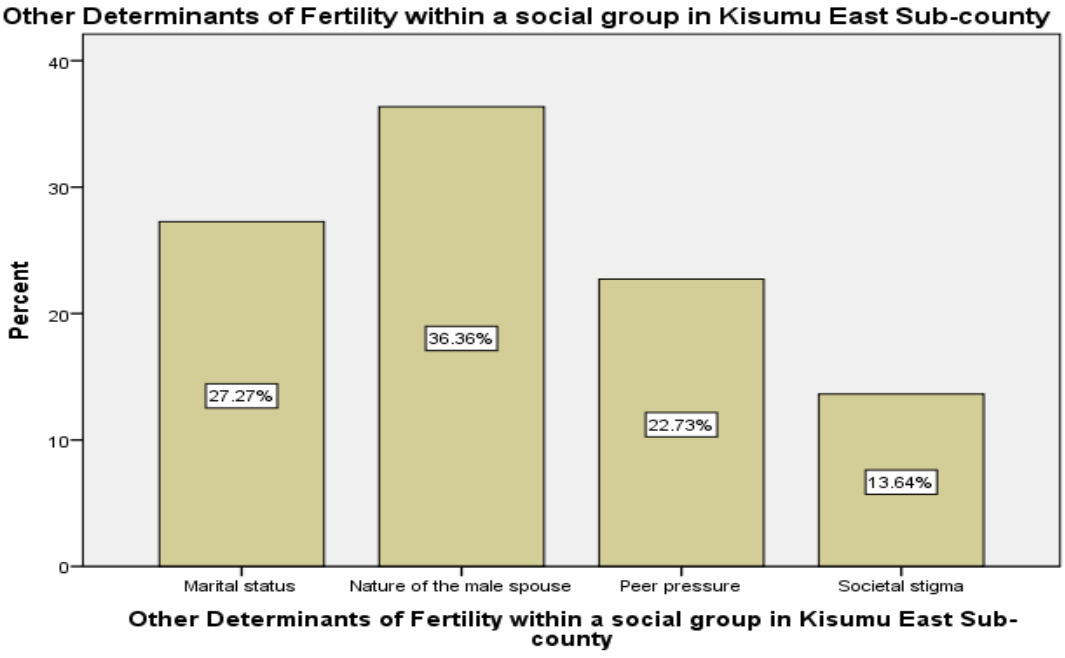

Figure 10: Bar chart showing percentage of women respondents based on other determinants of fertility within a social group in Kisumu East

Nature of the male spouse was mentioned by many women (36.36%) as a factor likely to influence the fertility in Kisumu East sub-county (Figure 10). According to discussion held with a Health Record Officer at Gita dispensary, many men mostly desire to have more children especially when there is no gender balance. Others hold tightly to social norms that sustain a social system such as power and predominance in roles of moral authority, and control over the number of children to born. They also tend to demand for male children for gender and inheritance purposes. Again, a meeting with the focus group discussion held on 20th December 2022 confirmed that most men were unwilling to practically participate in family planning programs hence influencing women fertility. The findings are not in agreement with studies conducted in most developed nations which realized occupational commitment, economic status, pursuit of higher education and career development as other determinants of women fertility (Population facts, 2019). The nature of male spouse regarding the number of children born in Kisumu East is determined by their level of eeducation, exposure, poor attitude towards family planning and other cultural beliefs. Most married women in Kisumu East are tasked with the duty of bearing children for the continuation of the family.

4.2.8 Respondents Residential Classification by Urban Proximity in Kisumu East Sub County

The women respondents were asked about their residential classification by urban proximity in Kisumu East Sub County which was categorized into Town centre, Near town centre and far from town centre. The respondent's residential classification by urban proximity in Kisumu East are presented in Figure 11.

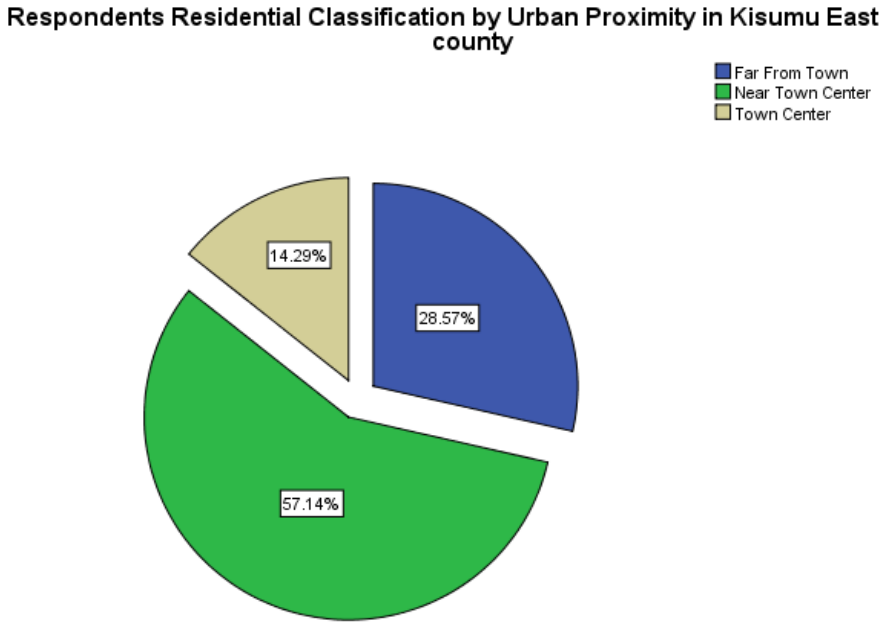

Figure 11: Pie chart showing percentages of total women respondents based on residential classification by urban proximity

Majority 57.14% of respondents lived near the town centres, 28.57% were found far away from the town while the remaining 14.29% belonged to the town centre (Figure 11). Most women in Kisumu East who reside near town centers are characterized by high economic status with low number of children. Those who reside near the town centers majorly occupy the sub standards housing and are either middle class or economically disadvantaged. They tend to have slightly higher number of children compared to those who reside in the town center. Similar findings were noted in Western Europe by Hank (2012) that racial, economic and ethnic minority groups concentrate in city centres inhabiting the oldest and most substandard houses. Contradicting findings were reported by Boyle (2019) who realized that minority social groups tend to occupy the small share

of the environment close to the town centre with most segregated to the suburban and rural areas. Most of the youthful population of Kisumu East are in urban areas seeking employment and education (Kenya National Bureau of Statistics, 2019). From the results it is evident that the financial cost, effort required to raise and educate children as well as access to information, technology, quality education, quality health care, and employment are all determined by urban proximity.

4.2.9 Residential Distance from the Town Centre in Km.

The information on the women respondents on household residential distance from town centre were obtained. The results on residential distance from town centre presented in Figure 12.

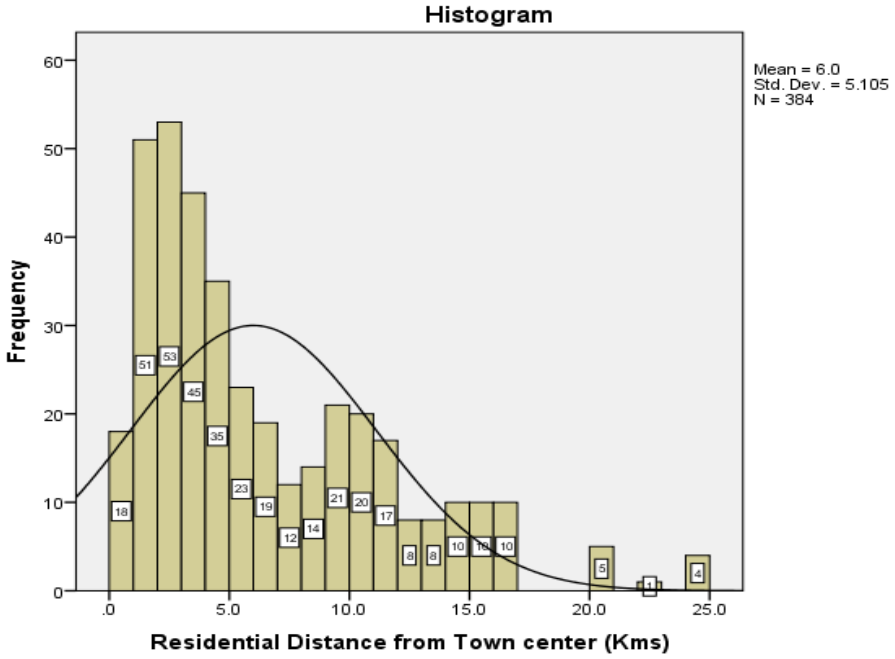

Figure 12: Histogram showing the frequencies of residential distance from town centre of respondent's households in Kisumu East Sub- County.

Most respondents (Figure 12) lived between 1-5 Km away from the town centre. Respondents within the proximity of the CBD reported a high to average economic status. According to Murine a Sunday school teacher in one of the local churches, most women preferred being near town centres because they believed they could access better schools for their children and other essential quality services. These results are a reflection of findings by Republic of Kenya (2013) which realized that high income groups live in lavish geographical areas characterized by closeness to the Central Business District with developed infrastructure and quality services. Similarly, Maina (2015) reported that the negatively geographically segregated areas are characterized by uneven spatial distribution of public services such as schools, healthcare, security and transport system. Howsoever, studies in Sub Saharan Africa by Corker (2016) differ with the outcome in that most households in SSA are characterized by low levels of urbanization and so many social groups are centralized in areas far away from the urban centre (Corker J, 2016). In Kisumu East, Urban rural disparities have led to increased fertility among the low social class minorities as a result of distance from the town centre.

4.3 The Influence of Exposure on Number of Children Ever Born

This section presents results on influence of exposure on number of children born per woman. The exposure was measured by: Frequency of sharing common centres by women (age 18-49 years) respondents; frequency of psychosocial and cultural factors influencing first and last childbirth; frequency of interaction on number of children born; and frequency of social interactions on the number of children.

4.3.1 Sharing Common Centres and The Mean Number of Children Ever Born

The frequencies of sharing common centres by women respondents and corresponding mean number of children born per woman were obtained and the results are presented Table 3.

Table 3: Common centres shared by respondents, frequency of sharing, percentage of total respondents and the mean number of children born per woman

	Frequency	Percent	Mean number of children born per woman
Churches	82	21.1	4
Health facilities	192	50.0	2
Market places	40	10.5	5
Water points	45	11.8	4
Other facilities	25	6.6	3
Total	384	100.0	

Table 3 shows that about 21% of women who shared common churches gave birth to an average of 4 children. The 50% of the respondents who attended common health facilities registered the lowest number of childbirths. Women who shared common market places were likely to give birth to more children. Moreover, the correlation between sharing common centres and mean number of children born per woman were examined using Spearman rank correlation coefficient. The result shows that the relationship was strong and positive ($r = 0.675$). This implies that as sharing common centres increase, the mean number of children born per woman also increase. However, the correlation is not statistically significant ($\alpha = 0.05$, $p = 0.105$). From the results, the high number of children among women who share common centres such as churches and markets in Kisumu East is attributed to the fact that fertility choices made by one individual depends on actions taken by others through observation and sharing of believes during social interactions.

These findings are a true reflection of the reports on the global context which noted that interactions among social groups help in transforming fertility decisions and behaviour among women (World population Data Sheet, 2013). The results agree with Manski (2019) in Northern Asia which reported that daily social exchange which occurs in markets, churches, health facilities, or even workplaces positively influence the fertility behaviour among women of minority groups. This could be because of exchange of ideas and retention of cultures and behaviours among social groups. Similarly, in Kenya Watkins (2016) observed that the fertility behaviours of others in common centres can also influence individuals' fertility decision. The 50% of women who attended common health facilities registered the lowest number of childbirths, this is because a study conducted by Wilson (2017) confirmed that prevalence use of family planning by members of the same social group can influence an individual to start the same practice that help in controlling her fertility. The findings however are contradicting with the reports by the UN (2019) in Central and southern Asia which noted a decrease in fertility among women who were focused on the high level of social interactions that is characterized by pursuit of higher education economic activities and professional careers.

4.3.2 Psychosocial and Cultural Factors That Influence the First and The Last Childbirth.

The influence of the psychosocial and cultural factors on the first and the last childbirth was analysed using multinomial logistic regression. The results are presented in Table 4.

Table 4: Table of Multinomial Logistic Regression on Psychosocial factors influencing first and last child birth

Parameter Estimates

First and Last Childbirth		B	Std. Error	Wald	Df	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
								Lower Bound	Upper Bound
1.00 First Childbirth	Intercept	.360	1.371	.076	1	.072			
	Social Pressure	.022	.049	.417	1	.696	.842	.824	1.052
	Cultural Norms	21.418	.884	6.176	1	.019	.187	.048	.682
	Perceptions	-.049	1.225	.312	1	.421	.957	.944	1.148
	Others	-.017	.911	.241	1	.726	.853	.996	18.611[b]
2.oo Last Childbirth	Intercept	.128	1.422	.062	1	.083			
	Social Pressure	.036	.066	.382	1	.541	.742	.905	1.144
	cultural Norms	18.235	.862	5.198	1	.025	.263	.064	.794
	Perceptions	-.058	1.116	.324	1	.529	.939	.961	1.046
	Others	-.028	.832	.157	1	.726	.853	.902	16.415[b]

Cultural norms (Table 4) were the most frequently mentioned factors, in first and last child birth, it therefore formed the reference category. The model for parameter estimates for first and last childbirth significantly fitted the data (p= 0 019, p =0.25). Cultural norms had a statistically significant overall influence on the first and the last childbirth. On one hand, if a subject were to increase her social pressure score by one point, the multinomial log-odds of preferring social pressure to cultural norms would be expected to increase by 0.022 unit while holding all other

variables in the model constant. The unit of increase is very small and insignificant. If a subject were to increase her perceptions score by one point, the multinomial log-odds of preferring perceptions to cultural norms would be expected to decrease by 0.049 unit while holding all other variables in the model constant. The unit of decrease is very small and insignificant.

For social pressure relative to cultural norms, the Wald test statistic is 0.417 with an associated p value of 0.696. For perceptions relative to cultural norms, the Wald test statistic is 0.312 with an associated p-value of 0.421. At significance level of 0.05, we reject the null hypothesis that a particular predictor's regression coefficient is zero given that the rest of the predictors are in the model. We concluded that the regression coefficients for social pressure and perceptions have been found to be statistically different from zero given that cultural norm is in the model. Since the odds ratios for social pressure and perceptions are 0.842 and 0.957 respectively (which are less than one), the major factor influencing first childbirth was cultural norms.

On the other hand, last childbirth, if a subject were to increase her social pressure score by one point, the multinomial log-odds of preferring social pressure to cultural norms would be expected to increase by 0.036 unit while holding all other variables in the model constant. The unit of increase is very small and insignificant. If a subject were to increase her perceptions score by one point, the multinomial log-odds of preferring perceptions to cultural norms would be expected to decrease by 0.058 unit while holding all other variables in the model constant. The unit of decrease is very small and insignificant.

For social pressure relative to cultural norms, the Wald test statistic is 0.382 with an associated p value of 0.541. For perceptions relative to cultural norms, the Wald test statistic is 0.324 with an associated p-value of 0.529. At significance level of 0.05, we reject the null hypothesis that a particular predictor's regression coefficient is zero given that the rest of the predictors are in the model. We concluded that the regression coefficients for social pressure and perceptions have been found to be statistically different from zero given that cultural norms are in the model. Since the odds ratios for social pressure and perceptions are 0.742 and 0.939 respectively (which are less than one), the major factor influencing last childbirth was cultural norms.

The above reports concurred with that of Khuha, (2017) which noted that culture was the most overriding factor in determining when to have the first and the last child birth. The results are also consistent with those of Domnique (2009) in Sub Saharan Africa which reported that high fertility in Sub Saharan Africa have been sustained by cultural norms within different geographically segregated groups. Africa is widely known for preservation of culture and heritage which helps in understanding our past. Similar findings were also noted by Boulay (2015) in Ethiopia where women decision on the number of children to be born and when to start and complete childbearing is greatly influenced by the cultural norms within a highly connected homogeneous network.

In Kisumu East, individual fertility decision and behaviour is mostly determined by social cultural norms and practices at large through observation and assimilation. Social cultural norms in turn influence decision making of women on the perceived value of children. The results are however not in agreement with the findings by Wilson (2017) which reported use of family planning programs that aid in controlling fertility successfully among certain women in the same social

group. The prevalence use of family planning by the neighbours or members of the same social group can influence an individual to start the same practice that help in controlling her fertility. High levels of education promote uptake of family planning methods, ultimately contributing to a decrease in the desired family size among women within a social group.

