

**ESTIMATION OF THE TREND OF CANCER INCIDENCES IN KIAMBU AND
GATUNDU LEVEL FIVE HOSPITALS, KIAMBU COUNTY KENYA
BETWEEN 2013 AND 2017**

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DECLARATION AND APPROVAL

This research thesis has not been submitted to be assessed for a degree to any other university or location. It is entirely original.

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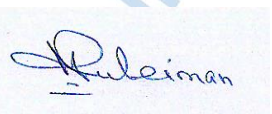
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DEDICATION

This thesis is dedicated to my family members, who have provided me with unwavering love, support, and motivation throughout this journey.



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ABSTRACT

Cancer is an abnormal division of cells without control, thus invading other tissues. It is a combination of different diseases but named according to the organ origin or the cell they originate from. This study estimated the trend of cancer incidences in Kiambu County in two selected health facilities which are Gatundu Level 5 and Kiambu Level 5 hospitals in a period of five years from 2013 to 2017. In addition to determining the association between alcohol and tobacco use and cancer among individuals attending Kiambu and Gatundu level 5 medical centers between 2013 and 2017, the study's objectives also included determining the distribution of cancer by age, sex, and cancer type among these patients. To address the above-named objectives the study used a descriptive cross-section design. Standard abstract forms were adopted to collect data from the hospital records and patients' files. The number of cancer cases was abstracted from hospital files and used to calculate incidence within the five years. Cancer patient ages recorded from patient's files were analyzed to determine age distribution per cancer type. Utilizing documented lifestyle variables (such as smoking and alcohol intake), the relative risk or odds of developing a particular cancer were determined. In order to produce a comprehensive data analysis, the gathered data was next checked for completeness, coded, and then the information was input into a program called the "Statistical Package for Social Sciences (SPSS) software version 23." Additionally, the descriptive information was examined and shown in charts, graphs, and tables. Through Thematic analysis, qualitative data was coded and displayed as tables, graphs, and charts. In the two hospitals, a total of 180 cancer patients were listed. 33.3% (60) at Kiambu level 5 hospital and 66.7% (120) at Gatundu level 5. Regarding the gender distribution of cancer incidences, 57 men and 123 women were affected. The two most common types of cancer among women, accounting for 33.4% and 11.7% of cases, were breast and cervical cancer, respectively. For men, the most common cancers were of the stomach and esophagus. In both facilities, there was a higher incidence of cancer among individuals aged 41-60. As a result of the investigation, it was determined that there was a substantial correlation between age and cancer (sign.-level =.016), sex and the main tumor sites of cancer (sig-level =.000), smoking and primary sites of cancer (sign. level =.001), and alcohol and primary sites of cancer (sign. Level =.000).

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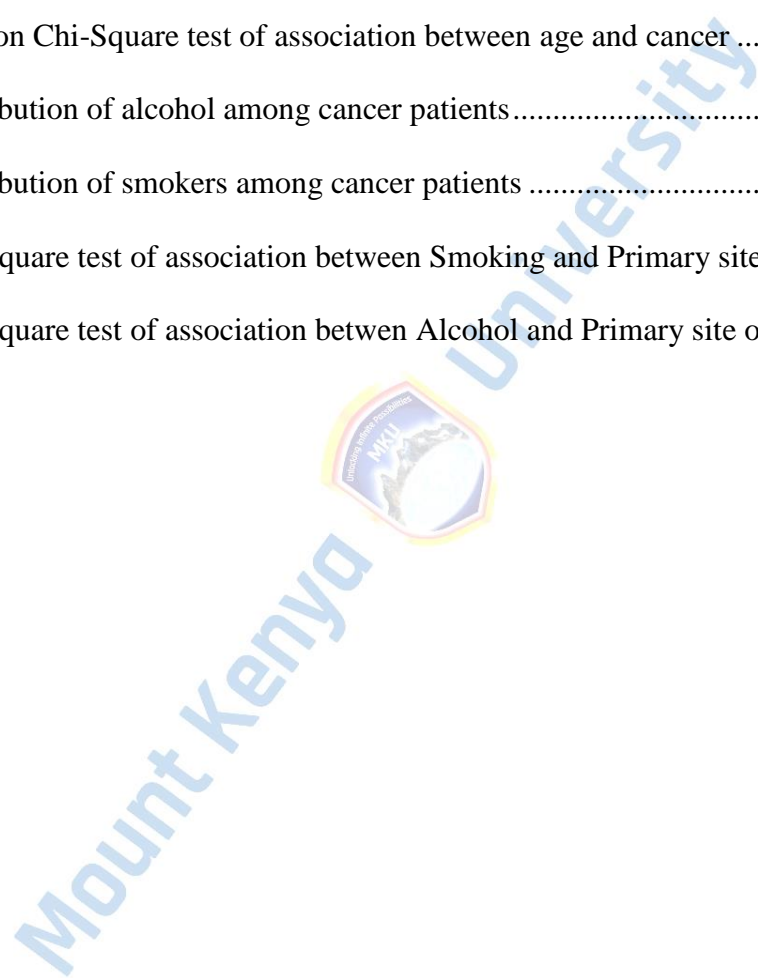
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LIST OF ACRONYMS AND ABBREVIATIONS

AFP	Alpha-Fetoprotein
CI	Cancer Incidence
CDC	Centers for Disease Control and Prevention
CR	Cancer Registry
HIS	Health Information System
HIV	Human Immunodeficiency Virus
HPV	Human Papillomavirus
KDHS	Kenya Demographic and Health Survey
KNBS	Kenya National Bureau of Standard
MOH	Ministry Of Health
NCI	National Cancer Institute
NGOs	Non-Govenement Organizations.
PCC	Palliative Care Center
PSA	Prostate-Specific Antigen
RH	Reproductive Health
SDG	Sustainable Development Goal
SPSS	Statistical Package for Social Sciences
UNICEF	United Nations Children Funds
WHO	World Health Organization

DEFINITION OF KEY TERMS

Cancer Incidence	The number of new cases of cancer diagnosed in a specific population during a particular time period. Cancer incidence rates help identify trends and patterns in the occurrence of cancer within a population.
Cancer Registry	A systematic collection of data on cancer cases, typically maintained by hospitals or health departments. Cancer registries are essential for tracking cancer incidence, survival rates, and trends over time.
Level Five Hospital	In Kenya, Level Five hospitals are regional referral hospitals that provide specialized health services, including diagnostics, treatment, and specialized care. They serve larger populations and offer more comprehensive medical care than lower-level facilities.
Mortality Rate	The number of deaths from cancer (or other causes) within a specific population and time period. Cancer mortality rate is a measure of the frequency of deaths due to cancer in a given population.
Non-Communicable Disease (NCD)	A type of disease that is not caused by infectious agents and cannot be transmitted from person to person. Cancer is a prominent non-communicable disease, along with others like heart disease and diabetes.
Prevalence	The total number of cases of cancer present in a population at a specific time. Cancer prevalence provides insights into the burden of cancer within the population.
Screening	The process of testing for cancer in individuals who do not yet show symptoms. Screening aims to detect cancer at an early stage, when treatment is more likely to be successful.
Trend Analysis	The process of collecting and analyzing data over time to identify patterns, directions, or tendencies. In the context of cancer incidence, trend analysis helps determine whether the number of cases is increasing, decreasing, or remaining stable over time.

