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Influence of Geographical Segregation on Fertility of Women in Kisumu East Sub County, Kisumu County, Kenya

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ABSTRACT

Fertility and geographical segregation are some of the major factors influencing human population growth. High fertility stagnates development by draining resources. The fertility rate of Kisumu East Sub County is rated at 4.8 exceeding the average for the county, national and the global which is 4.2, 3.4 and 2.3 respectively. The purpose of this study is to assess the influence of geographical segregation on fertility of women. This study was guided by Becker's economics theory of fertility and Hägerstrand theory of Spatial diffusion. The households were the unit of analysis and a sample size of 384 was obtained as determined by the Fisher's formula. Cross-sectional descriptive research design was used. 384 women respondents aged between 18-49 were selected using cluster and snowball sampling techniques. Quantitative data such as descriptive statistics: percentages, means and standard deviation was analysed using SPSS version 22. Inferential statistics: chi-square, gamma statistics, spearman's rank, multiple logistic regressions, multiple correlation coefficient and multinomial logistic regression were used to analyse the data. Qualitative data was analysed by coding, creating categories, themes and patterns then evaluating the usefulness of the information in answering the research questions. Piloted tool revealed a spearman-brown reliability coefficient of .721. All the tests of significance were conducted at α=0.05. According to the multinomial logistic regression, the influence of cultural norms on first and last child birth remained statistically significant. Sharing common centres and mean number of children born per woman showed strong 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). Spearman rank correlation indicated 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. 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 and low geographical concentration was significant. The findings of this study will provide knowledge on aspects of geographical segregations influencing fertility among women and will give useful information to reproductive health planners and policy makers on fertility issues in Kisumu East Sub County. Therefore, the study recommends wider adoption of reproductive family health awareness and economic empowerment among women to help reduce the number of children born per woman.

Key words: Geographical segregation, Fertility.

1. INTRODUCTION

Fertility is among the fundamental components of population dynamics that affect the global population trends in terms of growth, structure and composition (Pew Research Centre, 2015). 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 Prospects, 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, 2020a). (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. Reduced fertility stimulates economic development by reducing the number of dependents, however, continued increasing population obstructs the 2030 Agenda for SDGs (United Nations, 2021a). Measures of geographical segregation have the potential to explain differences in fertility between women (Wilson and Kuha, 2018).

The (Population Reference Bureau, 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 centers (Scott, 2011). Similar reports in UK indicated that fertility levels of the negatively geographically segregated groups grow higher than that of the geographically favored (Coleman and Dubuc, 2010). However, in Germany, (Milewski, 2010) concludes that levels of fertility were low among those people who hardly met at common centers 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.

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, 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). Fertility rate in Africa has been declining at a lower rate than in other areas undergoing demographic transition over the same period (Bongaarts, 2020). Sub-Saharan Africa will be the most populous of the eight global regions by 2062 (medium variation prediction, 2019). The (United Nations, 2020a) 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 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).

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 Council for Population Development, 2020). Kenyans Vision 2030 acknowledge that rapid population increase could hinder the plan of achieving high HDI (Kenya Vision 2030, 2008).

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 (National Council for Population and Development (NCPD), 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).

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, 2020). 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). 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, Nyamasaria 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

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can influence the fertility behavior of women in such areas (Michel, 2018). These reports primarily centered on the residential segregations within the sub-county and its resultant fertility trends, the pathways that link segregation to fertility and the mechanism responsible for this correlation remains unclear in the area, understanding a better link between segregation and fertility was crucial as policies favoring social diversity may target access to different amenities especially in Kisumu East which can help forecasts better future demographic trends.

2. PURPOSE AND OBJECTIVE OF THE STUDY

The purpose of this study was to assess the influence of geographical segregation on women's fertility in Kisumu East Sub-County, Kisumu County, Kenya. The specific objectives are to examine the influence of exposure on the number of children born per woman in Kisumu East Sub County and to analyze the influence of concentration on the number of children born per woman in Kisumu East Sub County.

2.1 Theoretical Framework

Hagerstrand theory of spatial diffusion affirms that an idea spreads through a group of people and how they have been segregated in different geographical areas. 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 centers, 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 economic barriers, ethnicity barriers, voluntary barriers 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. This theory is significant and relevant due to its spatial interaction model which have proven their usefulness in a variety of settings, including forecasting patterns of communication 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. For this, the degree of exposure and concentration among neighborhoods was an important determinant on how knowledge and ideas about fertility influence the number of children to be born.