4.3.3 Influence of Frequency of Interaction on Number of Children Ever Born

The multiple correlations of percentage interactions of women in common centres, frequencies of interactions of women (daily, weekly, monthly and annually) and mean number of children were analysed using Spearman's Rho correlation coefficients (Table 5a). The multiple correlation coefficient was also estimated where the dependent variable was number of children born per woman and independent variables were percentage interactions of women in common centres, daily interaction frequencies, weekly interaction frequencies, monthly interaction frequencies and annual interaction frequencies (Table 5b) The significance of multiple correlation coefficient analysis was tested using analysis of variance (Table 5c).

Table 5a: Pairwise Spearman's Rho correlation coefficients between percentage interactions of women in common centres, frequencies of interactions of women (daily, weekly, monthly and annually) and mean number of children born per woman

			Daily Interaction Frequencies	weekly Interaction Frequencies	Monthly Interaction Frequencies	Annual Interaction Frequencies	Number of Children Born per Woman	Percentage Interactions
Spearman's rho	Daily Interaction Frequencies	Correlation Coefficient	1.000	-.059	.603	-.508	.732	.773
		Sig. (2-tailed)	.	.912	.205	.304	.03	.042
		N	384	384	384	384	384	384
	weekly Interaction Frequencies	Correlation Coefficient	-.059	1.000	.485	-.761	.882*	.759*
		Sig. (2-tailed)	.912	.	.329	.079	.020	.048
		N	384	384	384	384	384	384
	Monthly Interaction Frequencies	Correlation Coefficient	.603	.485	1.000	-.806	.665	.623
		Sig. (2-tailed)	.205	.329	.	.053	.612	.135
		N	384	384	384	384	384	384
	Annual Interaction Frequencies	Correlation Coefficient	-.508	-.761	-.806	1.000	-.552	.727
		Sig. (2-tailed)	.304	.079	.053	.	.256	.064
		N	384	384	384	384	384	384
	Number of Children Born per Woman	Correlation Coefficient	.732	.759*	.665	-.552	1.000	.385
		Sig. (2-tailed)	.03	.048	.612	.256	.	.010
		N	384	384	384	384	384	384
	Percentage Interactions	Correlation Coefficient	.773	-.196	.623	.727	.385	1.000
		Sig. (2-tailed)	.042	.587	.135	.064	.010	.
		N	384	384	384	384	384	384

Table 5b Multiple correlation Coefficient Analysis:

Dependent variable, mean number of children born per woman and independent variables: percentage interactions of women in common centres, daily interaction frequencies, weekly interaction frequencies, monthly interaction frequencies and annual interaction frequencies

R	R Square	Adjusted R Square	Std. Error of the Estimate
.730[a]	.697	.694	2.427

Table 5c Analysis of variance showing the significance of prediction of mean number of children born per woman by percentage interactions of women in common centres, daily interaction frequencies, weekly interaction frequencies, monthly interaction frequencies and annual interaction frequencies

Model	Sum of Squares	Df	Mean Square	F	Sig.
1 Regression	125.237	5	112.247	65.324	.023
Residual	14.221	379	15.662		
Total	139.458	384			

Significance level, α= 0.05

The results showed a strong positive and statistically significant linear correlation (r =0.732, p = 0.03) between daily interaction by women and number of children born per woman (Table 5a). Moreover, weekly interactions by women had the strongest positive correlation (r = 0.759, p = 0.048) with number of children born per women (Table 5). These results demonstrated that as the frequency of interactions of women daily and weekly increase, the number of children born per woman also increase. These results concur with that of Manski (2019) in Northern Asia which stated that daily social exchange that occurs in common centres positively influence the fertility behaviour among women of minority groups. Women individuals in the same segregated social

group sometimes behave similarly because they face the same similar institutional environment and have similar fertility characteristics (Manski, 2019). These results are however inconsistent with studies conducted in Germany which reported low levels of fertility among those women who hardly met at common centres (Milewski, 2014). From the results, it is evident that daily interactions among women at the informal setup are mostly idleness driven. Being idle due to lack of proper Labor force participation promotes high fertility rates among the women.

The results also showed weak positive and statistically significant linear correlation ($r = 0.385$, $p = 0.010$) between percentage interactions of women in common centres and number of children born per woman (Table 5a). Apparently, as the percentage interactions of women in common centres increase, the number of children born per woman also increase. Similar observations were made by Khuha (2017) who stated that social interactions at the common centres influence a woman decision on reproduction rate. By contrast, annual interactions by women showed insignificant negative correlation ($r = -0.552$, $p = 0.256$) with number of children born per woman (Table 5a). Seemingly, as the frequencies of interactions by women increase annually, the mean number of children born per woman decrease. These results are in agreement with studies conducted in Germany which reported low levels of fertility among those women who hardly met at common centres (Milewski, 2014). Similarly, in Central and Southern Asia, fertility decreased to 2.4 births per fertile female in 2018 among women who had high level of social interactions (United Nation, 2019). Women in such developed nations have children later in life, owing to their pursuit of higher education economic activities and professional careers (Population Facts, 2019). This is supported by the fact that occupations demand more time from women hence no time for childbearing.

The multiple correlation coefficient analysis demonstrated higher adjusted R square value of 0.695 indicating the higher predictability of number of children born per woman from the combined influence of percentage interactions of women in common centres, daily interaction frequencies, weekly interaction frequencies, monthly interaction frequencies and annual interaction frequencies (Table 5b). This prediction is statistically significant at $\alpha = 0.05$ (Table 5c). Several studies have reported similar observations; Bongarts (2013) reported that social interactions among women help in transforming ideas about family planning methods and fertility perceptions. Frequent observation of fertility behaviours of others can also influence individuals' fertility decision (Wartkins, 2016). Through social interactions at the common centres, it is clear that cultural norms and believes that relates to reproduction rate, childbearing, gender balance, age at first birth and completed fertility can be transmitted to individual women.

4.3.4 Social Interaction and Number of Children Ever Born

The opinions of women on whether social interactions and sharing common centres could influence number of children born per woman were sought through five-point Likert scale (agree, strongly agree, neutral, disagree, and strongly disagree). The multiple correlations of the frequencies of social interactions of women, sharing common centres by women, and number of children born per woman were analysed using Spearman's Rho correlation coefficients (Table 6).

Table 6a: Pairwise Spearman's Rho correlation coefficients between social interactions of women, sharing common centres by women, and number of children born per woman

	Number of Children Born	Social Interactions	Sharing Common Centres

Number of Children Born	Correlation Coefficient	1.00	.50	.61
	Sig. (2tailed)	.	.04	.01
	N	384	384	384
Social Interactions	Correlation Coefficient	.50	1.00	.03
	Sig. (2tailed)	.04	.	.40
	N	384	384	384
Sharing Common Centres	Correlation Coefficient	.61	.03	1.00
	Sig. (2tailed)	.01	.40	.
	N	384	384	384

The results showed a moderately strong positive and statistically significant linear correlation (r =0.50, p = 0.04) between social interactions by women and number of children born per woman (Table 6a). Moreover, sharing common centres by women had the strongest positive correlation (r = 0.61, p = 0.01) with number of children born per women (Table 6a). These results demonstrated that as the frequencies of women involved in social interactions and sharing common centres increase, the number of children born per women also increase. Similarly, in the Netherlands, neighbourhoods and Labor force involvement form arena where women interact frequently and this influence their fertility decision through emotional contagion, social learning and social pressure (Logan, 2012). The findings are inconsistent with that of Granovetter (2015) which realized that innovations in fertility control measures such as adoption of contraceptives and easy access to information on fertility control has made women fertility decision to be individualized rather than socially influenced. The results also contradict with the demographic reports by the UN

(2015) which noted that social isolation was associated with likelihood of increased fertility in an area. In Kisumu East, the high number of children born per woman is conspicuously caused by sharing of information and ideas among women during social interactions at the common centres.

The multiple correlations of the frequencies of social interactions of women, sharing common centres by women, and number of children born per woman were analysed using Spearman's Rho correlation coefficients (Table 6b).

Table 6b: Multiple correlation Coefficient Analysis: Dependent variable, number of children born per woman and independent variables: social interactions of women and sharing common centres by women

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.391[a]	.153	-.355	2.187

Analysis of variance was used to analyse the number of children born per woman by social interactions of women and sharing common centres by women

Table 6c Analysis of variance showing the significance of prediction of number of children born per woman by social interactions of women and sharing common centres by women

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	4.316	3	1.439	.301	.824[b]
	Residual	23.907	381	4.781		
	Total	28.222	384			

The multiple correlation coefficient analysis showed a negative adjusted R square value of -0.355 indicating that the predictability of number of children born per woman from the combined influence of social interactions of women and sharing common centres by women was insignificant (Table 6c). Obviously, analysis of variance confirmed statistically insignificant prediction at $\alpha = 0.05$ (Table 6c). The negative correlation between social interactions and sharing common centres versus the number of children born is a reflection of the findings by Granovetter (2015). Innovations in fertility control measures such as adoption of contraceptives and easy access to information on fertility control has made women fertility decision to be individualized rather than socially influenced (Godley, 2011). Social interactions between individuals of different social mix leads to assimilation of positive or negative fertility behaviour, this occurs depending on social practices which alter social environment thus influencing the personal decision about number of children to be born.

4.3 The Influence of Geographical Concentration on The Number of Children Ever Born

This section presents results on influence of geographical concentration on number of children born per woman. The geographical concentration of human population was measured by: the frequencies of responses in low and high geographical concentrations areas and corresponding number of children born; the association between the frequency's responses in levels (high and low) of geographical concentrations and number of children born; and the frequencies of responses in levels of geographical concentrations (high and low) and number of children born.

4.4.1 Levels of geographical concentration of human population and the number of children Ever Born

The respondents were interviewed on how the level of geographical concentration of human population could influence the number of children born. The findings are presented in Table 7.

Table 7: The frequencies of responses in low and high geographical concentrations areas and corresponding number of children born

	Number of children Born	High Geographical Concentrations	Low Geographical Concentrations	Total
	< 2			
		0	37	37
	>10	128	0	128
	2-4	0	91	91
	5-7	0	37	37
	8-10	91	0	91
Total		219	165	384

A total of 219 respondents lived in high geographical concentration zones, while 165 resided in low geographical concentration zones (Table 7). Respondents with fertility greater than 10 children were only found in the high geographical concentrations and were the majority. The modal fertility for the low concentration was 2-4 children. Majority of households with less than two children were found in low geographical concentration areas. In Kisumu high geographically concentrated areas characterized by limited resources, low socio-economic status and poor access to immediate good quality services, this explains high fertility in densely populated areas.

The results agreed with findings by Oliver (2017) which found out that high population density equate to high fertility rates because such environment women give birth at an earlier age and have more children. The results reflected the findings of KCIDP (2018-2022) and Kisumu County Population Statistic report (2019) which reported Kisumu East sub county as a ground for informal settlements in the county such as Nyalenda, Manyatta, Nyamasaria that have been growing for decades. The fertility

of women in areas of informal settlements are higher compared to those who are segregated in more decent areas (Kisumu County population statistics report, 2019). However, the outcome is inconsistent with those of the UN (2014) which projected areas with high population density to lower fertility rates. Daly (2017) also observed the contrary, he argued that low concentrated areas are often characterized by high resource availability and lower intrapopulation competition for resource individuals therefore exploit resources at a faster rate, reproduce earlier and hence have more children.

The association between the frequency's responses in levels (high and low) of geographical concentrations and number of children born was analysed using gamma statistics. The results are presented in Table 8.

Table 8: Gamma statistics results on association between high Geographical Concentrations, low geographical concentrations and number of children ever born

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Ordinal by Ordinal	Gamma	.493	.074	6.381	.036
N of Valid Cases	384				

The gamma coefficient of 0.493, which is significant at $\alpha = 0.05$ (Table 8), indicates moderately strong positive association between levels of geographical concentrations and number of children born in Kisumu East. Apparently, the results showed that as level of geographical concentrations increase, the number of children born also increase. The results are a true reflection in Kisumu East

because high geographical concentrated areas like slums are known for higher fertility rates due to low-income levels and poverty which render women idle and hence high fertility.

These results coincide with the findings in Sub Saharan Africa where countries with low population density and low fertility are known for scarcity of resources which limit women fertility (Lutz, 2016). Similar findings were reported in Europe by Rita (2022) where very low-density regions of the Northern Scandinavia had significantly lower fertility than the high-density areas of central and southern Europe Rita (2022). In Kenya, low geographically concentrated is commonly a sign of better living standards and plenty of resources in terms of land and space due to economic power which is known to influence fertility in a negative way. Better-income individuals would acquire fewer children of higher quality, who are costlier (Becker, 1960; Caldwell, 1976). Similarly, Kenya population Situation Analysis report (2018- 2020) indicated that there is a casual relationship between high population density and high fertility such that rise in density from 10100 inhabitants per square kilometres corresponds to an increase in fertility to about 0.7 children. The findings however differ with those of Daly (2017) which noted that low concentrated areas are often characterized by high resource availability and lower intrapopulation competition for resource, individuals therefore exploit resources at a faster rate, reproduce earlier and hence have more children.

4.4.2 Influence of high and low geographical concentrations and Number of children Ever Born

The multiple correlations of the frequencies of high and low geographical concentrations and number of children born were analysed using Spearman's Rho correlation coefficients (Table 9a).

Table 9a: Pairwise Spearman's Rho correlation coefficients between the frequencies of responses in levels of geographical concentrations (high and low) and number of children born Correlations

		Low Geographical Concentration	High Geographical Concentration	Number of Children Born
Low Geographical Concentration	Pearson Correlation	1	-.052	-.612
	Sig. (2-tailed)		.348	.02
	N			165
High Geographical Concentration	Pearson Correlation	-.052	1	.678
	Sig. (2-tailed)	.348		.022
	N			219
Number of Children Born	Pearson Correlation	-.612	.678	1
	Sig. (2-tailed)	.02	.022	
	N	165	219	

Table 9b: Multiple correlation Coefficient Analysis: Dependent variable, number of children born and independent variables: high geographical concentration and low geographical concentration

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.822[a]	.681	.673	1.750

Table 9c: Analysis of variance showing the significance of prediction of number of children born per woman by high geographical concentration and low geographical concentration

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	124.674	2	93.337	67.090	.0327
	Residual	24.126	382	23.063		
	Total	148.800	384			

The analysis of variance confirmed a statistically significant prediction at $\alpha = 0.05$.

Table 9a demonstrated a positive and significant correlation (r = 0. 678, p = 0.022) between high geographical concentration and number of children born. By contrast, the latter correlated negatively (r =-0.612, p=0.02) with low geographical concentration indicating women in high geographical concentration zones were likely to give birth to more children than those in low geographical concentrations. The multiple correlation coefficient analysis showed adjusted R square value of 0.673 indicating that the predictability of number of children born per woman from the combined influence of high geographical concentration and low geographical concentration was significant (Table 9b). Moreover, analysis of variance confirmed a statistically significant prediction at $\alpha = 0.05$ (Table 9c).

The results had a close similarity with findings noted in analysis of 174 countries globally which revealed a relationship between population concentration and fertility overtime, an observation on 166 countries showed that lower fertility was associated with higher population concentration, but only few countries showed a reverse result (World Population Data, 2019). In Gambia, Nigeria, Israel and Uganda, lower population densities were associated with lower fertility rates, this was observed through densities and harshness of the environment (Rottela, 2022). EROSTAT data report (2015) are however not in agreement with the current findings, the reports noted that the higher the density in a geographical area the lower the number of children born per woman. In the case of Kisumu East, most areas with low income and poverty like Nyalenda, Manyatta are generally characterized by high population density and high fertility rates.

4.5 The Influence of Centralization on the Number of Children Ever Born

Centralization was measured by residential distance from town centre, approximate distance from clean water access, approximate distance from learning centres, and approximate distance from health facilities. These variables were the predictors (independent variables) and number of children born, dependent variable in multiple linear regression. The results are presented in Table 10a.

Table 10a Multiple Regression results, independent variables: Influence of residential distance from town centre, approximate distance from clean water access, approximate distance from learning centres, and approximate distance from health facilities. Dependent variable, number of children born

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.626[a]	.392	-.215	2.071

The multiple linear regression analysis showed a negative adjusted R square value of 0.215 indicating that the predictability of number of children born per woman from the combined influence of residential distance from town centre, approximate distance from clean water access, approximate distance from learning centres, and approximate distance from health facilities was insignificant (Table 10a). Evidently, analysis of variance confirmed statistically insignificant prediction at $\alpha = 0.05$ (Table 10b).

Table 10b Analysis of variance showing the significance of prediction of number of children born per woman by independent variables: residential distance from town centre, approximate distance from clean water access, approximate distance from learning centres, and approximate distance from health facilities

Model	Sum of Squares	Df	Mean Square	F	Sig.