CHAPTER ONE: INTRODUCTION

1.1 Background information

Cancer is an abnormal division of cells without control, thus invading other tissues. It's a combination of different diseases but named according to organ/site or the cell they originate from (Ministry of Health, 2013). Four major categories can be used to categorize the root causes of cancer: (1) genetics; (2) biological factors, such as age, sex, and nutritional status; (3) lifestyle choices that lead to overweight and obesity, such as binge drinking excessive amounts of alcohol, smoking cigarettes, and not exercising (Mbugua et al., 2021). The fourth category includes environmental factors such as exposure to carcinogens like asbestos and aflatoxins, radiation from UV rays and ionization to viruses like HIV, HEPATITIS B and C, EBV, parasitic infections, and bacterial infections (MOH, 2017).

With 18.1 million new cases of cancer in both genders each year, it is the second most prevalent cause of mortality globally (IARC, 2018). In 2018, 9.6 million of these deaths were pointed out. An estimated 14 million additional instances of cancer worldwide died and suffered from morbidity in 2012 (Panajotović et al., 2022). This reflects the true picture of the increasing mortality and morbidity caused by cancer over the years if the trend continues. According to the Ministry of Health (2013), 7.6 million, or 13% of the total fourteen million fatalities, took place in 2008. According to MOH (2017), cancer is the second-leading cause of death worldwide, accounting for 8.8 million deaths in 2015. The majority of these deaths—70%—occur in nations with low or middle incomes, like Kenya. Lung cancer accounts for approximately 18.4% of all cancer deaths, leading both in terms of sex and incidence (11.6% of all cancer cases). carcinoma of the breast is the second-most common cancer type at 11.6%, followed by colorectal cancer at 10.2% and prostate malignancies at 7.1%. Cancer of the colon ranks second in terms of death from

cancer with a percentage of 9.2, followed by carcinoma of the stomach in third place with 8.2% and cancer of the liver in fourth place with 8.2%.(Bryan and others, 2018).

In the United States, cancer affects 14.9 and 16.4 out of every 100,000 children under 15 and 20 years old, respectively. In developed countries, cancer ranks as the fourth most prevalent cause fatalities among children under the age of fifteen. The most common cancer in children is leukemia (Panajotović et al., 2022). In Africa, the cancer burden estimates in 2008 were 618,000 new cases with 512,000 resulting in death. If this trend continues the estimates by the year 2030 will be at 1.27 million new cancer incidences in the continent of Africa with 970,000 resulting in death(Maina, 2014). Yearly there are about 600,000 cancer mortality cases in Africa(Faso et al., 2007)In Kenya third principal cause of mortality is cancer with infectious diseases and related cardiovascular conditions being first and second respectively(MOH, 2017).

There are almost 37000 new number of cases due to cancer every year in our country Kenya with an estimation of 28000 and more of these cases dying every year(MOH, 2017). According to A Korir et al. (2014), there were 41,000 individuals diagnosed with cancer in 2012, of which 28,453 were life-threatening. A Korir et al. (2014) reported that the yearly cancer incidence rate for men was 167.2 per 100,000 men and 196.6 per 100,000 women.

Prostate cancer accounts for 606 instances of cancer diagnoses among men between 2004 and 2008; cancer of the esophageal tract accounts for 333 cases. With 1154 cases, cancer of the breast was the most common tumor diagnosed in women between 2004 and 2008; 1053 cases were of cancer of the cervical cavity. Cervical or cancer of the breast accounted for 44% of all cancer cases in females, as reported by Wambalaba et al., (2019).

1.2 Statement of the Problem

Globally With almost nine million cases in 2018, malignancies is the second most prevalent cause of mortality globally, corresponding to the IARC (2018). Additionally, it is responsible for 18.1 million cases that emerge annually in both genders. In Africa, the annual rate of cancer incidence is 7.3% of mortality and 5.8% of morbidity. It puts a tremendous strain on Kenya's healthcare system. According to statistics, the incidence of cancer is rising, which is causing a rise in the rates of morbidity and death for both men and women who are of reproductive age. Nearly 37,000 new cases of cancer are identified in Kenya each year, with over 28,000 cases dying from the disease (MOH, 2017).

According to statistics, cancer claims the lives of fifty Kenyans each day (GOK, 2011b). Between 2004 and 2008, there were approximately 41,000 cases reported; 28,453 of these instances resulted in death (Wambalaba et al., 2019). According to A Korir et al. (2014), the number of cases is 167.2/100,000 for men and 196.6/100,000 for women; as a result, both Kenyan society and the global community suffer economically. To better handle and manage the deadly illness, Kenya, a mid-income country, recently passed the Cancer Control and Prevention Act 2016 and developed the National Cancer Control Strategy, 2017–2022 (Odipo et al., 2024). The high expense of communicable diseases to the government and the medical system (Gouda et al., 2019) means that cancer in Sub-Saharan Africa does not receive the attention it merits. In Kenya, cancer is a serious health problem. The absence of extensive cancer registries makes it difficult to plan, manage, and implement preventive programs at the federal and local levels (Kenya Network of Cancer Organizations, 2014). It is difficult to control and manage cancer if one does not have complete information about the prevalence and mortality rates of the disease in Kiambu County. In order to accomplish the objectives of the National Cancer

Control Strategy, all 47 counties must be involved, as well as leadership from all levels of our medical systems.

1.3 Study Justification

In Kenya, cancer is on the rise. However there is low cancer awareness, inadequate equipment's to aid in the treatment of cancer, few health facilities to mitigate cancer, few cancer specialist and surgeons, a high cost of treating cancer, and the responsibility is of cancer-treating facilities very wanting at the county level(GOK, 2011b). The establishment of cancer data on distribution in terms of age, gender, and causative factors at the Kiambu county level will aid in cancer awareness and the development of an adequate cancer treatment center at the county level. The study will also help realize one of Kenyans BIG FOUR AGENDA which is "Achieving universal health care"(Gitongakaruro et al., 2018). The study will help establish comprehensive Statics on cancer incidence and mortality in Kiambu County. These statistics are essential in enhancing better planning and financial budgeting and allocation of resources towards cancer control and management. Comprehensive statics at the county level (Kiambu County) will also enhance better planning, management and introduction of preventive programs at this level. Establishment of a Kiambu cancer registry will be essential for policymakers, health care institutions, the public as well as fellow researchers 40% of all types of cancers are preventable through lifestyle changes such as having healthy eating habits, physical exercise, having environmental friendly activities, and controlling tobacco smoking. Prevention is always better than cure and if this would work it would provide a long-term solution that is cost-effective and time-friendly to both Kenyans and their health system (Hernández Vargas et al., 2021).