3. LITERATURE REVIEW

3.1 The influence of exposure on the number of children born per woman.

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 centers or facilities (Echenique and Fryer, 2005). It is the extent to which two groups share common residential units, work areas, health facility, shopping center and so the extent to which a woman experiences segregation (Echenique, 2005). Exposure mainly entails social interactions and social isolations (Fryer, 2006). 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, 2006). High quality social connections and interactions are essential to women fertility and reproductive well-being (United Nations, 2008).

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, 2020b). Global reports agree that interactions among social groups help in transforming fertility decisions and behavior among women (Carl and Toshiko, 2013). Social interactions help in transforming ideas about family planning methods and fertility perceptions (Bongaarts, 2020). Observing the fertility behaviors of others in common centers can also influence individuals' fertility decision (Wartkins, 2016). Through social interactions at the common centers, 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 (Yli-Kuha *et al.*, 2010). The 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 well understood.

A study conducted by (Wilson and Kuha, 2018) 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. 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

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focused on the high level of social interactions (United Nations, 2021b). 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 (Singh *et al.*, 2021). 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 (Colleran, 2016). 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).

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, (Iyer and Weeks, 2020), 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 (Madhavan and Adams, 2003). The influence of social isolation on women fertility needs to be clearly understood.

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 (Bachrach, 2014). A complex set of norms and sanctions guides the women fertility decision (Bachrach, 2014). 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). 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, 2020). 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 (Atake and Gnakou Ali, 2019). 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 (Kenya National Bureau of Statistis (KNBS), 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

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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 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 compare 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.

3.2 The influence of concentration on the number of children born per woman.

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 and Denton, 1988). 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. 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 (Nargund, 2009). 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 (Rotella *et al.*, 2021). 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 (Chua, Huang and Jin, 2019). 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 result 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

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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 (Rotella *et al.*, 2021). 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 need to be 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 of 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.

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.

4. METHODOLOGY

4.1 Research design and Sampling Procedure

This study used a cross-sectional descriptive research design. 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. Either single ladies with children, married women with children, or daughters with children at their homes. 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). 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. This study employed stratified random, cluster and snowball sampling procedures to obtain a minimum sample size of 384 female respondents aged between 18-49 years. 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.

4.1.1 Research Instruments

Questionnaire

A researcher administered both open-ended and closed-ended questionnaires to 384 women respondents aged between 18-49 years.

Key Informant Interviews

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.

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Focus Group Discussions.

The researcher conducted five focus group discussions with eight to ten women aged between 18-49 years from each ward. They were guided by the researcher via discussion of particular guiding questions as per the objective of the study outlined before.

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.

5. RESULTS AND DISCUSSION

5.1 The influence of exposure on number of children born per woman

Exposure was measured by: Frequency of sharing common centers by women (age 18-49 years) respondents; frequency of psychosocial and cultural factors influencing first and last childbirth; frequency of interaction influence on number of children born; and frequency of social interactions influencing the number of children.

Sharing common centers and the mean number of children born per woman

Table 1: 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 1 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 centers 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

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 analyzed using multinomial logistic regression. The results are presented in Table 2.

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Table 2: Table of Multinomial Logistic Regression on Psychosocial factors influencing first and last child birth

Parameter Estimates

First and Last Childbirth[a]		B	Std. Error	Wald	Df	Sig.	Exp(B)	95% Confidence Interval for Exp(B) Lower Bound	95% Confidence Interval for Exp(B) 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 2) 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. From the results

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the prevalence use of family planning by the neighbors 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 like the case in Kisumu East.

Influence of frequency of interaction on number of children born per woman

The multiple correlations of percentage interactions of women in common centers, frequencies of interactions of women (daily, weekly, monthly and annually) and mean number of children were analyzed using Spearman's Rho correlation coefficients (Table 3a). 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 centers, daily interaction frequencies, weekly interaction frequencies, monthly interaction frequencies and annual interaction frequencies (Table 3b) The significance of multiple correlation coefficient analysis was tested using analysis of variance (Table 3c).