1	Regression	11.073	4	2.768	.646	.659[b]
	Residual	17.149	380	4.287		
	Total	28.222	364			

These results are a reflection of findings by Olusanya (2009) in Nigeria which reported that different segregated locations have a significant disparity in fertility between areas located near the city and those that are far away from the city owing to individual's attitudes on fertility control. However, the findings differ with that of Ushie (2011) who reported that the financial cost, effort required to raise and educate children as well as access to information, technology, quality education, quality health care, and employment are all determined by centralization which in turn influence the number of children born. This is possible because, the spatial location of the woman in reference to the urban centre can shape her way of life and reproductive performance hence influencing her fertility decisions (Gris, 2018). The predictability of number of children born per woman from the combined influence of residential distance from town centre, approximate distance from clean water access, approximate distance from learning centres, and approximate distance from health facilities was insignificant in Kisumu East, this is because the infrastructural development has made it easier for women to access the best services even if they are far away and one can therefore comfortably choose where to reside based on their economic capacity.

Despite that fact that the multiple linear regression analysis showed insignificant adjusted R square value of -0.215, the coefficients, the t-ratio (t) and the statistical significance (sig.) could tell us the influence of individual independent variables on number of children born (Table 10c).

Table 10c: Coefficients, t-ratio and significance of multiple linear regression analysis Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	11.583	4.768		2.429	.072
	Approximate Distance from Health Facilities (Kms),	.052	.084	.653	4.626	.03
	Approximate Distance from Clean water access,	.454	.425	-.452	-1.067	.046
	Approximate Distance from Learning centres (Kms,	.784	.625	.626	11.255	.008
	Residential distance from town centre	.346	.848	-.194	-.408	.04

Significance level, $\alpha = 0.05$

The results demonstrated that the two independent variables with statistically significant highest positive influence on number of children born was approximate distance from learning centres (t=11.255, p=0.008), followed by approximate distance from health facilities (t =4.626, p=0.03). The results are identical to the findings by Maina (2017) that realized a decrease in number of children as one moved away from schooling facilities. It a common belief that education is key to a good future for children, schools in urban settings are larger, tend to benefit from better educational resources, and often enjoy greater autonomy in how they can allocate quality resources. In most countries and economies, students who attend schools in urban areas tend to perform at higher levels than other students hence the high concentration of school going children close the

urban areas. Similarly, easy access to health facilities and services, transportation convenience, equipment and drug availability plays important roles in women fertility decision.

Conversely, the independent variables with statistically significant negative influence on number of children born were residential distance from town centre (t =-0.408, p=0.04), followed by approximate distance from clean water access (t=-1.067, p=0.046). This is possible because Closeness to urban centre would likely increase the costs of raising children (Ushie,2011). Urban housing is more expensive, and children are probably less valuable in household production in urban vs rural areas (Hill, 2010). Approximate distance from clean water access negatively influenced the number of children born, this could be possible because, Kisumu County Development Plan (2020) clearly reported that clean water is a top priority in every residential area whether in rural or urban areas and have been made to be more affordable even in poor household who cannot afford piped water hence not likely to influence childbirth.

4.5.2 Centralization and Number of Children Ever Born

The opinions of people were sought on the influence of centralization on number of children born. The questions were asked on a 5-point Likert scale (agree, strongly agree, neutral, disagree and strongly disagree) and then the frequencies of responses were correlated using Spearman's Rho correlation coefficients (Table 11).

Table 11: Spearman Rho correlation coefficients showing the correlations between frequencies of responses of 5-point Likert scale: agree, strongly agree, neutral, disagree and strongly disagree to the notion that centralization could influence number of children born. Correlations

		Likert: 1-5 (Agree-Strongly Disagree	Centralization	Number of children Born in Kisumu East Sub- County
Spearman's rho	Centralization	Correlation Coefficient	1.000	.625
		Sig. (2-tailed)	.	.026
		N	384	384
	Number of children Born in Kisumu East Sub- County	Correlation Coefficient	.625	1.000
		Sig. (2-tailed)	.026	.
		N	384	384

The results showed that the correlations between centralization and number of children born was strong and positive (r=0.625, p=0.026). Apparently, the respondents who agree tend to coincide with those who strongly agree (Table 11). The results are in agreement with that of Gris (2018) which noted that the spatial location of the woman in reference to the urban centre can influence fertility in terms of shaping people's way of life and reproductive performance. The findings are also a reflection of a report by National Council for Population Development (2018), which reported a likelihood of human fertility increasing with increase in geographical centralization among women in Kisumu East County. This is possible because people prefer to settle where they access centralized geographical goods and services and human settlement development is known to come with increased fertility. The findings however differ with studies conducted in Sub Saharan Africa which revealed that women fertility is majorly determined by the socio economic and cultural characteristics but not level of centralization as many social groups are centralized in areas

far away from urban centre (UN, 2017). Sub Saharan Africa has low rate of urbanization, and most women are located far away from the urban centre.

4.6. The Influence of Clustering on the Number of Children Ever Born

Clustering was measured by length of stay in the neighbourhood and mean monthly income. These variables were the predictors (independent variables) and number of children born per woman was dependent variable in multiple linear regression. The results are presented in Table 12a, 12b,

4.6.1 Influence of Length of stay in the neighbourhood and mean monthly income on the Number of Children Ever Born

Clustering was measured by length of stay in the neighbourhood and mean monthly income. These variables were the predictors (independent variables) and number of children born per woman was dependent variable in multiple linear regression. The results are presented in Table 12a.

Table 12a: Multiple Regression results, independent variables: Length of stay in the neighbourhood (years) and mean monthly income '000' (KShs.). Dependent variable, number of children born

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.928[a]	.861	.815	.808

The multiple linear regression analysis showed adjusted R square value of 0.815 indicating that 81.5% of variation of number of children born per woman could be predicted from the combined influence of length of stay in the neighbourhood and mean monthly income (Table 12a). The results are a true reflection in Kisumu East because through interactions with the adjoining

neighbourhoods and areas of informal employment, women exchange knowledge and acquire varied perceptions that in turn shape their decision on number of children to be born.

The results are a similar to studies conducted by Klarner (2014) which noted that during the prolonged close contact, women may have opportunities to interact with other women in the neighbourhoods as they share fertility related experiences. Identically, in Mali, the explosion of Ghetto neighbourhood is characterized by defined and enforced norms as a result low occupation and income status which increase levels of fertility (Klasen, 2019).

The findings are also in agreement with those of Kulu (2010) which reported that in developed nations, rise in female Labor force participation rates have led to the most fabulous fall in fertility rates due to the close contact between women of varied neighbourhoods. Nonetheless, the results dissent with findings in Europe by Rannveig (2020) which reported that fertility was seen as highly individualized and couple based rather than neighbourhood choice because most households were far separated from each other.

Table 12b: Coefficients, t-ratio and significance of multiple linear regression analysis.

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	2.216	.912		2.431	.051
	Mean Monthly Income '000' (KSHs	-.429	.014	-.369	-2.140	.006
	Length of Stay in the Neighbourhood (Years)	.207	.051	.694	4.020	.007

The results from coefficients and t-ratio (Table 12b) demonstrated that the length of stay in the neighbourhood had statistically significant highest positive influence on number of children born per woman (t=4.020, p=0.007). Conversely, the mean monthly income had statistically significant negative influence on number of children born (t =-2.140, p=0.006). The results are possible in Kisumu East because the larger part of the sub county lies in the rural area which is characterizes by permanent residents, women tend to establish long term permanency with the neighbors hence influencing high birth rates among them. Due to low income and low economic capabilities most the women will tend to give birth to high number of children.

The outcomes share a similar finding with Odunayo, (2019) that reported more children among the permanent residents compared to temporary immigrants. Most people tend to establish their families where they are assured of long-term residential permanency (Askei, 2012). The results are also in agreement with Ojiambo (2020) that noted fewer children among the economically endowed women. In the contrary to the findings, Solanke (2019) notes that individual characteristics may present fertility outcome and is not entirely based on neighbourhood characteristics. Bigger economic capabilities come with occupational responsibility and commitment that hinder more births per woman.

4.6.3 Influence of Clustering on Number of Children Ever Born

The opinions of people were sought on the influence of clustering on number of children born. The questions were asked on a 5-point Likert scale (agree, strongly agree, neutral, disagree and strongly disagree) and then the frequencies of responses were correlated using Spearman's Rho correlation coefficients (Table 13).

Table 13: Spearman Rho correlation coefficients showing the correlations between frequencies of responses of 5-point Likert scale: agree, strongly agree, neutral, disagree and strongly disagree to the notion that clustering could influence number of children born per woman

Correlations

			Likert: 1-5 (Agree-Strongly Disagree	Clustering	Number of children Born in Kisumu East Sub- County
Spearman's rho	Clustering	Correlation Coefficient	1.000	.401	
		Sig. (2-tailed)	.	.089	
		N	384	384	
	Number of children Born in Kisumu East Sub- County	Correlation Coefficient	.401	1.000	
		Sig. (2-tailed)	.089	.	
		N	384	384	

The results showed that the correlations between clustering and number of children born was weak positive (r=0.401, p=0.089). Apparently, the respondents who agree do not tend to coincide with those who strongly agree (Table 13). Despite showing a weak positive linear correlation, Clustering proved statistically insignificant in measuring the number of children born per woman. Such observations are possible in Kisumu East because clustering is not necessarily a function of fertility, but majorly associated with geo-economic spatial patterns. Contradicting observations have been made in India by Gilkey (2015) were clustering highly influenced human fertility. The findings in Netherlands also differ by the results as women fertility is mostly determined by neighbourhood interaction among women Logan (2012). Another study conducted in Kenya by

Banjo (2019) differed with the outcome by revealing that neighbourhoods' characteristics of a social groups to which individual belong are among the factors that influence fertility. The outcomes from the current study could be possible because if a woman with very low income and education resides in neighbourhoods for a long time or permanently where most women are educated and exposed to media, her perceptions on fertility might change.

CHAPTER FIVE: SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

5.1 Introduction

The chapter presents summary of the study findings, conclusions based on the findings in chapter four and finally the chapter highlights recommendations and areas of further research.

5.2 Summary of the Findings

The first objective of the study was to examine the influence of exposure on the number of children ever born. The findings were as follows; women who engaged in daily and weekly social interactions at the same time-shared common centres were likely to give birth to more children. The correlation between sharing common centres and mean number of children born per woman showed strong positive relationship (r = 0.675). The odd of the first childbirth occurring increased with increased adherence to cultural norm at 95% confidence Interval for *Exp(OR)* increased from an odd ratio of 0.842 to 0.957 upper bound of 1.052 and lower bound of 0.824. However, the odd of the last childbirth occurring decreased with an increase in value of cultural norms at 95% Confidence Interval for *Exp(OR)* decreased from an odd ratio of 2.263 to 0.939 upper bound of 0.794 and lower bound of 0.064. Holding perception, peer pressure and other factors constant, the influence of cultural norms on first and last child birth remained statistically significant. Daily and weekly social interactions showed a strong positive significant linear correlation with fertility (r =0.732, p = 0.03). Weekly interactions by women had the strongest positive correlation (r = 0.759, p = 0.048) with number of children born per women. By contrast, annual interactions by women showed insignificant negative correlation (r = -0.552, p = 0.256) with number of children born per woman. The spearman rank correlation indicated a strong positive and statistically significant

linear correlation (r =0.50, p = 0.04) between social interactions by women and number of children born per woman. Sharing common centres by women had the strongest positive correlation (r = 0.61, p = 0.01) with number of children born per women there was a significant positive linear association between the fertility and daily interaction (r = .77, p = .042).

The second objective of the study was to analyse the influence of concentration on the number of children ever born. The findings were as follows: A total of 219 respondents lived in high concentration zones, while 165 resided in low concentration zones. Respondents with fertility greater than 10 children were only found in the high geographical concentrations and were the majority. The modal fertility for the low concentration was 2-4 children. Majority of the households with less than two children were found in low geographical concentration areas. The gamma coefficient of 0.493, which is significant at $\alpha = 0.05$ indicated moderately strong positive association between levels of geographical concentrations and number of children born. The results showed that as level of geographical concentrations increase, the number of children born also increase. Positive and significant correlation (r = 0. 678, p = 0.022) was realized between high geographical concentration and number of children born. By contrast, the latter correlated negatively (r =-0.612, p=0.02) with low geographical concentration indicating women in high geographical concentration zones were likely to give birth to more children than those in low geographical concentrations. The multiple correlation coefficient analysis showed adjusted R square value of 0.673 indicating that the predictability of number of children born per woman from the combined influence of high geographical concentration and low geographical concentration was significant. The respondent's perceptions on the relationship between low geographical

concentrations and number of children born was significant. On the other hand, there was a positive spearman rank correlation between high geographical concentration and number of children born. The respondent's perceptions on the relationship between high geographical concentrations and number of children born was significant.

The third objective was to determine the influence of concentration on the number of children ever born. The findings were as follows: Majority 57.14% of respondents lived near the town centres, 28.57% were found away from the town while the remaining 14.29% belonged to the town centre. The multiple linear regression analysis showed a negative adjusted R square value of 0.215 indicating that the predictability of number of children born per woman from the combined influence of residential distance from town centre, approximate distance from clean water access, approximate distance from learning centres, and approximate distance from health facilities was insignificant. The results demonstrated that the two independent variables with statistically significant highest positive influence on number of children born was approximate distance from learning centres ($t=11.255$, $p=0.008$), followed by approximate distance from health facilities ($t=4.626$, $p=0.03$). The independent variables with statistically significant negative influence on number of children born were residential distance from town centre ($t=-0.408$, $p=0.04$), followed by approximate distance from clean water access ($t=-1.067$, $p=0.046$). The results showed that the correlations between centralization and number of children born was strong and positive ($r=0.625$, $p=0.026$). The spearman rank coefficients were used to measure perception about geographical centralization on the number of children, 62.5% of the number of children born could significantly be explained by the centralization influence.

The fourth objective was to establish the influence of clustering on the number of children ever born. The findings were as follows: The multiple linear regression analysis showed adjusted R square value of 0.815 indicating that 81.5% of variation of number of children born per woman could be predicted from the combined influence of length of stay in the neighbourhood and mean monthly income. The results from coefficients and t-ratio demonstrated that the length of stay in the neighbourhood had statistically significant highest positive influence on number of children born per woman (t=4.020, p=0.007). Conversely, the mean monthly income had statistically significant negative influence on number of children born (t =-2.140, p=0.006). Multiple linear regression analysis portrayed that there was significant influence between Length of Stay in the Neighbourhood and Number of children born [F (383) =29.68, P < .001, R^2 = .428]. Again, the model showed that length of stay in the neighbourhood had a positive linear association (t = 11, p < .001). Length of stay in the neighbourhood and number of children born depicted a significant positive linear relationship, 42.8% of the change in number of children born could be explained by the length of stay in the neighbourhood. Multiple linear regression analysis showed that there was significant influence between the average mean monthly income and Number of children born [F (383) =29.68, P < .001, R^2 = .336]. Again, the model showed that income had significant negative linear association (t = -11, p < .001). Women who earned more per month were likely to give birth to fewer children, 33.6% decline in the number of children born per woman could be attributed to an increase in monthly average income.

5.3 Conclusions

From the findings outlined, the following conclusions were drawn:

Cultural norm was a major factor likely to influence the first and the last childbirth while frequent social interaction among women at the common centers leads to increase of the number of children born per woman Kisumu East.

Areas with high geographical concentration like the informal settlements are known for higher fertility rates because of socio economic challenges while areas of low geographical concentrations are associated with low fertility rates.

Women located fer away from the town center, health facilities and areas of informal settlement are likely to give birth to high number of children.

Long-term residential permanency, bigger economic capabilities and occupational responsibilities promote low fertility among women.

5.4 Recommendations

The findings of this study recommended the following:

Reproductive health planners should put ephasis on women's reproductive health through strengthening the family planning agenda, promoting health education and creating awareness. This can be achieved by bringing the family planning programs and health services within physical access for women and encouraging them to visit the facilities more often.

The county government and legal policy makers should promote formal and quality productive social interactions like seminars, conferences and group meetings for women. This can be achieved through setting up public arenas for social gathering where women can meet for exchange of vital information focused towards the flow of the vital reproductive information among the detached women population.

The county government should equip rural areas and informal settlements with proper public facilities and services such as good schools, quality health care services, clean water, Street lighting among many more. This will ensure equal distribution of quality services thus reducing the high fertility rates among women.

Women should strive towards social and economic empowerment. Economically empowered women are more productive with less time to raise more children hence curbing high birth.

5.5 Areas for Further Research

1. Future Research should include the spatial segregation inequalities on demographic groups.
2. Similar comparative study should be performed to assess the influence of actual population densities on increasing fertility.
3. Patterns of Rural Urban fertility Differentials should be thoroughly assessed.