Cancer is one of the leading causes of mortality in Kenya and poses a significant public health challenge. With an increasing number of cases nationwide, understanding local

trends in Kiambu County helped in identifying regional patterns and guiding targeted interventions. While national cancer statistics are available, there is limited data on specific counties like Kiambu. Local data from Kiambu and Gatundu Level Five hospitals provided valuable insights into the cancer incidence trends in this area, helping to address gaps in knowledge that are essential for effective healthcare planning. With accurate estimates of cancer incidence trends, healthcare authorities can make better-informed decisions on resource allocation. Understanding whether cancer cases are increasing or stabilizing can inform how resources are directed, particularly in terms of staffing, equipment, and facilities for cancer diagnosis and treatment. Regional data on cancer incidence trends can support the formulation of localized health policies and initiatives, complementing Kenya's national cancer strategy. The study findings advocated for new policies aimed at reducing cancer risk factors, such as addressing environmental, lifestyle, or occupational health concerns specific to the Kiambu County context. Finally, this study served as a foundation for further research on cancer in Kenya, particularly within Kiambu County. It may prompt future studies on cancer risk factors, treatment outcomes, patient demographics, and longitudinal analyses to better understand the disease burden over time.

1.4 Study Objectives

1.4.1 Broad objective

To Estimate the trend of cancer incidence in Kiambu and Gatundu Level Five Hospitals Kiambu County Kenya 2013-2017.

1.4.2 Specific objectives

1. To determine the distribution of cancer by sex in Kiambu and Gatundu Level Five Hospitals Kiambu County Kenya 2013- 2017.

2. To determine the distribution of cancer by age in Kiambu and Gatundu Level Five Hospitals Kiambu County Kenya 2013-2017.
3. To determine the association of alcohol and cigarette smoking to cancer in Kiambu and Gatundu Level Five Hospitals Kiambu County Kenya 2013 -2017.

1.5 Research questions

1. What is the distribution of cancer by sex in Kiambu and Gatundu Level Five Hospitals Kiambu County Kenya 2013- 2017?
2. What is the distribution of cancer by age in Kiambu and Gatundu Level Five Hospitals Kiambu County Kenya 2013-2017?
3. What is the association of alcohol and cigarette smoking to cancer in Kiambu and Gatundu Level Five Hospitals Kiambu County Kenya 2013-2017?

1.6 Rationale

The investigation was carried out in two major hospitals in Kiambu County: Kiambu Level Five Hospital and Gatundu Level Five Hospital. Because both of these hospitals provided medical care services to a large proportion of the county's population, they were chosen despite their locations and proximity to adjacent counties, which included Muranga County to the north and northeast, Nairobi and Kajiado counties to the south, Machakos County to the east, and Nakuru County to the west of Kiambu. It was also likely that patients receiving care in neighborhood community-based facilities would be referred to or receive their primary care at one of both of the hospitals.¹

1.7 Significance of the study

By examining cancer incidence trends in Kiambu County, this study provided specific insights into the prevalence and increase or decrease of cancer cases in the region. This localized understanding allows healthcare providers and policymakers to tailor their

responses to the unique needs of Kiambu County's population. The study results guided the development of regional and national cancer prevention programs. By understanding the cancer burden at a county level, policymakers can create policies that focus on reducing cancer risk factors, promoting healthy lifestyles, and ensuring access to timely care. Publishing and disseminating the findings increased public awareness of cancer trends in Kiambu County. Awareness campaigns informed by local data can educate communities on cancer prevention, early signs, and the importance of regular screenings, fostering a more proactive approach to health. By aligning with Kenya's national cancer control strategy, this study supported broader goals of reducing cancer incidence and mortality rates. The findings provided county-level data that complements national efforts, helping to close gaps in Kenya's overall cancer data and strategy implementation. This study underscores the importance of maintaining accurate, comprehensive health records. As a result, it may lead to better data management practices in Kiambu and Gatundu hospitals, enhancing cancer surveillance systems that contribute to long-term cancer monitoring and research.

1.8 Limitations of the study

1. This study used data from only two hospitals (Kiambu and Gatundu Level Five Hospitals), which may not capture the full picture of cancer incidences in Kiambu County. Some residents may seek treatment outside these facilities or not seek treatment at all, leading to an underestimation of cancer incidence.
2. Cancer registries and medical records in resource-limited settings can suffer from incomplete or inaccurate documentation due to various factors, such as understaffing, limited training, or system inefficiencies. Missing or incorrect data can affect the reliability of trend estimates.

3. Using patient data comes with ethical considerations and limitations related to patient privacy and consent. Some data may be excluded or anonymized to protect patient privacy, which could limit the depth of demographic and clinical information available for analysis.

1.9 Delimitation of the study

1. This study was delimited to data from Kiambu and Gatundu Level Five Hospitals in Kiambu County, Kenya. It does not include data from other hospitals, clinics, or healthcare facilities in Kiambu County or nearby counties, which may serve different patient populations.
2. The study focused specifically on a five-year period between 2013 and 2017. Trends in cancer incidence outside of this period were not analyzed, which limited the study's ability to identify longer-term trends in cancer incidence in Kiambu County.
3. The study relied on existing hospital records and cancer registries maintained by Kiambu and Gatundu hospitals. It didn't involve primary data collection (such as patient interviews or surveys) or external data sources like national cancer registries, which could provide a broader context.

CHAPTER TWO: LITERATURE REVIEW

2.1 Incidence of cancer

Cancer is becoming a great burden to the world and especially the third world countries like Kenya. This is associated with lifestyle behaviors' which lead to cancer like the use of tobacco and alcohol. Globally cancer incidence is at 18.1 million new cancer cases with a figure of 9.6 million cases resulting to death in 2018 (IARC, 2018). A large number of 7.6 million mortality cases accounted for 13% of all mortality rates in the year 2008, 70% of these mortality cases were found in low earning and middle earning

countries. 13.1 million deaths are likely to occur by 2030 if the trend continues (Ministry of Health, 2013)

In the globe, cancer ranks as the second-leading cause of death, with up to 8.8 fatalities reported in 2015. It comes in second place among non-communicable diseases, accounting for 7% of fatalities in the country, after stroke and heart disease (GOK, 2011a). Forecasts for the number of cancer cases in Africa in 2012 were 14 million, of which 8 million resulted in mortality. If this trend continues the estimates by 2030 will be at 22 million new cancer incidences in Africa with 13 million resulting to death, 70% of this incidence rates and 60% of cancer deaths were found in low and middle regions (Dent et al., 2017). After infectious diseases and heart disease, coronary artery cancer is the third leading cause of mortality in Kenya, with 37,000 yearly deaths from cancer-related causes and 27,000 from single cases (MOH, 2017). Cancer of the lungs is the most common cause of death from cancer in both men and women. Prostate tumors rank fourth with 7.1%, colon cancer ranks third with 10.2%, and cancer of the breast ranks second with 11.6% of cases. Cancer is the leading cause of cancer-related deaths, accounting for 18.4% of the deaths caused by cancer. Cancer of the colon ranks second in terms of deaths caused by cancer, making up 9.2% of all deaths caused by cancer, according to Bray et al. (2018). Gastrointestinal cancer comes in third place with 8.2%, followed by liver cancer in fourth place with 8.2%.