Table 3a: Pairwise Spearman's Rho correlation coefficients between percentage interactions of women in common centers, frequencies of interactions of women (daily, weekly, monthly and annually) and mean number of children born per woman

Table 3a: Table of Multiple Correlation Coefficient showing number of children born per woman and percentage interaction of women in common centers, daily, weekly, monthly and annually

			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

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Table 3b: Multiple correlation Coefficient Analysis: Dependent variable, mean number of children born per woman and independent variables: percentage interactions of women in common centers, daily interaction frequencies, weekly interaction frequencies, monthly interaction frequencies and annual interaction frequencies

Table 3b: Table of Multiple correlation Coefficient Analysis:

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.730[a]	.697	.694	2.427

Table 3c: Table of Analysis of variance showing the significance of prediction of mean number of children born per woman by percentage interactions of women in common centers, 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 3a). Moreover, weekly interactions by women had the strongest positive correlation (r = 0.759, p = 0.048) with number of children born per women (Table 3a). These results demonstrated that as the frequency of interactions of women daily and weekly increase, the number of children born per woman also increase. 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 3a). Apparently, as the percentage interactions of women in common centres increase, the number of children born per woman also increase. By contrast, annual interactions by women showed insignificant negative correlation (r = -0.552, p = 0.256) with number of children born per woman (Table 3a). Seemingly, as the frequencies of interactions by women increase annually, the mean number of children born per woman decrease. 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 3b). This prediction is statistically significant at α = 0.05 (Table 3c). 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.

Social Interaction and Number of Children Born per woman

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, 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 4).

Table 4a: 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 Centers
Number of Children Born	Correlation Coefficient	1.00	.50	.61

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	Sig. (2-tailed)	.	.04	.01
	N	384	384	384
Social Interactions	Correlation Coefficient	.50	1.00	.03
	Sig. (2-tailed)	.04	.	.40
	N	384	384	384
Sharing Common Centers	Correlation Coefficient	.61	.03	1.00
	Sig. (2-tailed)	.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 4a). 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 4a). 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. 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.

Table 4b: Table of Multiple correlation Coefficient Analysis: Dependent variable, number of children born per woman and independent variables: social interactions of women and sharing common centers by women

Model Summary

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

Table 4c: Analysis of variance showing the significance of prediction of number of children born per woman by social interactions of women and sharing common centers 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 centers by women was insignificant (Table 4c). Obviously, analysis of variance confirmed statistically insignificant prediction at $\alpha = 0.05$ (Table 4c). Social interactions between individuals of different social mix leads to assimilation of positive or negative fertility behavior, this occurs depending on social practices which alter social environment thus influencing the personal decision about number of children to be born.

The influence of geographical concentration on the 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.

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Levels of geographical concentration of human population and the number of children born per woman

Table 5:Table of 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 5). 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 are often 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 association between the frequency's responses in levels (high and low) of geographical concentrations and number of children born was analyzed using gamma statistics. The results are presented in Table 6.

Table 6: Table of Gamma statistics results on association between high Geographical Concentrations, low geographical concentrations and number of children 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 6), indicates moderately strong positive association between levels of geographical concentrations and number of children born in Kisumu East sub-county. Apparently, the results showed that as level of geographical concentrations increase, the number of children born also increase. Table 7a further 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. In Kisumu East, high geographical concentrated areas like slums are known for higher fertility rates because of low-income levels and poverty which render women idle and hence high fertility.

Influence of high and low geographical concentrations and Number of children Born per woman

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 7a).

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Table 7a: Table of Pairwise Spearman's Rho correlation coefficients between the frequencies of responses in levels of geographical concentrations (high and low) and number of children born

		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	

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

CONCLUSION

Cultural norm was a major factor likely to influence the first and the last childbirth of while sharing common centers increase social interaction among women and this in turn influence the number of children born per woman Kisumu East.
Increase in daily, weekly and monthly interactions among women leads to increased number of children per woman through social pressure and social contagion.
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.
Most of the high geographically concentrated areas lack basic municipal services and proper access to quality healthcare services, good educational services or public places for social gathering.

Recommendations

The findings of this study recommended the following:

Emphasis should be put on women's reproductive health to strengthen the family planning agenda, health education and 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.

Need exists for social empowerment among women. Economic empowerment of women will make them to be busier and more productive, this will curb rural-urban migrations and reduce the high population concentration in urban slums for better living standards and low fertility.

The rural areas and informal settlements should be equipped with proper public facilities and services such as good schools, quality health care services, clean water, Street lighting, roads for emergency access among many more. This will help to curb rural urban migration and ensure equal distribution of resources thus reducing the fertility rates of women.

Formal and quality 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 information focused towards the flow of the vital reproductive information among the detached women population.

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