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APPENDICES

APPENDIX 1: QUESTIONNAIRE

My name is Loy Kinda Oduor, a Master's degree student at Maseno University. This questionnaire is prepared for the purpose of collecting relevant data for academic research on establishing Influence of Geographical Segregation on fertility of women in Kisumu East Sub County. Kindly, note that the information you provide was only be used for academic purposes and will be treated as confidential. Thank you for your willingness to share your knowledge on the subject.

Research Project on: **INFLUENCE OF GEOGRAPHICAL SEGREGATION ON FERTILITY OF WOMEN IN KISUMU EAST SUB COUNTY, KISUMU COUNTY, KENYA.**

Note that: Fertility is the potential number of live children a woman has ever given birth to or have planned to have throughout (during) her reproductive life.

Ward ……. Village..... Date…….

Name Of Respondent……..... Period Lived In The Area (Months/Years) …....

SECTION 1

BIODATA (Please tick one appropriate choice)

1. Marital Status

a) Married [] b) Single [] e) Separated [] c) Divorced [] d) Widowed []

2. Age Bracket in Years

a) 18-25 Years [] b) 26-33years [] c) 34-41 Years [] d) 42-49 Years []

3. Occupation Status

a) Formally employed [] b) Informally employed [] c) Self Employed []

4. Level of Education Primary [] Secondary [] Tertiary [] Other []
5. At what age did you give birth to your firstborn? Specify in years (.....)
6. At what age did you get your last child? Specify in years if applicable (.....)
7. Number of live Children You Ever given birth to None [] 1- 4[] 4-6[] 7-10[] Others (Specify) []
8. Religion (specify if any) .....
9. For Christians specify denomination in 8 above.....
10. The type of house lived in Permanent () Semi permanent () Grass thatched () Others (.....)

11. Ethnicity (Please Specify) .....

12. Size of residential land, (provide answer in acres) …….

SECTION II THE INFLUENCE OF EXPOSURE ON NUMBER OF CHILDREN BORN PER WOMAN

1a. How many children have you ever given birth to? (Please specify) Boys (....) Girls (.....) others b.

Do you desire to have more children? (Please tick) Yes () No ()

If yes, give reason.....

c. At what age are you planning to stop child bearing? (Please tick)

20-24	25-29	30-34	35-39	40-44	45-49

d. Why this age.....

e. Which one(s) of these factors might have influenced or may have Influence on your first childbirth and number of children born to you? (Please tick)

Social pressure	Cultural norms	Perceptions	Other(specify)	Number of Children Born
Yes	Yes	Yes	Yes	Girl(s)…….
No	No	No	No	Boy(s)…….

f. What is the total number of children you desire to have throughout your reproductive life? Specify (.....)

Why this number.....

2.a. What is the major mode of segregation in your location? Educational () Occupational ()

Ethnicity () Socio - economic class () Voluntary () Any other specify (.....)

b. Does the choice above have an influence on the number of children born to you? Yes () No ()

Give reasons for your answer.....

c. Does the choice above have an influence on the number of children born to women in your location Yes ()

No () Give reasons for your answer.....

3.a. Have you experienced any form of social isolation in your location? Yes () No ()

Explain your choice.....

b. Do other women in your location experience social isolation? Yes () No ().

Explain.....

c. Does social isolation have an influence on the number of children born to a woman? Yes () No

d. Give reasons.....

4 a. Do you interact with other women in your neighborhood? (Please Tick) Yes () No ()

b. Do Women in your group discuss fertility matters during your social interactions. (Please Tick) Yes () No ()

c. Please fill the table below

Frequency of interaction / Common centers	Daily	weekly	Monthly	Annually	Never
Market Center					
Water points					
Churches					
Health Facilities					
Others					

5a. What are the educational characteristics of women in your social groups? (Please tick) Primary () Secondary () Tertiary () Others (specify) b. What are your levels of social interactions (Please tick as applicable) Religious women () Business women () Elderly women () Any other specify (.....)

c. Does your social group still observe the traditional norms about fertility? (Please tick) Yes () No () Explain your answer.....

6a. Has Social interactions and networking with other ladies influenced the number of children born to you? (Please tick) Yes () No ()

b. Explain.....

c. What are other determinants of fertility within your social groups? .....

7. In your opinion, does social isolation influences the number of children born per woman (Please fill in the number of children and tick the corresponding scale)

Social Isolation perception	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
Number of Children					

Scale	5	4	3	2	1

8. Do social interactions influence the number of children born per woman (Please fill in the number of children and tick the corresponding scale)

Social Interactions perception	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
Number of Children					
Scale	5	4	3	2	1

9. When ladies share common centers, can that influence the number of children they intend to give birth to? (Please fill in the number of children and tick the corresponding scale)

Perception on sharing common centers	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
Number of Children					
Scale	5	4	3	2	1

10.What do you consider as modern measures in this ward that may address fertility? (Please tick) [kindly insert the methods] Specify (.....)

SECTION III THE INFLUENCE OF CONCENTRATION ON THE NUMBER OF CHILDREN BORN

1 a. What is your perception on the level of population concentration in your ward? ..... b. Kindly fill the table below

Level of population concentration	Influences in regards to fertility
High concentration	

Low Concentration	

2a Does concentration influence the number of children born to you? Yes () No ()

b. Explain.....

c. Does concentration influence the number of children born to other women in your area?

Yes () No () Explain.....

3. a. What is the current fertility status of Kisumu East sub county? (please tick) increasing () Constant [] Decreasing (). Give reason for the above for your choice.....

b. Do you believe lowering fertility rate is worth doing? YES [] NO []

c. Explain .....,,,,,,,,,,,,,,,,,,,,,,,,,,,,.....

4. Can high concentration in an area be attributed to lower fertility? (Please fill in the number of children and tick the corresponding scale)

Perception on High concentration	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
Number of Children					
Scale	5	4	3	2	1

5.Can low concentration in an area be attributed to high fertility? (Please fill in the number of children and tick the corresponding scale)

Perception on low concentration	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
Number of Children					
Scale	5	4	3	2	1

SECTION IV THE INFLUENCE OF CENTRALIZATION ON THE NUMBER OF CHILDREN BORN PER WOMAN

1.a. How do you classify your place of residence? (Please tick)

Town Centre Near town Centre Far away from town Centre

b. What is the approximate distance from your place of residence to the town center?
Less than 5km () 6-10km () 11-15 Km () 16-20 Km () More than 20 km () REGRESS
c. Do you have access to the following public services? Health amenities, Schools () Clean water ()
d. What is the approximate distance covered to reach these public services in km?
Health facilities.....Schools.....Clean water.....
e. Do the distance from public facilities influence your fertility decisions? (Please tick) Yes () No () Give reasons for your choice.....

2a. Are you a permanent or temporary resident? (Please tick)
Permanent () Temporary () Commuter ()
b. Give reasons.....
c. Does the type of residence influence the number of children born to women in your area?
Yes () No () If yes, explain.....
d. Does the type of residence influence the number of children born to you? Yes () No () explain.....

3.a. Does distance from your place of residence to town center influence the number of children born to you? YES () NO () Explain.....

b. Does your place of residence influence the number of children you intend to get? Yes () No () give reasons.....

4. Do you think staying in this place for a longer period can influence your fertility desires?

Yes () No () Explain .....

6. In your opinion do centralization has an influence on number of children you give birth to?

(Please fill in the number of children and tick the corresponding scale)

Perception on Influence of Centralization	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
Number of Children					
Scale	5	4	3	2	1

7. In your opinion explain how centralization can influence the number of children you intend to give birth to.....

SECTION V THE INFLEUNCE OF CLUSTERING ON THE NUMBER OF CHILDREN BORN PER WOMAN

1a. Are you close with neighboring homesteads? (Please tick) Yes () No ()

For your choice, give distance in km .....

b. For how long have you stayed in this neighborhood?

Less than 1 year () 1-3yrs () 4-6 years () more than 10 years ()

c. What are the reasons for neighborhood contact. (Please tick) Economic activities (.....) Labor force involvement () Market centers () water points () any other specify (.....) e. What are the educational characteristics of women in your neighborhoods? Primary () Secondary () Tertiary () Others ()

2.a. What is the average neighborhood homestead family size in your area?

1-3 () Children 4-6 children () 7-10 children () More than 10 children ()

b. Does the neighborhood homestead family size influence the number of children born to you? Yes () No () If yes, explain how.....

c. Does neighborhood homestead family size influence number of children born to other women in your area? Yes () No () If yes, Explain how.....

3. Does neighborhood homestead family size influence the number of children you intend to get?

YES () NO () Give reasons.....

4. Are you currently Participating in any form of Labor Force?

Yes [] No () Not fully [] Explain.....

b. From your choice above, what type of Labor Force are you involving yourself in?

Formal Employment [] Informal Employment [] Self Employment []

c. Does your labor force involvement determine the number of children ever born?

Yes [] No [] Explain.....

5. What is your Total average level of income earned from your Labor Force Participation?

Labor Force	Average monthly income in Kshs.	Tick
	Below Ksh.5000	

	Ksh.5001-10,000	
	Ksh10,001-15,000	
	Ksh.15,001-20,000	
	Ksh.20,001-25,000	
	Ksh.25,0001-30,000	
	Ksh.30,001-35,000	
	Over Ksh.40,000	

6. Does clustering has an influence on number of children born to you? (Please fill in the number of children and tick the corresponding scale)

Perception on Influence of Clustering	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
Number of Children					
Scale	5	4	3	2	1

7. In your opinion explain how clustering can influence the number of children born to other women?.....

KINDLY ASSIST ME/US LOCATE ANOTHER WOMAN/OTHER WOMAN WITHIN THE MENTIONED AGE BRACKET IN SECTION 1 (3) FOR A SIMILAR INTERVIEW.

NAME……./PHYSICAL/LOCATION(S)……

Thank You for your co-operation.

APPENDIX 2: Interview Schedule for the Key Informants

GEOGRAPHICAL SEGREGATION INFLUENCING FERTILITY OF WOMEN IN KISUMU EAST SUB COUNTY, KISUMU COUNTY, KENYA.

Ward……..……. Sub location……. Village.....

Date……Name of the Key Informant….....Gender…Period worked in the area.....

1. Comment on the current fertility rate of ladies in Kisumu East Sub County
2. What are some of the notable consequences of high fertility rate to Kisumu East Sub County?
3. In your opinion, do social isolation and social interaction have an influence on the number of children born per woman in Kisumu East Sub County?
4. Do you think that concentration can influence the number of children born in Kisumu East sub county?
5. What is your view on the relationship between distance from the town center and the number of children born in Kisumu east?
6. Can clustering influence the number of children born per woman in Kisumu East?
7. In your opinion, what modern family planning methods can be influenceive in controlling fertility among women in Kisumu East Sub County?
8. Do you think fertility situation of women in Kisumu East require special strategies to control?

Thank You for your Time and Responses

APPENDIX 3: Questions for focus group discussion

GEOGRAPHICAL SEGREGATION INFLUENCING FERTILITY OF WOMEN IN KISUMU EAST SUB COUNTY, KISUMU COUNTY, KENYA.

1. Generally, what is the average number of children born per woman in Kisumu East sub county?
2. Do you think ladies sharing common centers can influence the number of children ever born by a woman?
3. In your opinion, do you think level of population concentration within Kisumu East sub county can influence the number of children born per woman?
4. Do you think the distance from the town center can influence the number of children ever born by a woman?
5. Can women participation in various forms of labor influence the number of children born to them?
6. Do you think fertility control measures which have been used by women have helped to control their fertility?
7. Do you think the fertility rate in Kisumu East has reached a level where it requires other special measures or strategies to control?