Ninety thousand children under the age of fifteen die from cancer every year, out of 160000 instances newly diagnosed worldwide. In the United States, cancer affects 14.9 and 16.4 out of every 100,000 children under 15 and 20 years old, respectively. Cancer during childhood is among the top four causes fatalities among individuals under the age of fifteen in advanced nations. Leukemia is the most prevalent cancer in children (WHO, 2009).

According to GLOBOCAN cancer is a killer disease more than malaria. About 635,400 Africans died due to cancer in 2015 which was 60% higher than malaria deaths if this trend continues there will be new cancer cases adding to a total of 1.4 million and 1 million deaths up to by the year 2030 in Africa. However, comprehensive data on both incidence and mortality remain absent because, as of 2014, malignancies databases compliant with the International Agency for Research on Cancer (IARC) covered only a small portion (2%) of this continent's population density. Consequently, the complete picture remains unclear, despite indications that certain cancers may have been neglected (Dent et al., 2017). Due to the above shortcomings, there is a need for the African governments, their health systems, and the international community to address this deadly disease called cancer with urgency by first establishing cancer registries with complete and coherent information and this including Kenya and Kiambu County to be specific (Okyere et al., 2023).

2.1.1 Incidence of breast cancer

Among the many illnesses that cause it, cancer is the primary cause of death worldwide. Eight million people died from cancer worldwide in 2008; by 2030, that figure is expected to increase to eleven million (Shamsi et al., 2021). Cancer of the breast, which is more prevalent in women, is one of the main causes fatalities for women. While cancer of the breast is a global issue, certain regions have higher rates of incidence, which have been linked to exposure levels and other known risk factors (Melvin et al., 2016). Early screening of breast cancer can play a vital role in preventing a majority of premature deaths, but the cost of diagnosis, side effects of treatment do have a disadvantage on the screening method. Better risk-free techniques that are tailored to individual breast cancer screening programs can benefit from a better grouping of women according to their various risk factors for breast cancer (Momenimovahed & Salehiniya, 2019).

At 140 out of every 184 nations, carcinoma of the breast is among the most prevalent kind of cancer globally. Lung cancer accounted for the vast majority of cancer-related fatalities in 2018, as reported by Sankaranarayanan et al. (2011). Breast cancer ranked second globally in terms of complications cases with 2088849. This accounted for 11% of the cases in all age groups. Cancer of the breast ranked in fourth place in terms of fatality cases, with over 626679 cases. Africa has seen an increase in the prevalence of breast cancer (Mong'are et al., 2023).

In 2018 Africa experienced a drastic rise of breast cancer cases by 27.7% which was 1.5 times more as compared to prostate cancer. The majority of the sub-Saharan nations have put more focus on combating and eliminating communicable diseases which are very common in the region (Ba et al., 2020). less focus has been put on non-communicable diseases hence the increasing number of breast cancer cases. This has led to a less focus on breast cancer screening which is a good preventive measure as compared to treatment which has overburdened the majority of these nations when it comes to financial matters. Low living standards, early treatment initiation, and delayed breast cancer screening have all been linked to higher rates of illness and death in Africa (Gebremariam et al., 2019). Africa's survival rate is 53% in low- and middle-income countries and 85% in developed countries (Antabe et al., 2020). Because they have access to early diagnosis programs, more effective therapies, a higher standard of living, and advanced technologies like mammography, which strengthens early detection of breast cancer, high-income countries have higher survival rates. This isn't the case in nations with low or middle incomes, where mammography examination services are either hard to come by or very costly when they are (Tompkins et al., 2016).

Late-stage diagnosis, a lack of high-quality and adequate medical services, and inadequate medical care are just a few of the numerous factors contributing to low rates

of survival in sub-Saharan Africa (Antabe et al., 2020). 33.7% of women with cancer were diagnosed at stage 2, 21% at stage 4, 29.7% at stage 3, and 7.4% at stage one, according to a study done at Kenyatta National Referral Hospital, the largest referral hospital in East Africa (Antabe et al., 2020). A thorough grasp of the regional and national variations in cancer detection and screening is necessary to promote a greater adoption of the procedure in sub-Saharan Africa (Abuidris et al., 2013). The World Health Organization estimates that 5,884,000 years of life were lost globally in 2004 as a result of cancers of the breast. In developed nations, the number of cases of cancer of the breast has been steadily declining and staying stable (Forae et al., 2014). This hasn't been the case in emerging economies, where the incidence of cancer of the breast has increased. Azubuikwe et al. (2018) estimated that in 2015, breast cancer was assumed to be the cause of 25% of new cancer cases and 15% of cancer-related fatalities among women of reproductive age (Kinyao & Kishoyian, 2018).

2.1.2 Incidence of prostate cancer

Among the prevalent cancer being diagnosed among males, prostate cancer was ranked number two globally. Prostate cancer led to 13.5% of all cancer deaths among males in the year 2018. In contrast to other races, black males experienced these deaths more frequently (Wachira et al., 2018). Cancer of the prostate is the leading cause of mortality for men in the Caribbean and sub-Saharan Africa. In Kenya, prostate cancer is the leading cause of death for men, and the disease is nearly always found in its later stages, when rehabilitation is most difficult. This has been connected to challenges facing prompt diagnosis and treatment, as well as a lack of adequate and exceptional screening services (Wachira et al., 2018). Early detection and treatment of the condition are still essential for achieving the overall goal of preventing cancer of the prostate.

According to research, cancer of the prostate may not always present with symptoms; therefore, early detection is essential to reducing morbidity and death (Yeboah-Asiamah et al., 2017). Preventive screening services must be improved, particularly for the high-risk population. Since men between the ages of 40 and 69 are the most susceptible to cancer of the prostate, it is important to make sure that they receive regular screenings (Yeboah-Asiamah et al., 2017). Low rates of detection of cancer of the prostate have been found in several sub-Saharan African studies. The rising number of cancers of the prostate deaths is a result of this combined with inadequate screening services (Ojewola et al., 2017). For instance, in an investigation carried out in Nigeria, only 10.2% of the men population has had prostate cancer. In Ghana only 10% of the men population have been screened on prostate cancer similar results were obtained in Uganda where only 2.6% of the men population reported to have sought prostate cancer screening (Cobran et al., 2014).

In Kenya, as in most of Africa, there is still very little knowledge about cancer of the prostate screening. Merely 2.4% of the male participants in a community-based survey carried out in Kenya had undergone screening for prostate cancer. In a similar study conducted in the capital city of Kenya, only 4.1% of participants said they had had a cancer of the prostate screening (Antabe et al., 2020).

Men between the ages of 40 and 69 are required to undergo screening for cancer of the prostate in Kenya, with an emphasis on informed shared decision-making (Antabe et al., 2020). Cancer of the prostate screening rates are still low, though. Cancer screening for prostate cancer uptake is still low in Kenya and throughout Africa, despite a number of current initiatives aimed at raising awareness of the illness (Moses et al., 2017).

Globally, the first evaluation of cancer of the prostate occurs at age 66, and both the mortality rate and the prevalence are associated with advanced age. When compared to

white men, African American men have an augmented occurrence of cancer of the prostate (Villers & Grosclaude, 2017). The mortality rate of African-American males is twice compared of that of white males. This has been noted whereby out 158.3 new cases diagnosed per 100000 males are African American males(Villers & Grosclaude, 2017). The difference for this scenario has been linked to environmental factors, social factors, and finally genetic factors (Kemper et al., 2022). According to Price et al. (2012), there is an expectation that by 2040, the number of incidences of cancer of the prostate will surpass 2,293,818, which will result in a rise in rates of mortality. Prostate cancer presents with asymptomatic symptoms however in the late stages, patients may present with the following symptoms including; urination difficulty, increased urge to urinate, and nocturia. In the advanced stages of prostate cancer, patients may present with severe back pain and urine retention necessitating the need for medical intervention(Price et al., 2012).

Prostate-specific antigen, a glycoprotein found in prostate tissue, has historically been used as the main marker for cancer of the prostate detection due to its elevated level. Obesity males also tend to have an elevated level of a prostate-specific antigen, therefore there is a need to have tissue biopsy examination to correctly define the true positives(Tarapore et al., 2014). The use of tissue biopsy is the standard procedure to truly confirm that a patient has prostate cancer. A sedentary lifestyle and inadequate physical activity are major factors in the onset and progression of prostate cancer, according to investigations carried out globally. Tarapore et al. (2014) discovered a link between poor eating habits and racial disparities in cancer of the prostate incidence globally.

A number of investigations have also looked for particular genes implicated in the mutation that causes cancer of the prostate. To distinguish between genetic mutations

and environmental factors that contribute to the development of these mutations, a comprehensive analysis of epidemiological studies of cancer of the prostate and the impact of specific risk factors is required (Price et al., 2012). A better understanding of the mutations that cause cancer of the prostate and the risk factors associated with them will surely aid in the development of the most effective preventative measures mechanism, which includes more efficient and timely screening vaccinations and other preventative measures (Rosser et al., 2015).

2.1.3 Incidence of gastric cancer

Cancer of the stomach is the fourth most common cancer globally and ranks second in terms of cases of mortality associated with cancer in the twenty-first century. It was a growing public health concern and a threat to humanity a century ago (Lodenyo, 2017). Over 938000 of the estimated 999000 people diagnosed with cancer of the stomach globally each year are expected to die as a result of their diagnosis (Lodenyo, 2017). Gastric cancer has been associated with the highest cancer burden, especially when considering years of life lost as a result of disability-adjusted.

Gender differences exist in the morbidity rates of gastric cancer, as do regional variations worldwide. In numerous nations, men have a two to three times higher risk of stomach cancer than women do. Except for Africa, in which there has been a spike, several parts of the world have seen a decline in the number of cases of stomach cancer. Although stomach cancer rates have declined in other parts of the world, *Helicobacter pylori* infections have been connected to the stagnation of stomach cancer in western nations. Sylla and Wild (2012) found that while the prevalence of this bacteria has been decreasing in developed countries, it has been increasing among less developed ones.

90% of the reported gastric cancer has been linked to adenocarcinomas which arise from the top layer of the stomach lining. However other cancers have developed and especially

from the lymphoid tissue lymphoma which instigates from lymphoid tissue of the stomach and leiomyosarcoma which arise from the muscles that surround the mucosa. Two types of adenocarcinoma have a different appearance in terms of histological appearance, age at the time of diagnosis, gender ratio, and finally in epidemiological patterns (Cavaleiro-Pinto et al., 2010). The main causes of cancer of the stomach are thought to be *H. pylori*-induced persistent gastritis, intestinal metaplasia, and atrophy. Research conducted over the last thirty years has demonstrated that *H. pylori* is the main cause of cancer of the stomach (Asombang et al., 2014). Inadequate management of *H. pylori* can result in gastritis, intestinal metaplasia, and ultimately an intestinal tumor (Asombang et al., 2014).

There are regional and cultural disparities in the incidence of stomach cancer. Eastern and central Asia, as well as Latin America, have continuously had very high incidences. According to Rawla and Barsouk (2019), the overall rate of cancer of the stomach is higher in men (32.1 per 100,000) than in women (5.6%). However, in the east and north of Africa, there are only 4.7 cases of cancer of the stomach diagnosed per 100,000 males each year (C. Y. Wu et al., 2010). Korea has the greatest incidence of cancer of the stomach, with an estimated 60 cases per 100,000 newly diagnosed per year among men. Nonetheless, Korea still has the lowest incidence rate of stomach cancer, with 25 cases per 100,000 women (Hamashima et al., 2018).

The elevated rate of associated with cancer morbidity has been associated with the persistently high rates of stomach cancer-related fatalities in Latin America and eastern and central Asia. This has been linked, especially in developing nations, to low rates of survival and inadequate treatment. In ten countries around the world, male cancer of the stomach mortality is the most prevalent among oncological related causes of death; most

of these deaths occur in eastern and central Asian countries. Still, in four countries, it is the leading cause of death for women (Kushi et al., 2012).

Most published studies on the prevalence of cancer of the gastric in Africa use modeled studies, which frequently only use cancer records from the relevant institution to approximate the data rather than taking into account published and unpublished literature (Danwang & Bigna, 2019). Most African countries have a number of problems, the most significant of which is the way the cancer registry is updated, which often leads to predicts of the incidence of cancer of the stomach that are not accurate. The estimation of projected cancer of the gastric prevalence often presents a misleading picture of the continent's stomach cancer cases because non-transmissible illnesses and helicobacter pylori account for twice the burden of stomach cancer in Africa (Machlowska et al., 2020).

2.1.4 Incidence of cancer of the cervix

Globally, cancer of the cervical gland is the most prevalent cause of death and has been on the rise, particularly among women who are fertile. According to Nyangasi et al. (2018), there were over 526000 instances of cervical carcinoma diagnosed worldwide in 2015, accounting for 239000 deaths due to the disease. Most of these fatalities and cases of morbidity take place in sub-Saharan Africa. The majority of those with disadvantages has low cervical survival rates for cancer, which have been related to subpar health systems, low educational attainment, and low knowledge of screening for cervical cancer services. Despite research on the disease, human papillomavirus, a sexually transmitted infection, is the main cause of cervical cancer in women of reproductive age. However, other factors may also be involved (Wamburu et al., 2016).

Over 99000 instances of carcinoma of the cervical cavity were diagnosed in 2012, and the disease was responsible for over 57400 deaths. Cancer of the cervical cavity is

becoming more common in sub-Saharan Africa, which is an important issue for the public (Gatumo et al., 2018). It's projected that, in sub-Saharan Africa, 90% of the annual global deaths related to cervical cancer will be revealed by the year 2030 (Rosser et al., 2015). This has been linked to increased risk factors such as social-economic evolution, growth, and aging. Moreover, behavioral markers and STDs play a significant role in the human papillomavirus's spread, which has also significantly raised the rate of HIV infection in the sub-Saharan region (Rosser et al., 2015).