Thank you for your time and responses

APPENDIX 4: OTHER FIGURES

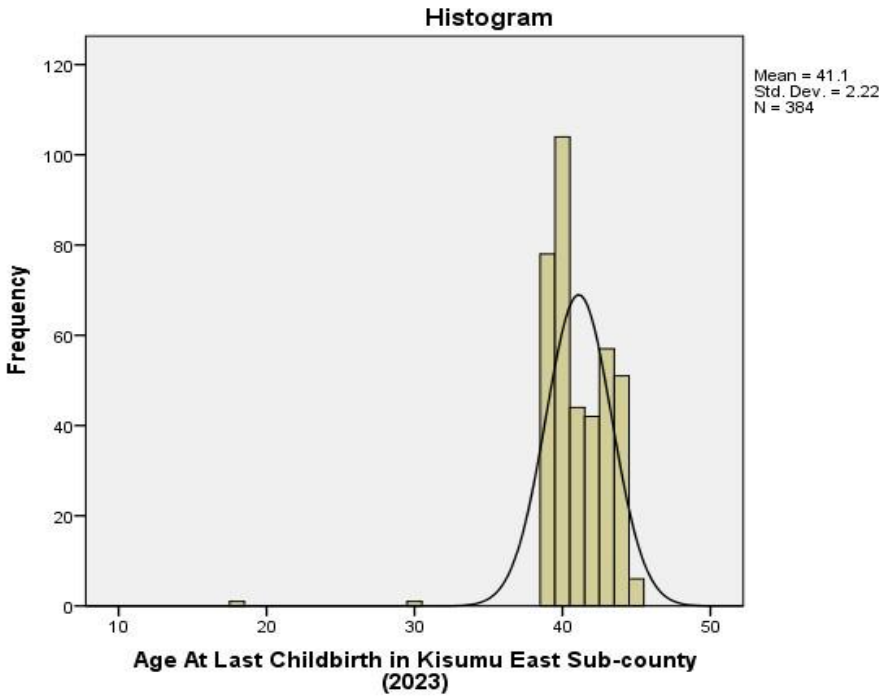

Figure 13: Age bracket of women respondents at first birth

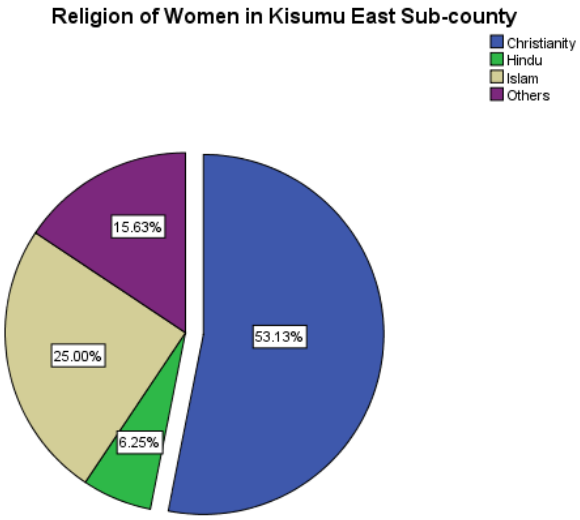

Figure 14: religion of women respondents in Kisumu East

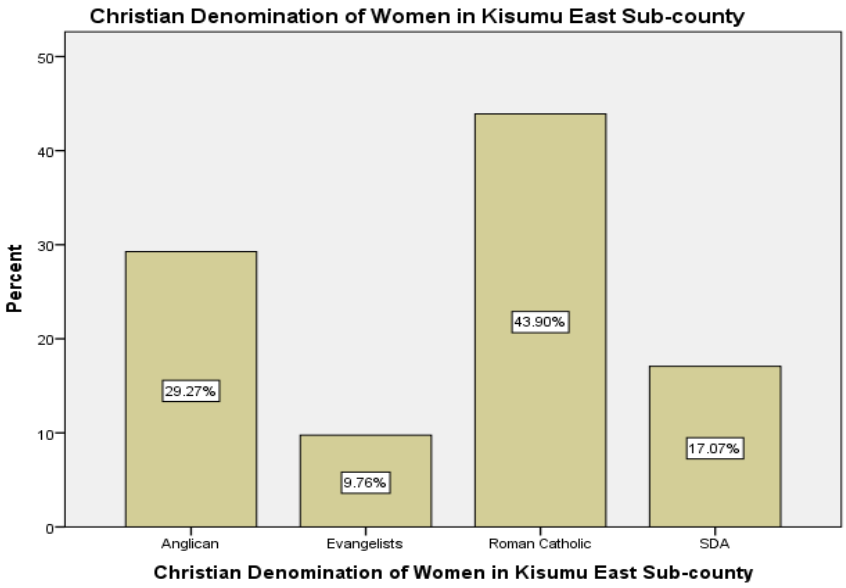

Figure 15: Christian Denomination of Women Respondents

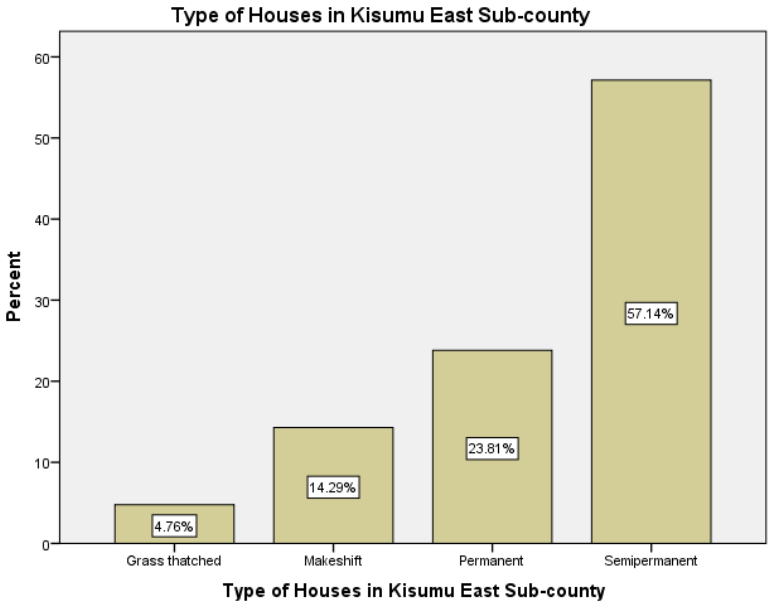

Figure 16: The type of houses lived by women respondents in Kisumu East

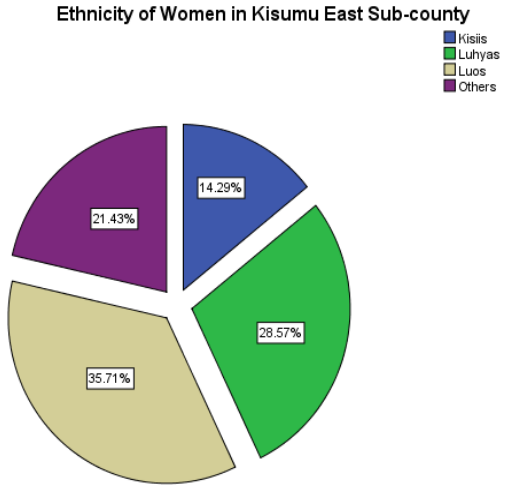

Figure 17: Ethnicity

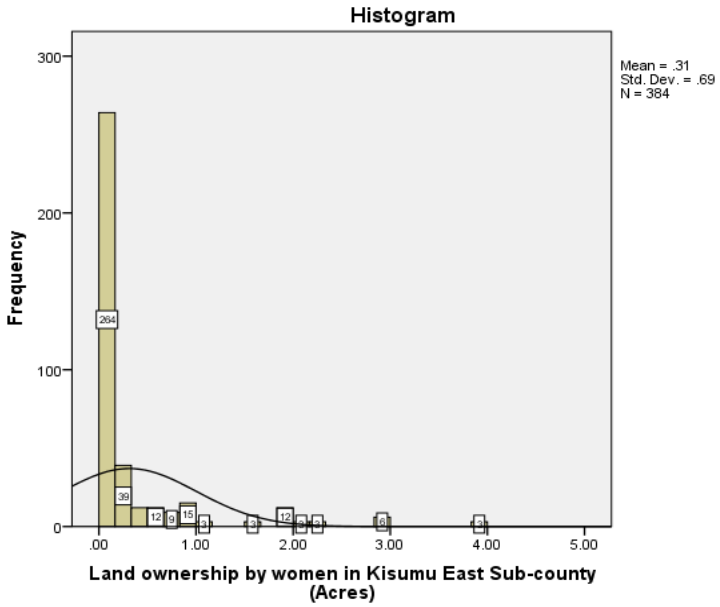

Figure 18: Size of Land Owned by the Respondents

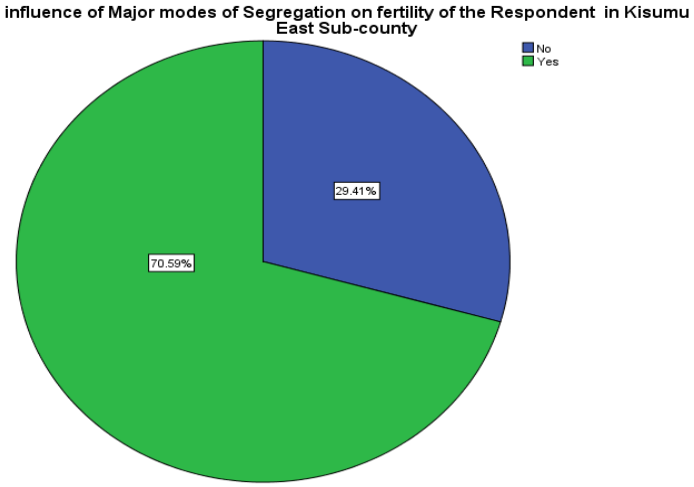

Figure 19: mode of segregation on fertility of the respondent

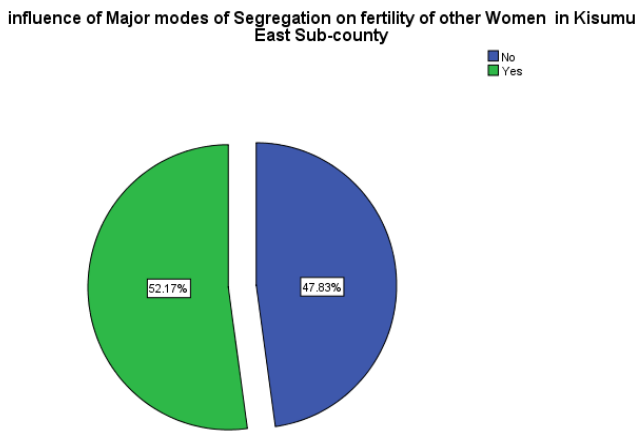

Figure 20: Influence of modes of Segregation on other Women's Fertility

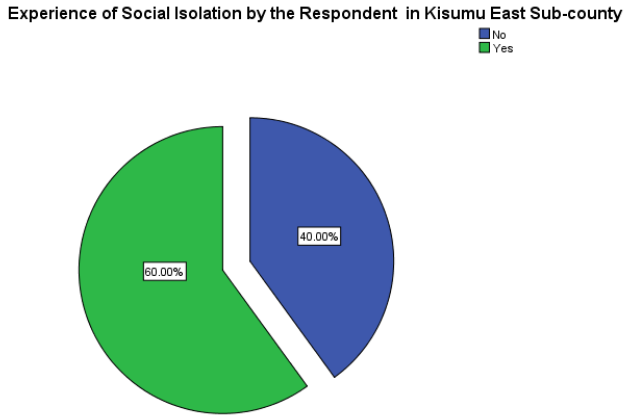

Figure 21: Experience of Social Isolation by The Respondent

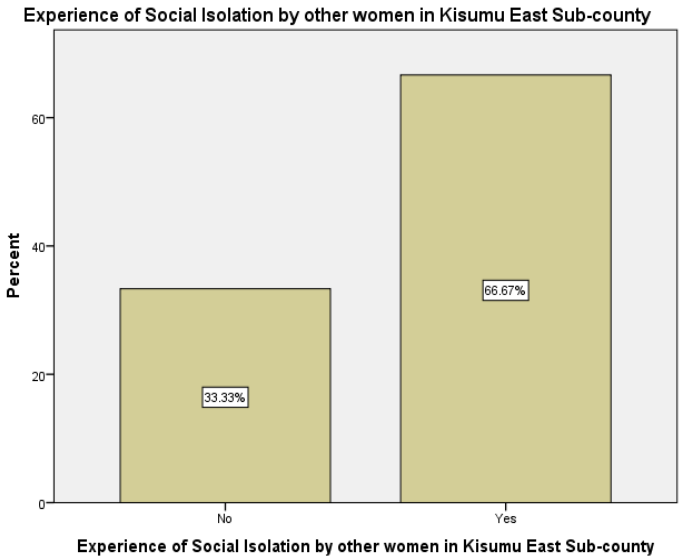

Figure 22: Experience of Social Isolation by other Women

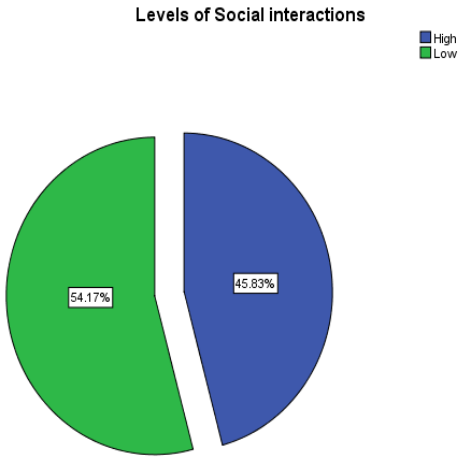

Figure 23: Levels of Social Interactions

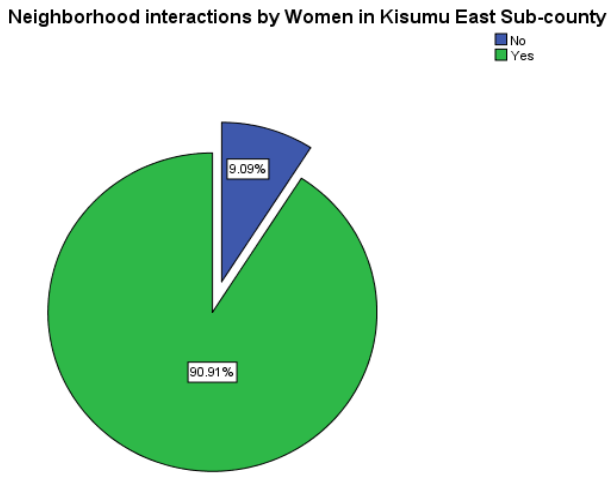

Figure 24: Neighborhood Interactions

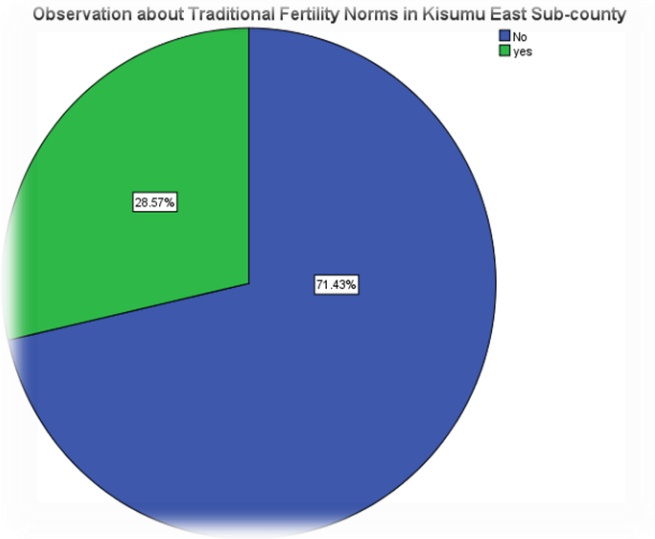

Figure 25: Observation about Traditional Fertility Norms

Figure 26: Social interactions with other women and Fertility

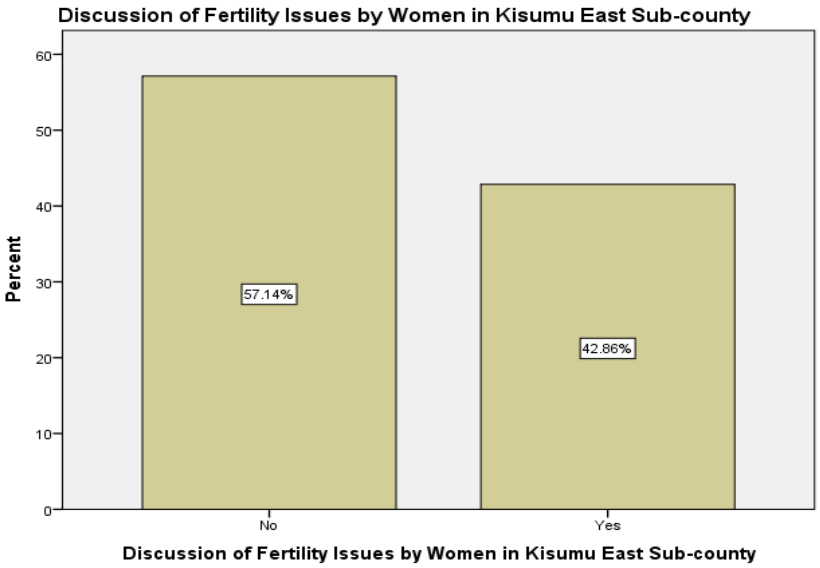

Figure 27: Discussion of Fertility issues by Other Women

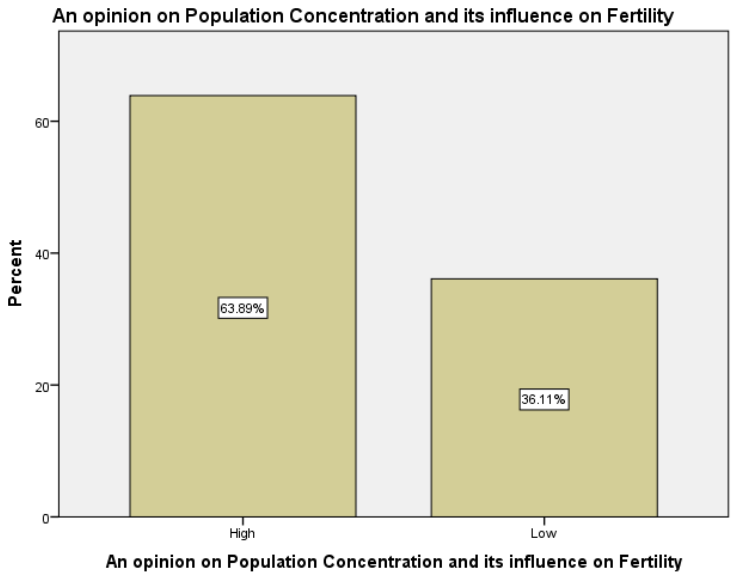

Figure 28; Population Concentration and Fertility

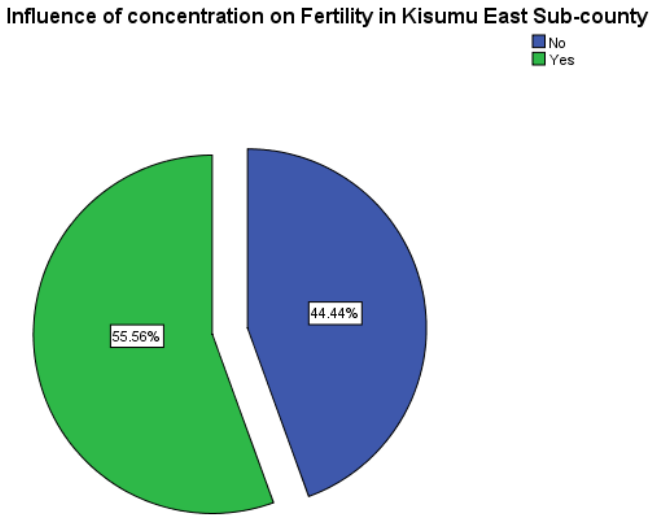

Figure 29: An opinion on Concentration and Fertility

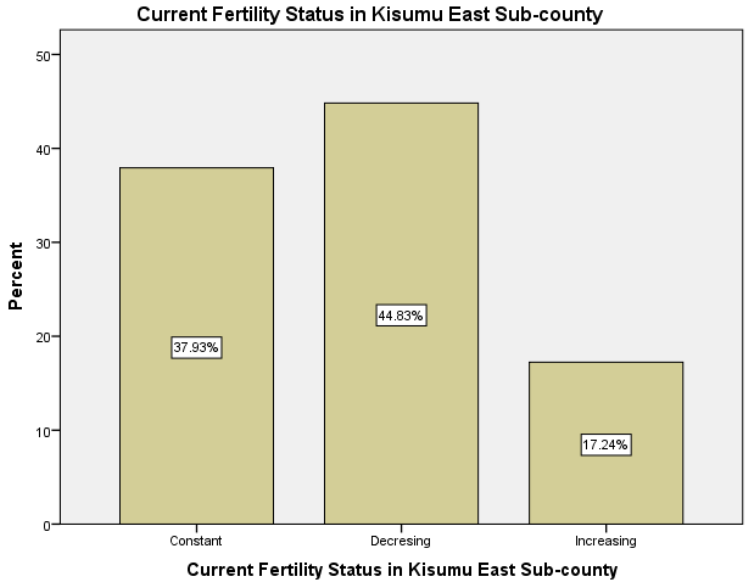

Figure 30: Current Fertility Status

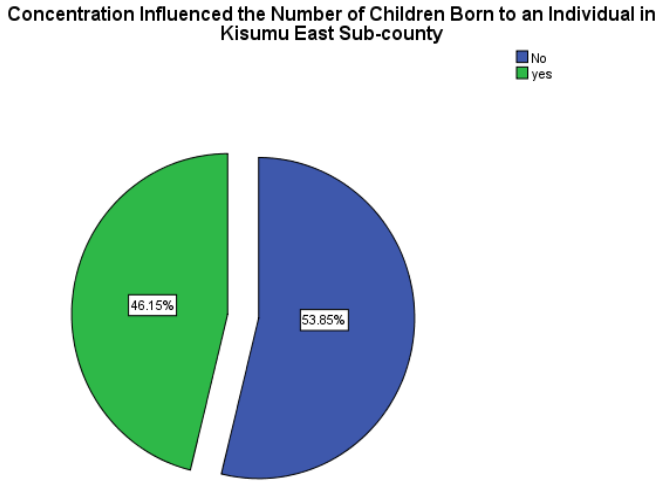

Figure 31: Perception on Concentration and number of children Born

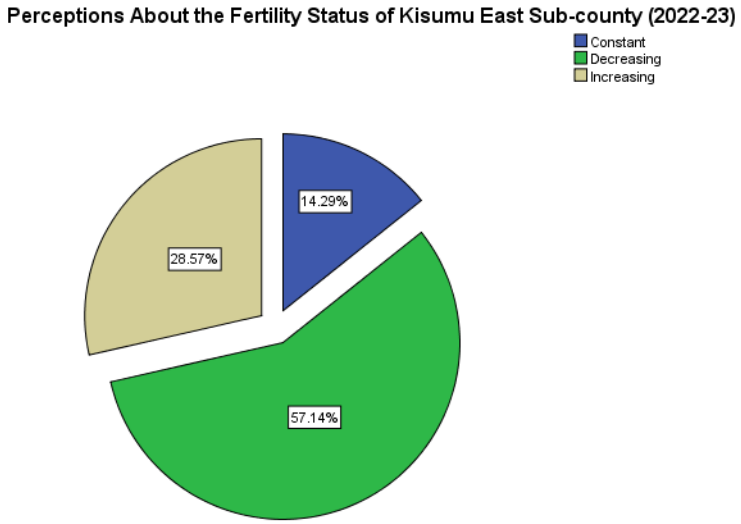

Figure 32: Perceptions on Fertility status

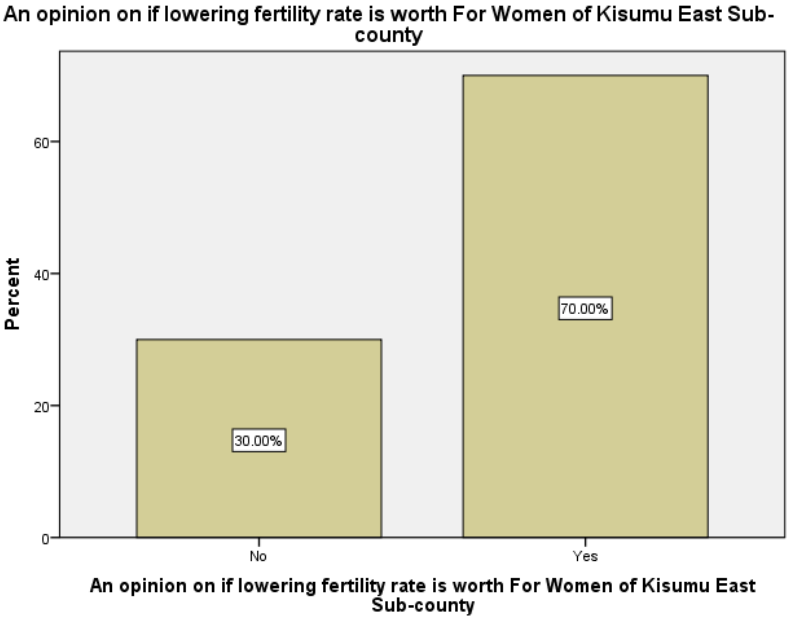

Figure 33: An opinion on Lowering Fertility

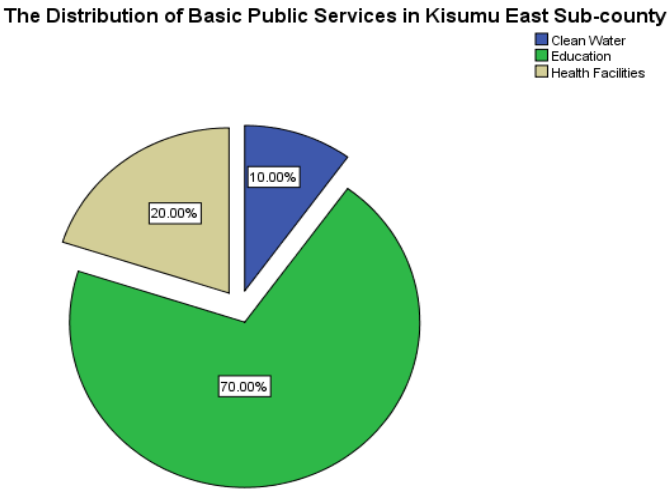

Figure 36; Distribution of Basic Services

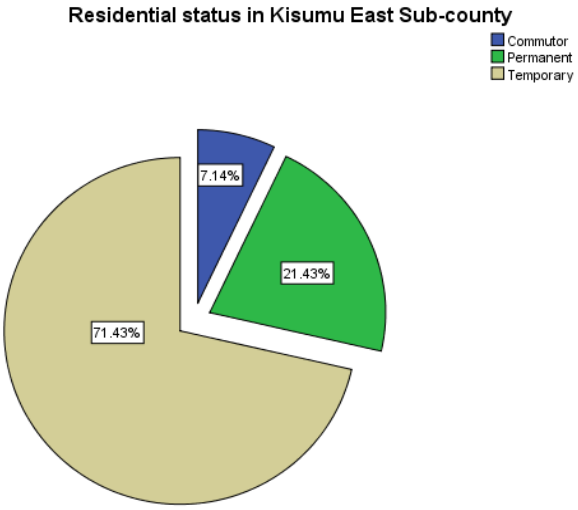

Figure 37: Residential status

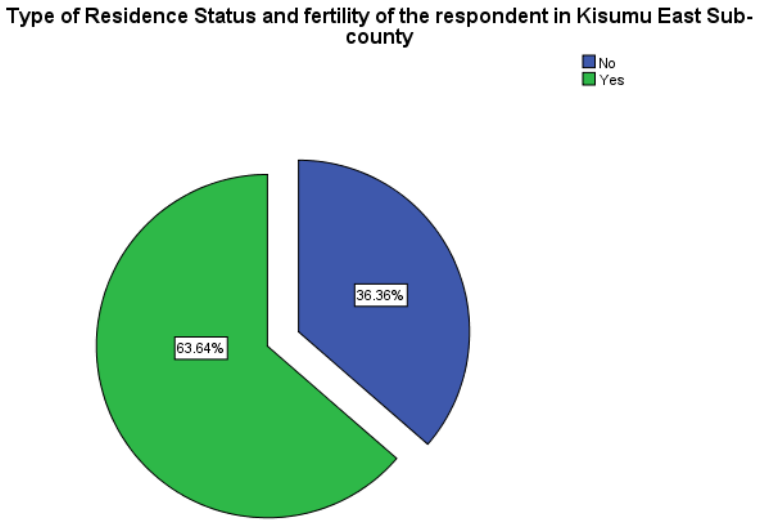

Figure 38: Residence Status and Fertility of the Respondent

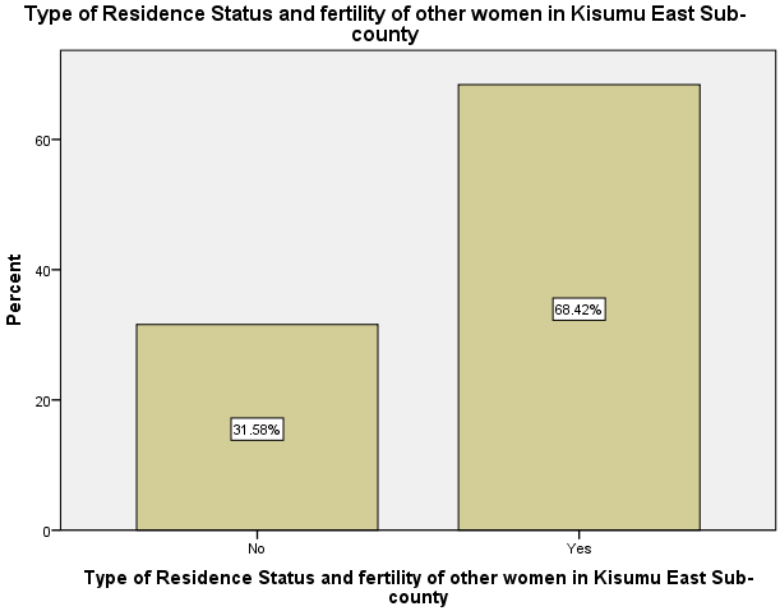

Figure 39: Residence Status and Fertility of Other Women

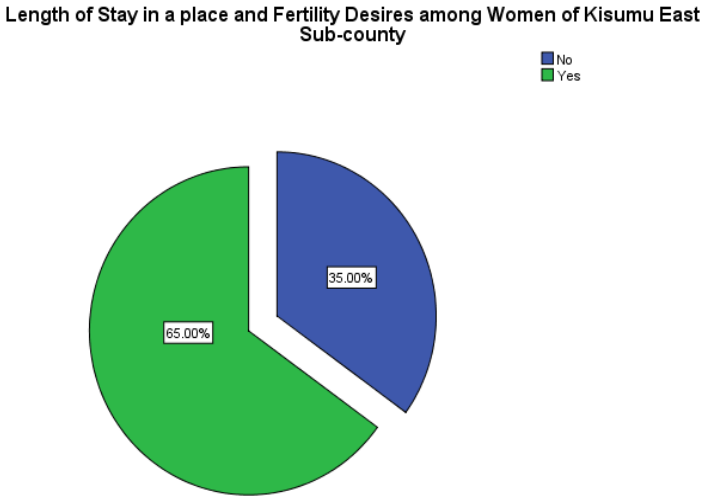

Figure 40: Length of Stay and Desire to have Children

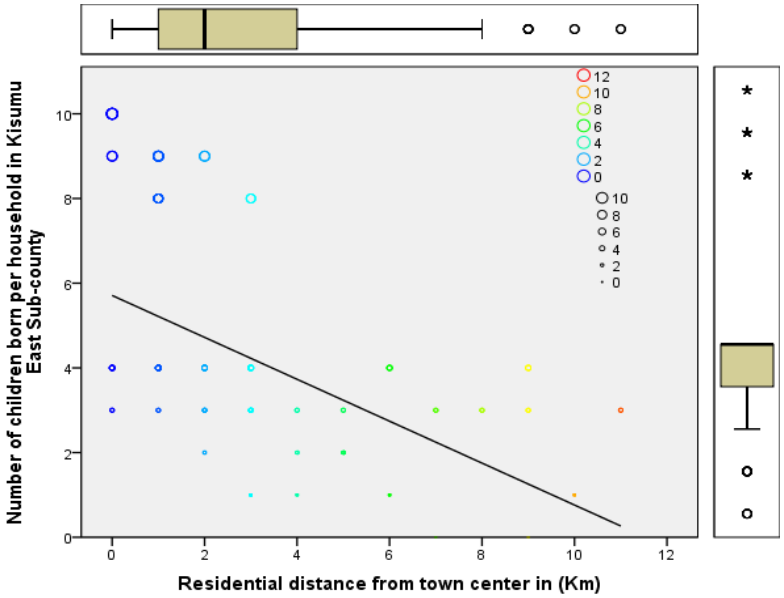

Figure 41: Regression plot; number of children born per woman and Residential Distance from town center

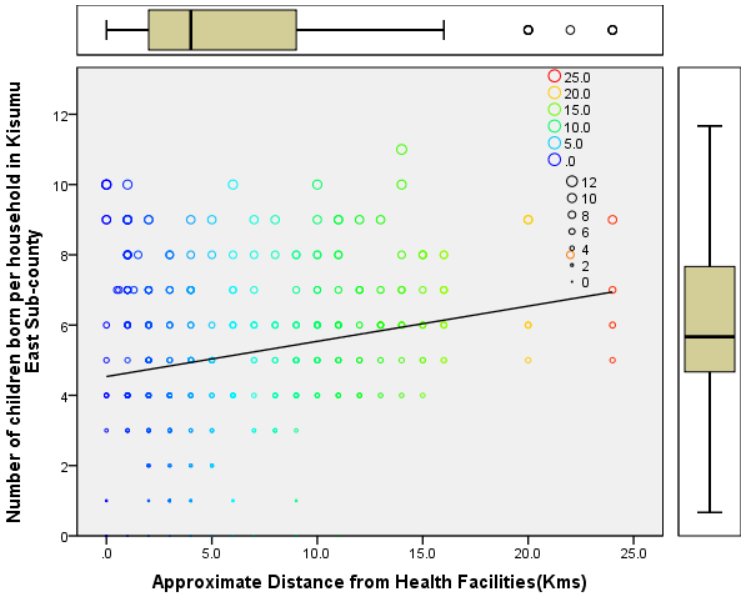

Figure 42: Regression plot; number of children born per woman and Approximate Distance from Health Facilities

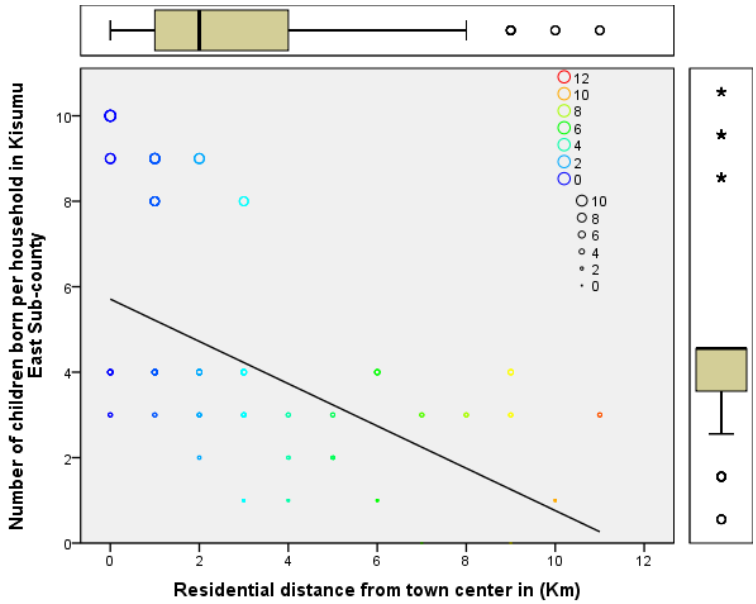

Figure 43: Regression plot; number of children born per woman and Residential Distance from town center

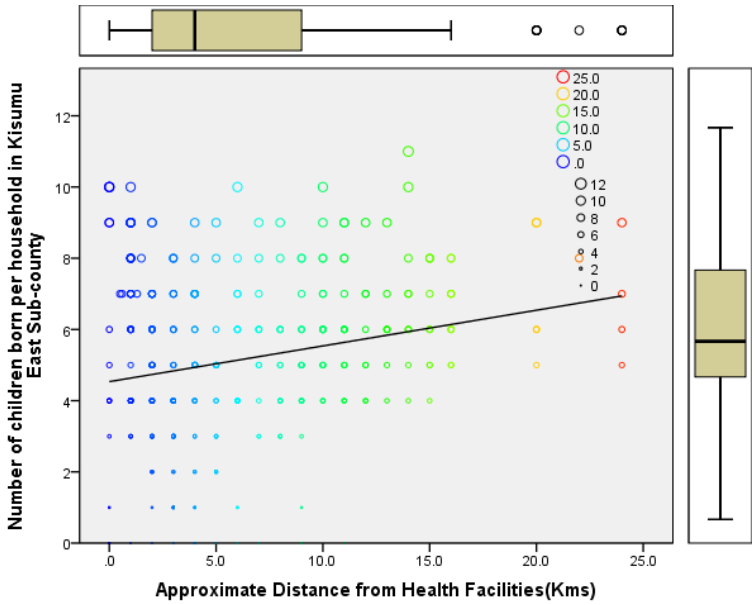

Figure 44: Regression plot; number of children born per woman and Approximate Distance from Health Facilities

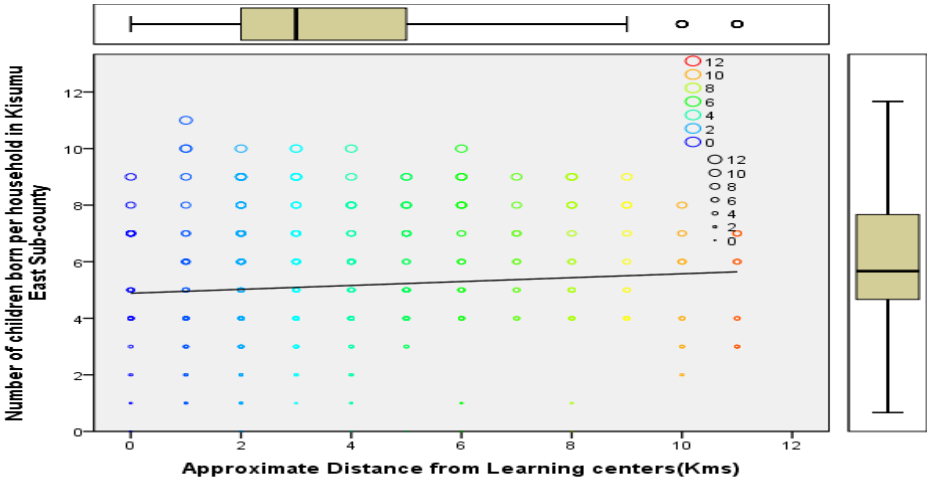

Figure 45: Regression plot; number of children born per woman and Approximate Distance from Learning Centers