The primary factors contributing to the development of cervical cancer in sub-Saharan Africa have been determined to be low vaccination uptake and coverage rates, as well as low screening coverage for cervical cancer services. Less developed nations have higher rates of cancer of the cervical cavity, but it is also easily curable and preventable if caught in time. In advanced nations such as the United States, the prevalence of cervical carcinoma is incredibly low (Khozaim et al., 2014). This has been linked to the existence of efficient health systems, easy access to screening programs, high rates of vaccination, and affluent demographics. There is still more to be done to safeguard the vulnerable groups who are most at risk for contracting cancer of the cervical cavity, even though efforts to combat the disease are increasing in developing countries (Masika et al., 2015). Cervical cancer is the second most prevalent type of tumor among women after cancer of the breast, but it is still the leading cause of death for women in Kenya. The Nairobi Cancer Registry states that in 2016, 2354 women were confirmed to have cervical carcinoma, and 65% of them died as a result of the illness, despite the fact that there is insufficient data on the number of cases in Kenya. A recent study from the Kenya Demographic Health Survey found that only 14% of women between the ages of 30 and 49 ran for treatment for cancer of the cervical cavity (Morema et al., 2014).

Despite the establishment of the national cancer of the cervical cavity prevention strategy plan by the Kenyan government, the plan's implementation has not yet begun. Nonetheless, a number of studies on the adoption and awareness of testing for cervical cancer in Kenya's major cities have been carried out; however, few of these studies have specifically addressed these topics, particularly at community level (Gichangi et al., 2013).

2.1.5 Incidence of lung cancer

The cancer of the lungs has been among the cancers most prevalent worldwide for a number of years. In 2012, there were approximately 1.8 million cases of cancer of the lungs reported globally. 58% of these cases have occurred in less developed countries. Lung cancer remains the most prevalent kind of cancer among men, with over 1.2 million cases reported globally (Gaafar, 2017). According to Pinkler et al. (2015), the highest recorded rates of diagnosis for these cases have been found in males in northern America (33.8%), followed by those in northern Europe (23.7%), and those with the lowest rates in western (1.1%) and middle (0.8%) Africa. In developing nations, lung cancer is the most prevalent cancer in men and the third the majority common in women. Cancer of the lungs, among other cancers, is the primary cause fatalities globally, resulting in 1.59 million deaths per year (Winkler et al., 2015). The main causes of lung cancer are smoking, using a waterpipe, smoking, and not having any programs in place to regulate tobacco use. East Africa saw 32,640 new cases of lung cancer in 2015; if preventative efforts are not implemented in a timely manner, the incidence is expected to increase. In actuality, over 70% of cases of lung cancer occur in low- and middle-income countries. By 2040, there will be 29.5 million cases of lung cancer worldwide, according to WHO estimates (Winkler et al., 2013). Of those cases, 16.5% will result in cancer-related deaths. Less drastic measures are required to stop cancer of the lungs from taking more

lives than anticipated. Cancer of the lungs is the most prevalent cancer globally, with over 11.6% of cases receiving a diagnosis (Lubuzo et al., 2020). 18.4% of deaths caused by cancer are attributable to lung cancer, with breast cancer coming in second at 11.6%, cancer of the prostate coming in at 7.1%, and cancer of the colon at 6.1% (Sylla & Wild, 2012).

For example, in 2018, China reported over 774,323 instances of cancer, with 690,567 recorded deaths from the disease in that same year, with lung cancer accounting for half of those deaths. In Africa, cancer of the lung ranks fourth in terms of incidence, especially among men. According to Watts et al. (2017), there are an estimated 39,300 lung cancer cases and 37,700 lung cancer-related fatalities worldwide.

2.2 Distribution of cancer by sex

Worldwide, men are 20% more probable than women to develop any form of cancer. However, the incidence of cancer in sub-Saharan Africa is almost twice that of men because women are tasked with raising 60–70% of the food collected from small-scale farming and for raising children. (Dent and others, 2017) The primary cause of passing away for both men and women is cancer of the lungs.

When all cancers are combined, the incidence of these diseases in economically developed nations is twice as high for both males and females. Just 21% of males and 2% of females in developed nations die from all cancers combined. However, colorectal, the prostate, female cancers of the breast, and cancer of the lungs are approximately 2–5 times more common in developed nations due to multiple risk factors and diagnostic procedures (Jemal et al., 1999). Cancer of the lungs accounts for 11.6% of all cancer cases, with breast cancer (11.6%), colon cancer (10.2%), and prostate tumors (7.1%) following in order of incidence. It accounts for about 18.4% of cancer-related deaths and is the most prevalent cause fatalities for both sexes. According to Bray et al. (2018),

cancer of the colorectal ranks third and fourth, respectively, with 8.2% and 8.2% of cancer-related deaths, while stomach and cancer of the liver rank third and fourth, respectively. Prostate cancer is the second most common cancer, accounting for 490,000 cases, but it ranks third in industrialized countries with 759,000 cases.

In less urbanized countries among men, the leading cancer is that of lungs with 751,000 incidences out of which 682,000 results in death, 462,000 liver cancer incidence and 441,000 deaths, 456,000 stomach cancer incidences out of which 362 die. These cancer incidences represent 40% of all new incidences and about 48% of all deaths related to cancer. Breast carcinoma affects women more often in developed than in developing nations; in developing nations, the incidence of cancer of the breast is 883,000, with 324,000 deaths, compared to 794,000 in developed nations. Cancer of the cervical cavity, on the other hand, is ranked second among women in nations that are developing with 445,000 incidences and 230,000 deaths, while in developed nations, it is ranked eleventh with 83,000 occurrences. Among women of developed countries cancer of the lungs is the number one cause of mortality with a number of (210,000), breast cancer is second with (198,000) deaths. There 25% cancer cases among men than among women worldwide and more especially in Africa. 20% of men and 10% of women in developed countries are more likely to die from cancer than in developing countries(Ferlay et al., 2015).

However, despite this information, there is no comprehensive data on the incidence of cancer by sex in Kiambu County since we only have a Nairobi cancer registry. In Kiambu county despite the huge cancer burden nothing much can be done without the real number in terms of health budget allocation and planning hence a huge need to establish this number both the Kenyan government, policymakers, Kenyan health system etc.

Over the past 50 years, differences in cancer of the lung incidences based on sex have emerged globally (Thomas et al., 2015). This has been noted in western nations like the US, where women are more likely than men to develop breast cancer or cancer of the lungs. Notwithstanding a discernible decrease in the prevalence of lung cancer in both sexes, there exist disparities in the incidence of lung cancer between the sexes because of an increased incidence of adenocarcinoma, which is more prevalent in young women, especially those who are of age at conception and do not smoke (Thomas et al., 2015). It has been noted that the lack of detection of lung cancer and the requirement for updated guidelines for screening are risk factors for an increase in cases of breast carcinoma among women of reproductive age. Women are more likely than men to develop cancer of the lungs due to a multitude of internal and external warning signs, suggesting that lung cancer is evolving into a more unique disease process in this population. Studies on the possible risk factors for developing lung cancer in both sexes will be essential (Barta et al., 2019).