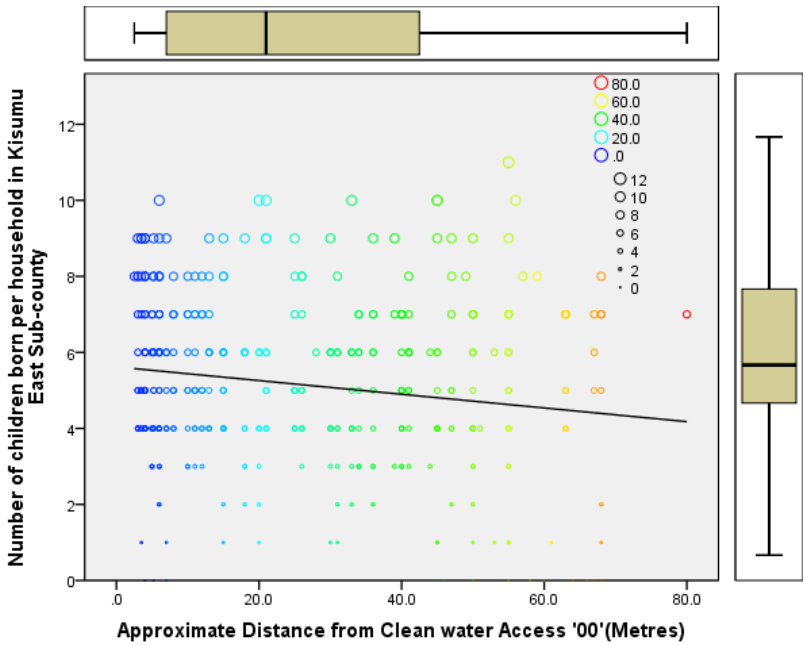

Figure 46: Regression plot; number of children born per woman and Approximate Distance from Clean Water Access

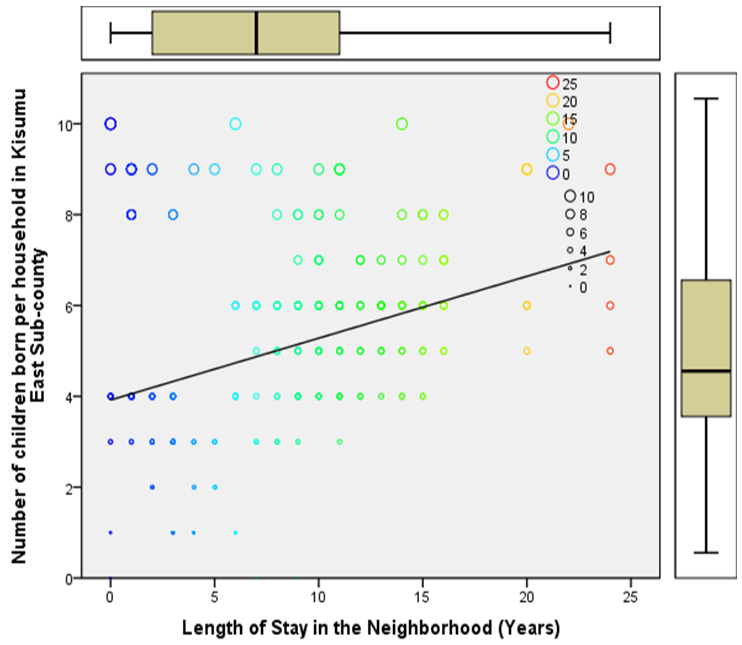

Figure 47: Regression plot; number of children born per woman length of stay in the neighborhood

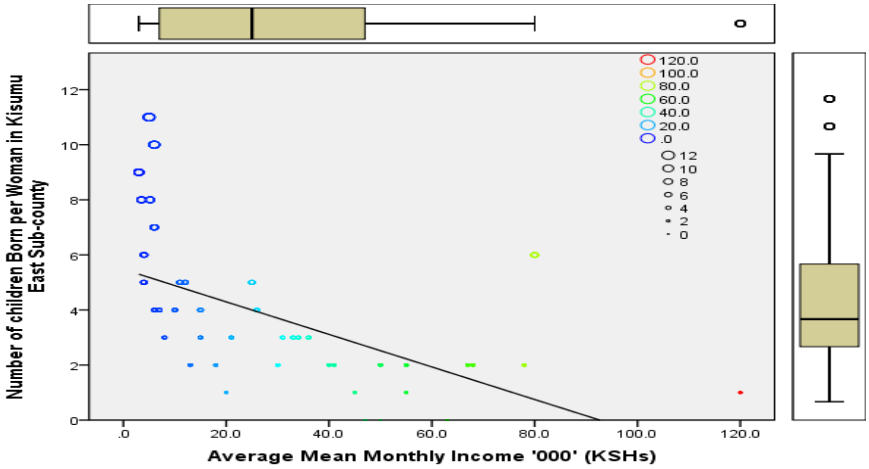

Figure 48: Regression plot; number of children born per woman and Average Mean Monthly Income.

APPENDIX 5: Data for the respondents

Age At Age At first Last Childbirth in Kisumu East Sub-county stay	Childbirth in Kisumu East Sub-county in the (2023)	Number of Children (2023)	Sharing Social Born	Status Common Interactions	income from town Ksh Centers Neighbohood	Residential distance from health center in '000'	Distance from learning center in Meters	Distance from Water centers in km	Clean Length source in km
34	39	8	20	6	4	0.8	0.3	0.7	0.1
4									
33	39	5	12	9	5	0.4	0.2	0.3	0
2									
28	39	3	10	3	9	0.6	5	0.5	0.5
12									
27	39	1	8	4	12	0.8	0.7	2	0.6
8									
26	39	8	20	6	4	0.8	0.3	0.7	0.2
4									
25	39	5	12	9	5	0.4	0.2	0.3	0
2									
18	39	3	10	3	9	0.6	5	0.5	0.5
12									
18	39	1	8	4	12	0.8	0.7	2	0.6
8									
18	39	8	20	6	4	0.8	0.3	0.7	0.1
4									
18	39	5	12	9	5	0.4	0.2	0.3	0
2									
18	39	3	10	3	9	0.6	5	0.5	0.5
12									
19	39	1	8	4	12	0.8	0.7	2	0.6
8									
19	39	8	20	6	4	0.8	0.3	0.7	0.1
4									

	19	39	5	12	9	5	0.4	0.2	0.3			
	0	2										
	19	39	3	10	3	9	0.6	5	0.5			
	0.5	12										
	19	39	1	8	4	12	0.8	0.7	2			
	0.6	8										
	19	39	8	20	6	4	0.8	0.3	0.7			
	0.1	4										
	19	39	5	12	9	5	0.4	0.2	0.3			
	0	2										
	19	39	3	10	3	9	0.6	5	0.5			
	0.5	12										
	19	39	1	8	4	12	0.8	0.7	2			
	0.6	8										
	19	39	8	20	6	4	0.8	0.3	0.7			
0.1	4											
	19	39	5	12	9	5	0.4	0.2	0.3	0	2	
	20	39	3	10	3	9	0.6	5	0.5	0.5	12	
	20	39	1	8	4	12	0.8	0.7	2			
0.6	8											
	20	39	8	20	6	4	0.8	0.3	0.7			
0.1	4											
	20	39	5	12	9	5	0.4	0.2	0.3			
	0	2										
	20	39	3	10	3	9	0.6	5	0.5			
	0.5	12										
	20	39	1	8	4	12	0.8	0.7	2			
	0.6	8										
	20	39	8	20	6	4	0.8	0.3	0.7			
	0.1	4										
	20	39	5	12	9	5	0.4	0.2	0.3			
	0	2										
	20	39	3	10	3	9	0.6	5	0.5			
	0.5	12										
	20	39	1	8	4	12	0.8	0.7	2			
	0.6	8										
	20	39	8	20	6	4	0.8	0.3	0.7			
	0.1	4										
	20	39	5	12	9	5	0.4	0.2	0.3			
	0	2										

20 39 3 10 3 9 0.6 5 0.5
0.5 12
20 39 1 8 4 12 0.8 0.7 2
0.6 8
20 39 8 20 6 4 0.8 0.3 0.7
0.1 4
20 39 5 12 9 5 0.4 0.2 0.3
0 2
20 39 3 10 3 9 0.6 5 0.5
0.5 12
20 40 1 8 4 12 0.8 0.7 2
0.6 8
20 40 8 20 6 4 0.8 0.3 0.7
0.1 4
20 40 5 12 9 5 0.4 0.2 0.3
0 2
20 40 3 10 3 9 0.6 5 0.5
0.5 12
20 40 1 8 4 12 0.8 0.7 2
0.6 8
20 40 8 20 6 4 0.8 0.3 0.7
0.1 4
20 40 5 12 9 5 0.4 0.2 0.3 0 2
21 40 3 10 3 9 0.6 5 0.5 0.5 12
21 40 1 8 4 12 0.8 0.7 2
0.6 8
21 40 8 20 6 4 0.8 0.3 0.7
0.1 4
21 40 5 12 9 5 0.4 0.2 0.3
0 2
21 40 3 10 3 9 0.6 5 0.5 0.5 12 21 40 1 8 4
12 0.8 0.7 2 0.6 8
21 40 8 20 6 4 0.8 0.3 0.7
0.1 4
21 40 5 12 9 5 0.4 0.2 0.3 0 2
22 40 3 10 3 9 0.6 5 0.5 0.5 12
22 40 1 8 4 12 0.8 0.7 2
0.6 8
22 40 8 20 6 4 0.8 0.3 0.7
0.1 4

22	40	5	12	9	5	0.4	0.2	0.3	0	2
22	40	3	10	3	9	0.6	5	0.5	0.5	12
22	40	1	8	4	12	0.8	0.7	2	0.6	8
22	40	8	20	6	4	0.8	0.3	0.7	0.1	4
22	40	5	12	9	5	0.4	0.2	0.3	0	2
22	40	3	10	3	9	0.6	5	0.5	0.5	12
22	40	1	8	4	12	0.8	0.7	2	0.6	8
22	40	8	20	6	4	0.8	0.3	0.7	0.1	4
23	40	5	12	9	5	0.4	0.2	0.3	0	2
23	40	3	10	3	9	0.6	5	0.5	0.5	12
23	40	1	8	4	12	0.8	0.7	2	0.6	8
24	40	8	20	6	4	0.8	0.3	0.7	0.1	4
24	40	5	12	9	5	0.4	0.2	0.3	0	2
24	40	3	10	3	9	0.6	5	0.5	0.5	12
30	40	1	8	4	12	0.8	0.7	2	0.6	8
30	40	8	20	6	4	0.8	0.3	0.7	0.1	4
30	40	5	12	9	5	0.4	0.2	0.3	0	2
30	40	3	10	3	9	0.6	5	0.5	0.5	12
30	40	1	8	4	12	0.8	0.7	2	0.6	8
30	40	8	20	6	4	0.8	0.3	0.7	0.1	4
30	40	5	12	9	5	0.4	0.2	0.3	0	2
30	40	3	10	3	9	0.6	5	0.5	0.5	12

30 40 1 8 4 12 0.8 0.7 2
0.6 8
30 40 8 20 6 4 0.8 0.3 0.7
0.1 4
30 40 5 12 9 5 0.4 0.2 0.3 0 2 30 40 3 10 3
9 0.6 5 0.5 0.5 12
30 40 1 8 4 12 0.8 0.7 2
0.6 8
30 40 8 20 6 4 0.8 0.3 0.7
0.1 4
30 40 5 12 9 5 0.4 0.2 0.3
0 2
30 40 3 10 3 9 0.6 5 0.5
0.5 12
30 40 1 8 4 12 0.8 0.7 2
0.6 8
30 40 8 20 6 4 0.8 0.3 0.7
0.1 4
30 40 5 12 9 5 0.4 0.2 0.3
0 2
30 40 3 10 3 9 0.6 5 0.5
0.5 12
30 41 1 8 4 12 0.8 0.7 2
0.6 8
30 41 8 20 6 4 0.8 0.3 0.7
0.1 4
30 41 5 12 9 5 0.4 0.2 0.3
0 2
30 41 3 10 3 9 0.6 5 0.5
0.5 12
30 41 1 8 4 12 0.8 0.7 2
0.6 8
30 41 8 20 6 4 0.8 0.3 0.7
0.1 4
30 41 5 12 9 5 0.4 0.2 0.3
0 2
30 41 3 10 3 9 0.6 5 0.5
0.5 12
30 41 1 8 4 12 0.8 0.7 2
0.6 8

30 41 8 20 6 4 0.8 0.3 0.7
0.1 4
30 41 5 12 9 5 0.4 0.2 0.3
0 2
30 41 3 10 3 9 0.6 5 0.5
0.5 12
30 41 1 8 4 12 0.8 0.7 2
0.6 8
30 41 8 20 6 4 0.8 0.3 0.7
0.1 4
30 41 5 12 9 5 0.4 0.2 0.3
0 2
30 41 3 10 3 9 0.6 5 0.5
0.5 12
30 41 1 8 4 12 0.8 0.7 2
0.6 8
30 41 8 20 6 4 0.8 0.3 0.7
0.1 4
30 41 5 12 9 5 0.4 0.2 0.3
0 2
30 41 3 10 3 9 0.6 5 0.5
0.5 12
30 42 1 8 4 12 0.8 0.7 2
0.6 8
30 42 8 20 6 4 0.8 0.3 0.7 0.1 4 30 42 5 12 9
5 0.4 0.2 0.3 0 2
30 42 3 10 3 9 0.6 5 0.5
0.5 12
30 42 1 8 4 12 0.8 0.7 2
0.6 8
30 42 8 20 6 4 0.8 0.3 0.7
0.1 4
30 42 5 12 9 5 0.4 0.2 0.3
0 2
30 42 3 10 3 9 0.6 5 0.5
0.5 12
30 42 1 8 4 12 0.8 0.7 2
0.6 8
30 42 8 20 6 4 0.8 0.3 0.7
0.1 4

30	42	5	12	9	5	0.4	0.2	0.3
0	2							
30	42	3	10	3	9	0.6	5	0.5
0.5	12							
30	42	1	8	4	12	0.8	0.7	2
0.6	8							
30	42	8	20	6	4	0.8	0.3	0.7
0.1	4							
30	42	5	12	9	5	0.4	0.2	0.3
0	2							
30	42	3	10	3	9	0.6	5	0.5
0.5	12							
30	42	1	8	4	12	0.8	0.7	2
0.6	8							
30	42	8	20	6	4	0.8	0.3	0.7
0.1	4							
30	42	5	12	9	5	0.4	0.2	0.3
0	2							
24	42	3	10	3	9	0.6	5	0.5
0.5	12							
24	42	1	8	4	12	0.8	0.7	2
0.6	8							
32	43	8	20	6	4	0.8	0.3	0.7
0.1	4							
32	43	5	12	9	5	0.4	0.2	0.3
0	2							
45	43	3	10	3	9	0.6	5	0.5
0.5	12							
42	43	1	8	4	12	0.8	0.7	2
0.6	8							
41	43	8	20	6	4	0.8	0.3	0.7
0.1	4							
40	43	5	12	9	5	0.4	0.2	0.3
0	2							
31	43	3	10	3	9	0.6	5	0.5
0.5	12							
32	43	1	8	4	12	0.8	0.7	2
0.6	8							
39	43	8	20	6	4	0.8	0.3	0.7
0.1	4							
38	43	5	12	9	5	0.4	0.2	0.3
0	2							