Many risk factors, including tobacco use, have been linked to lung cancer in investigations. For example, in the United States, smoking habits have changed significantly, increasing the risk of cancer of the lungs in both genders. The majority of Americans did not start smoking until after World War II, which explains why women smoke at a lower rate than men (Fidler-Benaoudia et al., 2020). Women's lung cancer rates peaked in the 21st century, while men's smoking rates peaked in the 1980s and are currently on the decline (Fidler-Benaoudia et al., 2020).

Studies have revealed that women smoke more frequently than men do in countries that are developing. Despite this trend, nearly all of women diagnosed with lung cancer are chronic smokers, which raises serious public health concerns. Smoking behavior needs

to be addressed in order to avoid this problem and limit and control the increasing incidences in lung cancer, especially among women (Pirie et al., 2016).

Research, have further questioned are women more vulnerable to lung cancer than men due to the presence of carcinogen in tobacco despite having similar exposures. This statement has been supported by various prospective cohort studies which have been done globally. There has been conjecture, though, regarding whether female smokers may have a distinct genetic makeup from male smokers, potentially increasing their risk of developing cancer of the lungs (Barta et al., 2019). Compared to women who do not smoke, smokers have a higher profile of TP53 gene mutations; however, these results do not hold true for men. Furthermore, the GSTM1 gene, whose primary job is to deactivate toxic metabolites and foster an environment favorable for the occurrence of cancer of the lungs, is more likely to be mutated in females. Although the difference in the level and amount of smoking may exist between genders this may explain the differences between the smokers and the non-smoker's populations(Thomas et al., 2015).

Lung-related cancer diagnoses among men range from 15% to 20%, whereas women account for 50% of lung cancer diagnoses globally among nonsmokers. These inclinations have been growing. Six prospective cohort studies conducted in the United States show that among nonsmokers, women are more inclined than men to be diagnosed with lung cancer (15.2/100000 vs. 11.2/100000). Another retrospective cohort study conducted in the United States yielded similar findings. The current and growing trends in lung cancer among female people who do not smoke relative to males are among the primary factors influencing the shifting incidence of lung malignancies worldwide (Yang & Pyo, 2005).

Research has yielded concerning findings, as there appears to be a trend of cancer of the lung among women, particularly those under the age of 65. For example, a retrospective

study carried out in the United States over the past 20 years with participants of both sexes and ages ranging from 30 to 64 years found that the trend of cancer of the lung in men is declining relative to that in women (Thomas et al., 2015). This is concerning because women are now more likely than men to develop cancer of the lungs. However, it's not worrying this trend of lung cancer is also reflected in the global trends as well. Another study conducted in five countries, including Germany, New-Zeland, the UK, the USA, Denmark revealed that there is an increasing trend in lung cancer cases among women as compared to males, this trend is expected also to reflect in developing nations soon (Fidler-Benaoudia et al., 2020).

Several theories have emerged to fill the gap as to why females are more at risk of lung cancer and especially non-smokers and also women of reproductive age. This could be a result of genetic variation among the non-smoking populations. Based on studies, women with CYP1A1 gene polymorphisms have a higher chance of developing lung cancer due to DNA adducts that promote carcinogens, regardless of whether they smoke currently or not. According to North and Christiani (2013), whether a woman smokes or not, she is more probable than a man to have a mutation in the X-linked gastrin-releasing peptide receptor, which has been connected to the development of cancer of the lungs. Furthermore, women are at a higher risk of developing cancer of the lungs due to the increase in a type of cancer.

This has been connected to the EGFR and KRAS gene mutations and raised proliferation, both of which are present in the adenocarcinoma subtype. Women who do not smoke and live with men who smoke regularly make up 24% of those who have cancer of the lungs. On the other hand, insufficient information exists regarding the duration and intensity of the exposure. Another UK study that looked at the relationship between secondhand

smoke exposure and cancer of the lungs in nonsmoking women did not find any conclusive evidence. Using thermal coal for indoor cooking has been strongly associated with an increased risk of cancer of the lungs. This might occur because coal is known to cause cancer (North & Christiani, 2013). According to an Asian investigation, women who cook primarily with coal have a 5.4-fold increased risk of developing lung cancer than women who do not use coal. Further investigation has linked the human papillomavirus and mycobacterial tuberculosis as risk factors for the development of cancer of the lung in females (Pirie et al., 2016).

Stomach cancer is one of the most widely prevalent forms of cancer in the world. Cancer of the stomach accounts for 5.7% of all cases worldwide, making it the fifth most common cancer to be diagnosed, according to the GLOBOCAN 2018 report. With 8.2% of all cancer deaths, it ranks third in terms of cause of death from cancer, behind lung, colorectal, prostate, and cancer of the breast. According to GLOBOCAN, there were 683754 cases of cancer of the stomach in men and 349947 cases in women in 2018 (Kristina et al., 2016). Eastern Asia has one of the greatest incidence rates of cancer (32.1 per 100000 in men and 13.2 per 100000 women), accounting for about 60% of cancer of the stomach cases (Arnold et al., 2015). In response to the CONCORD report, most cases of cancer of the stomach are detected in its advanced stages, and the survival rate after five years is less than 30% in most countries. A study conducted in the US, revealed men are most affected by gastric cancer as compared to women. More effort should focus on the worldwide trend of gastric cancer among sex because few studies have focused on the pattern of stomach cancer across gender (Lou et al., 2020).

According to estimates, 841,000 new cases of carcinoma of the liver are diagnosed annually, making it among the top four causes of death worldwide. Cancer of the liver is also referred to as hepatocellular cancer. (E. M. Wu et al., 2018). One of the rare cancers

that tops the nation in terms of morbidity and death rates, for instance, is cancer of the liver. Greater knowledge of the hepatitis vaccination has led to a substantial decrease in hepatocarcinoma cancer, despite the fact that viral hepatitis is one of the risk factors for hepatocellular carcinoma (E. M. Wu et al., 2018). However, the two biggest warning signs for liver cancer nowadays are inadequate nutrition and liver damage. According to Iyer et al. (2017), liver cancer is becoming becoming more prevalent in Blacks, Hispanics, and females, despite being more common in men and Asian/Pacific Islanders. Hepatocarcinoma cancer affects men more frequently than women; in fact, cases of the disease are more than twice as common in men (D. L. White et al., 2012). Many factors contribute to this gender disparity, but the primary ones are differences in metabolic factors, risk-taking habits, current therapies, and tumor biology . Even so, hepatocarcinoma cancer guidelines currently focus on high-risk populations. Data on people with non-alcoholic fatty liver disorders are insufficient (Farinati et al., 2009).