29 43 3 10 3 9 0.6 5 0.5
0.5 12
43 43 1 8 4 12 0.8 0.7 2 0.6 8 35 43 8 20 6
4 0.8 0.3 0.7 0.1 4
36 43 5 12 9 5 0.4 0.2 0.3
0 2
44 43 3 10 3 9 0.6 5 0.5
0.5 12
28 43 1 8 4 12 0.8 0.7 2
0.6 8
28 43 8 20 6 4 0.8 0.3 0.7
0.1 4
28 43 5 12 9 5 0.4 0.2 0.3 0 2
29 43 3 10 3 9 0.6 5 0.5 0.5 12
22 43 1 8 4 12 0.8 0.7 2
0.6 8
27 43 8 20 6 4 0.8 0.3 0.7
0.1 4
42 43 5 12 9 5 0.4 0.2 0.3
0 2
25 43 3 10 3 9 0.6 5 0.5
0.5 12
23 43 1 8 4 12 0.8 0.7 2
0.6 8
23 43 8 20 6 4 0.8 0.3 0.7
0.1 4
34 44 5 12 9 5 0.4 0.2 0.3
0 2
33 44 3 10 3 9 0.6 5 0.5
0.5 12
28 44 1 8 4 12 0.8 0.7 2
0.6 8
27 44 8 20 6 4 0.8 0.3 0.7
0.1 4
26 44 5 12 9 5 0.4 0.2 0.3
0 2
25 44 3 10 3 9 0.6 5 0.5
0.5 12
18 44 1 8 4 12 0.8 0.7 2
0.6 8

18 44 8 20 6 4 0.8 0.3 0.7
0.1 4
18 44 5 12 9 5 0.4 0.2 0.3
0 2
18 44 3 10 3 9 0.6 5 0.5
0.5 12
18 44 1 8 4 12 0.8 0.7 2 0.6 8
19 44 8 20 6 4 0.8 0.3 0.7 0.1 4
19 44 5 12 9 5 0.4 0.2 0.3
0 2
19 44 3 10 3 9 0.6 5 0.5
0.5 12
19 44 1 8 4 12 0.8 0.7 2
0.6 8
19 44 8 20 6 4 0.8 0.3 0.7
0.1 4
19 44 5 12 9 5 0.4 0.2 0.3
0 2
19 45 3 10 3 9 0.6 5 0.5 0.5 12 19 45 1 8 4
12 0.8 0.7 2 0.6 8
19 30 8 20 6 4 0.8 0.3 0.7
0.1 4
19 18 5 12 9 5 0.4 0.2 0.3
0 2
19 39 3 10 3 9 0.6 5 0.5 0.5 12
20 39 1 8 4 12 0.8 0.7 2 0.6 8
20 39 8 20 6 4 0.8 0.3 0.7
0.1 4
20 39 5 12 9 5 0.4 0.2 0.3
0 2
20 39 3 10 3 9 0.6 5 0.5
0.5 12
20 39 1 8 4 12 0.8 0.7 2
0.6 8
20 39 8 20 6 4 0.8 0.3 0.7
0.1 4
20 39 5 12 9 5 0.4 0.2 0.3
0 2
20 39 3 10 3 9 0.6 5 0.5
0.5 12

20	39	1	8	4	12	0.8	0.7	2	0.6	8
20	39	8	20	6	4	0.8	0.3	0.7	0.1	4
20	39	5	12	9	5	0.4	0.2	0.3	0	2
20	39	3	10	3	9	0.6	5	0.5	0.5	12
20	39	1	8	4	12	0.8	0.7	2	0.6	8
20	39	8	20	6	4	0.8	0.3	0.7	0.1	4
20	39	5	12	9	5	0.4	0.2	0.3	0	2
20	39	3	10	3	9	0.6	5	0.5	0.5	12
20	39	1	8	4	12	0.8	0.7	2	0.6	8
20	39	8	20	6	4	0.8	0.3	0.7	0.1	4
20	39	5	12	9	5	0.4	0.2	0.3	0	2
20	39	3	10	3	9	0.6	5	0.5	0.5	12
20	39	1	8	4	12	0.8	0.7	2	0.6	8
20	39	8	20	6	4	0.8	0.3	0.7	0.1	4
20	39	5	12	9	5	0.4	0.2	0.3	0	2
20	39	3	10	3	9	0.6	5	0.5	0.5	12
21	39	1	8	4	12	0.8	0.7	2	0.6	8
21	39	8	20	6	4	0.8	0.3	0.7	0.1	4
21	39	5	12	9	5	0.4	0.2	0.3	0	2
21	39	3	10	3	9	0.6	5	0.5	0.5	12
21	39	1	8	4	12	0.8	0.7	2	0.6	8
21	39	8	20	6	4	0.8	0.3	0.7	0.1	4

21	39	5	12	9	5	0.4	0.2	0.3	0	2
21	39	3	10	3	9	0.6	5	0.5	0.5	12
22	39	1	8	4	12	0.8	0.7	2	0.6	8
22	39	8	20	6	4	0.8	0.3	0.7	0.1	4
22	39	5	12	9	5	0.4	0.2	0.3	0	2
22	39	3	10	3	9	0.6	5	0.5	0.5	12
22	39	1	8	4	12	0.8	0.7	2	0.6	8
22	39	8	20	6	4	0.8	0.3	0.7	0.1	4
22	40	5	12	9	5	0.4	0.2	0.3	0	2
22	40	3	10	3	9	0.6	5	0.5	0.5	12
22	40	1	8	4	12	0.8	0.7	2	0.6	8
22	40	8	20	6	4	0.8	0.3	0.7	0.1	4
22	40	5	12	9	5	0.4	0.2	0.3	0	2
23	40	3	10	3	9	0.6	5	0.5	0.5	12
23	40	1	8	4	12	0.8	0.7	2	0.6	8
23	40	8	20	6	4	0.8	0.3	0.7	0.1	4
24	40	5	12	9	5	0.4	0.2	0.3	0	2
24	40	3	10	3	9	0.6	5	0.5	0.5	12
24	40	1	8	4	12	0.8	0.7	2	0.6	8
30	40	8	20	6	4	0.8	0.3	0.7	0.1	4
30	40	5	12	9	5	0.4	0.2	0.3	0	2
30	40	3	10	3	9	0.6	5	0.5	0.5	12
30	40	1	8	4	12	0.8	0.7	2	0.6	8

30 40 8 20 6 4 0.8 0.3 0.7
0.1 4
30 40 5 12 9 5 0.4 0.2 0.3
0 2
30 40 3 10 3 9 0.6 5 0.5
0.5 12
30 40 1 8 4 12 0.8 0.7 2
0.6 8
30 40 8 20 6 4 0.8 0.3 0.7 0.1 4 30 40 5 12 9
5 0.4 0.2 0.3 0 2
30 40 3 10 3 9 0.6 5 0.5
0.5 12
30 40 1 8 4 12 0.8 0.7 2
0.6 8
30 40 8 20 6 4 0.8 0.3 0.7
0.1 4
30 40 5 12 9 5 0.4 0.2 0.3
0 2
30 40 3 10 3 9 0.6 5 0.5
0.5 12
30 40 1 8 4 12 0.8 0.7 2
0.6 8
30 40 8 20 6 4 0.8 0.3 0.7
0.1 4
30 40 5 12 9 5 0.4 0.2 0.3
0 2
30 40 3 10 3 9 0.6 5 0.5
0.5 12
30 40 1 8 4 12 0.8 0.7 2
0.6 8
30 40 8 20 6 4 0.8 0.3 0.7
0.1 4

30	40	5	12	9	5	0.4	0.2	0.3	0	2
30	40	3	10	3	9	0.6	5	0.5	0.5	12
30	40	1	8	4	12	0.8	0.7	2	0.6	8
30	40	8	20	6	4	0.8	0.3	0.7	0.1	4
30	40	5	12	9	5	0.4	0.2	0.3	0	2
30	40	3	10	3	9	0.6	5	0.5	0.5	12
30	40	1	8	4	12	0.8	0.7	2	0.6	8
30	40	8	20	6	4	0.8	0.3	0.7	0.1	4
30	40	5	12	9	5	0.4	0.2	0.3	0	2
30	40	3	10	3	9	0.6	5	0.5	0.5	12
30	40	1	8	4	12	0.8	0.7	2	0.6	8
30	40	8	20	6	4	0.8	0.3	0.7	0.1	4
30	40	5	12	9	5	0.4	0.2	0.3	0	2
30	40	3	10	3	9	0.6	5	0.5	0.5	12
30	40	1	8	4	12	0.8	0.7	2	0.6	8
30	40	8	20	6	4	0.8	0.3	0.7	0.1	4
30	41	5	12	9	5	0.4	0.2	0.3	0	2
30	41	3	10	3	9	0.6	5	0.5	0.5	12
30	41	1	8	4	12	0.8	0.7	2	0.6	8
30	41	8	20	6	4	0.8	0.3	0.7	0.1	4
30	41	5	12	9	5	0.4	0.2	0.3	0	2

30	41	3	10	3	9	0.6	5	0.5
0.5	12							
30	41	1	8	4	12	0.8	0.7	2
0.6	8							
30	41	8	20	6	4	0.8	0.3	0.7
0.1	4							
30	41	5	12	9	5	0.4	0.2	0.3
0	2							
30	41	3	10	3	9	0.6	5	0.5
0.5	12							
30	41	1	8	4	12	0.8	0.7	2
0.6	8							
30	41	8	20	6	4	0.8	0.3	0.7
0.1	4							
30	41	5	12	9	5	0.4	0.2	0.3
0	2							
30	41	3	10	3	9	0.6	5	0.5
0.5	12							
30	41	1	8	4	12	0.8	0.7	2
0.6	8							
30	41	8	20	6	4	0.8	0.3	0.7
0.1	4							
30	41	5	12	9	5	0.4	0.2	0.3
0	2							
30	41	3	10	3	9	0.6	5	0.5
0.5	12							
24	41	1	8	4	12	0.8	0.7	2
0.6	8							
24	41	8	20	6	4	0.8	0.3	0.7
0.1	4							
32	42	5	12	9	5	0.4	0.2	0.3
0	2							
32	42	3	10	3	9	0.6	5	0.5
0.5	12							
45	42	1	8	4	12	0.8	0.7	2
0.6	8							
42	42	8	20	6	4	0.8	0.3	0.7
0.1	4							
41	42	5	12	9	5	0.4	0.2	0.3
0	2							

40 42 3 10 3 9 0.6 5 0.5
0.5 12
31 42 1 8 4 12 0.8 0.7 2 0.6 8
32 42 8 20 6 4 0.8 0.3 0.7 0.1 4
39 42 5 12 9 5 0.4 0.2 0.3
0 2
38 42 3 10 3 9 0.6 5 0.5 0.5 12 29 42 1 8 4
12 0.8 0.7 2 0.6 8
43 42 8 20 6 4 0.8 0.3 0.7
0.1 4
35 42 5 12 9 5 0.4 0.2 0.3 0 2
36 42 3 10 3 9 0.6 5 0.5 0.5 12
44 42 1 8 4 12 0.8 0.7 2
0.6 8
28 42 8 20 6 4 0.8 0.3 0.7
0.1 4
28 42 5 12 9 5 0.4 0.2 0.3
0 2
28 42 3 10 3 9 0.6 5 0.5 0.5 12
29 42 1 8 4 12 0.8 0.7 2 0.6 8
22 42 8 20 6 4 0.8 0.3 0.7
0.1 4
27 42 5 12 9 5 0.4 0.2 0.3
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42 43 3 10 3 9 0.6 5 0.5
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25 43 1 8 4 12 0.8 0.7 2
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23 43 8 20 6 4 0.8 0.3 0.7
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28 43 8 20 6 4 0.8 0.3 0.7
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25 43 1 8 4 12 0.8 0.7 2 0.6 8
18 43 8 20 6 4 0.8 0.3 0.7 0.1 4
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18 43 8 20 6 4 0.8 0.3 0.7 0.1 4
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	21	44	1	8	4	12	0.8	0.7	2	0.6	8		
	21	44	8	20	6	4	0.8	0.3	0.7	0.1	4		
	21	44	5	12	9	5	0.4	0.2	0.3	0	2		
	21	44	3	10	3	9	0.6	5	0.5	0.5	12		
	21	44	1	8	4	12	0.8	0.7	2	0.6	8		
	22	44	8	20	6	4	0.8	0.3	0.7	0.1	4		
	22	44	5	12	9	5	0.4	0.2	0.3	0	2		
	22	44	3	10	3	9	0.6	5	0.5	0.5	12		
	22	44	1	8	4	12	0.8	0.7	2	0.6	8		
	22	44	8	20	6	4	0.8	0.3	0.7	0.1	4		
	22	44	5	12	9	5	0.4	0.2	0.3	0	2		
	22	44	3	10	3	9	0.6	5	0.5	0.5	12		
	22	44	1	8	4	12	0.8	0.7	2	0.6	8		
	22	44	8	20	6	4	0.8	0.3	0.7	0.1	4		
	22	44	5	12	9	5	0.4	0.2	0.3	2	2		
	22	45	3	10	3	9	0.6	5	0.5	0.5	12		
	23	45	1	8	4	12	0.8	0.7	2	0.6	8		
	23	41	8	20	6	4	0.8	0.3	0.7	0.1	4		
	23	41	5	12	9	5	0.4	0.2	0.3	0	2		
	24	41	3	10	3	9	0.6	5	0.5	0.5	12		
	24	41	1	8	4	12	0.8	0.7	2	0.6	8		

APPENDIX 6: LETTER OF INRODUCTION

The Respondent.....

Location.....

Dear Sir/Madam

REF: CONDUCTING RESEARCH

I am a master of Arts Geography Student in the school of Arts and Social Sciences, Maseno University. The Title of this study is Influence of Geographical Segregation on Fertility of Women in Kisumu East Sub County Kisumu County Kenya. I am glad to inform you that you've been selected to participate in this study. Your cooperation in this regard will be highly appreciated.

Yours Faithfully
Loy Kinda Oduor
Graduate Student

APPENDIX 7: RESEARCH PERMIT

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION

Ref No: **525781**

Date of Issue: **16/December/2022**

RESEARCH LICENSE

This is to Certify that Ms.. LOY KINDA ODUOR of Maseno University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Kisumu on the topic: INFLUENCE OF GEOGRAPHICAL SEGREGATION ON FERTILITY OF WOMEN IN KISUMU EAST SUB COUNTY, KISUMU COUNTY, KENYA. for the period ending : 16/December/2023.

License No: **NACOSTI/P/22/22636**

525781

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION

Verification QR Code

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See overleaf for conditions

THE SCIENCE, TECHNOLOGY AND INNOVATION ACT, 2013 (Rev. 2014)
Legal Notice No. 108: The Science, Technology and Innovation (Research Licensing) Regulations, 2014

The National Commission for Science, Technology and Innovation, hereafter referred to as the Commission, was the established under the Science, Technology and Innovation Act 2013 (Revised 2014) herein after referred to as the Act. The objective of the Commission shall be to regulate and assure quality in the science, technology and innovation sector and advise the Government in matters related thereto.

CONDITIONS OF THE RESEARCH LICENSE

1. The License is granted subject to provisions of the Constitution of Kenya, the Science, Technology and Innovation Act, and other relevant laws, policies and regulations. Accordingly, the licensee shall adhere to such procedures, standards, code of ethics and guidelines as may be prescribed by regulations made under the Act, or prescribed by provisions of International treaties of which Kenya is a signatory to
2. The research and its related activities as well as outcomes shall be beneficial to the country and shall not in any way;
    i. Endanger national security
    ii. Adversely affect the lives of Kenyans
    iii. Be in contravention of Kenya's international obligations including Biological Weapons Convention (BWC), Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO), Chemical, Biological, Radiological and Nuclear (CBRN).
    iv. Result in exploitation of intellectual property rights of communities in Kenya
    v. Adversely affect the environment
    vi. Adversely affect the rights of communities
    vii. Endanger public safety and national cohesion
    viii. Plagiarize someone else's work
3. The License is valid for the proposed research, location and specified period.
4. The license any rights thereunder are non-transferable
5. The Commission reserves the right to cancel the research at any time during the research period if in the opinion of the Commission the research is not implemented in conformity with the provisions of the Act or any other written law.
6. The Licensee shall inform the relevant County Director of Education, County Commissioner and County Governor before commencement of the research.
7. Excavation, filming, movement, and collection of specimens are subject to further necessary clearance from relevant Government Agencies.
8. The License does not give authority to transfer research materials.
9. The Commission may monitor and evaluate the licensed research project for the purpose of assessing and evaluating compliance with the conditions of the License.
10. The Licensee shall submit one hard copy, and upload a soft copy of their final report (thesis) onto a platform designated by the Commission within one year of completion of the research.
11. The Commission reserves the right to modify the conditions of the License including cancellation without prior notice.
12. Research, findings and information regarding research systems shall be stored or disseminated, utilized or applied in such a manner as may be prescribed by the Commission from time to time.
13. The Licensee shall disclose to the Commission, the relevant Institutional Scientific and Ethical Review Committee, and the relevant national agencies any inventions and discoveries that are of National strategic importance.
14. The Commission shall have powers to acquire from any person the right in, or to, any scientific innovation, invention or patent of strategic importance to the country.
15. Relevant Institutional Scientific and Ethical Review Committee shall monitor and evaluate the research periodically, and make a report of its findings to the Commission for necessary action.

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