The primary issue is identifying those who are at risk because most of these individuals have undiagnosed steatohepatitis. The doctors only monitor these patients during their treatment, particularly when they are receiving treatment for other primary illnesses that are secondary to hepatocarcinoma malignancies. After the age of 60, hepatocellular cancer is more common in women (Setiawan et al., 2016). This has been linked to a decrease in estrogen levels, which stop liver cancer from spreading. Since the presence of fatty tissue is still the main cause of relentless liver disease, more research is required to identify other factors, especially the relationship between hepatocellular carcinoma and chronic fatty liver illness (Liu & Liu, 2014).

According to an additional investigation conducted in Florida using a population-based cancer survey, cancer of the lungs is the most common cancer in the US population, with adenocarcinoma being the most prevalent form (Elkbuli et al., 2020). Recent information

from the American Cancer Society estimates that there were over 234000 cases of lung cancer reported in 2018, and additional new cases totaling 228,000 were reported in the following years (Brzezniak et al., 2015). As a result, this led to 154000 deaths related to cancer in the year 2018 and 142000 deaths in the year 2019(Brzezniak et al., 2015). It was noted a majority of these cases were in females as compared to males. According to data produced by the national cancer institute surveillance, there are 63.5 deaths per 100000 men in comparison to 39.2 deaths per 100000 women of ethnic groups with cancer of the lungs(Shamsi et al., 2021). Studies have demonstrated that women are likely to survive lung cancer as compared to men. this has been linked to the associated risk factors that are likely to favor the female gender, this includes both social-economic, and individual factors. i.e race of gender, insurance status among others.

Similar findings have been revealed in a study conducted in the UK regarding sex differences in colorectal cancer incidences(Abila et al., 2021). Researchers have recognized that colorectal cancer is a disease that has both social-economical and sex disparities. Research on sex influences the occurrence of colorectal cancer can be of vital input in developing the best preventive strategies in both genders. For instance in the united kingdom, in the year 2014, there were 22,8400 cases of colorectal cancer among males as compared to females which were 18,421 cases(Abila et al., 2021). Death rates have been higher in males as compared to females across all age groups from 45 to 49 years and the gap is growing wider in the age group of 70-74 years(Abila et al., 2021). Research done have recognized that sex differences in colorectal exist in regards to the type of cancer, location of the tumor cells, and survival rate among gender. Other factors such as behavioral factors, awareness of these risk factors, and lifestyle factors do play a vital role in enhancing the risk of getting colorectal cancer.

2.3 Distribution of cancer by age

In Children from 0 to 14 years, the second mortality cause is cancer and about 1180 of these children will die in 2018. The incidence rate of cancer in 2018 in ages 60-79 is 53%, 22.8% ;0for 40-59, 19.4% for 80% and above and 4.7% for below 40 years. The more age progresses of a certain age group the greater the risk of contracting cancer. Prostrate and uterine cancer is more in people aged 60-79, cervical and thyroid cancer is more in ages 40-59 years. Lung, pancreas, liver, breast cancer incidence rates go up as age progresses these cancers are also not common in people 40 years and below(Facts, 2018).

Given that age is now defined as the total number of unit time, age is now utilized as a virtual variable in all studies pertaining to cancer epidemiology, making it the most researched social demographic information risk factor for the various instances of cancer that have been reported. Investigations have categorized malignancies as associated with age illness because the incidence of cancer cases improves with age.This has been found to occur most noticeably in midlife (M. C. White et al., 2014). The process of growing older is known as aging, and age itself can be viewed as a proxy for the intricate processes connected to aging. As a result, growing older has long been thought to be a natural process, and developing malignancies does not always follow from aging (M. C. White et al., 2014). Most of the biological processes that control aging may also have a role in the etiology of diseases associated with aging, such as cancer. This is only possible if the environmental variables that do negatively impact the biological mechanism are changed, aging can be slowed down, and tumors can be postponed, eventually controlled, and avoided. (Holman et al., 2014).

A person's lifetime risk of being diagnosed with a particular type of cancer varies. According to a US study, the cumulative risk of all cancers combined rises with age until

it reaches age 70, at which point it somewhat declines. For example, the probability of receiving a cancer diagnosis has been projected to be 41% in the US population. Many older adults have been observed to live to an advanced age without having a cancer diagnosis. According to Bunnell et al. (2012), cancer is not an uncommon cause for mortality or morbidity in adults over 90.

According to their research, individuals 65 years of age or older accounted for slightly over half of all instances of cancer diagnosed in 2009 (Meisner, 2012). Since the baby boom generation was born after World War II, it is anticipated that the shape of this curve will gradually change to reflect an increased number of instances of cancer diagnosed at older ages (Sabia et al., 2012). Forecasts indicate that between 2010 and 2030, there will be a 45% rise in the total number of cases associated with cancer. The growing number of older adults in society is thought to be the cause of this increase. By 2030, it is predicted that 70% of cancer cases globally will involve adults 65 years of age or older (Sabia et al., 2012).

Therefore, rather than depending solely on treatment, there is a need to focus more on possibilities for primary prevention. The basis for long-term health and longevity is laid by midlife health. Additionally, some well-known warning signs for cancer and various other diseases peak in midlife (Anderson et al., 2012). Age serves as a time marker that records the length of time exposed and the build-up of cancer risk. Eighteen signs of aging have been identified. This includes changes in epigenetics and genomic instability, which are also characteristics of cancer (Prasad et al., 2012).

In Africa, cancer is a growing health issue that requires appropriate attention to control rising incidence and mortality rates. According to some estimates, aging and increasing population will cause a 70% increase in cases of new cancer by 2030 (Hamdi et al., 2021). Despite the fact that the death rate from cancer is currently higher than the combined

deaths from AIDS, TB, and malaria, not enough is being done in Africa to combat the disease. This may be related to the fact that many resources are being allocated to studying transmissible illnesses that are rife in Africa, with less attention being paid to the problems presented by a number of noncommunicable illnesses like cancer (Corbex et al., 2014). Notably, the lack of facilities and the rising cost of cancer treatment are expected to contribute to a spike in cancer-related fatalities in Africa. According to Katsidzira et al. (2019), there is an anticipated 30% increase in cancer mortality rates in Africa over the next 20 years compared to the global average. Cancer is a genetically transmitted disease that interacts with other risk factors to ascertain a person's risk, according to Hamdi et al. (2021).

A study carried out in East Africa found that cancer of the cervical cavity is the most prevalent cause of mortality and morbidity for women in low- and middle-income countries. In east Africa, cancer of the cervical cavity is the leading cause of cancer-related death and morbidity, with an incidence rate of upwards of 40 cases per 100,000 people (Banjo & Akinyemi, 2018). Due to the serious public health concern that cervical carcinoma poses, the World Health Assembly approved an international approach in August 2020 to accelerate its eradication (Abila et al., 2021). The goal of eliminating cervical cancer in women is for all countries to maintain and reduce the incidence rate to fewer than four instances per 100,000 women. Knowing where a nation stands in relation to the burden of factors associated with cervical cancer can help that nation develop interventions aimed at lowering the risks that women face.(Hindin and others, 2014).

Despite the fact that studies on cancer receives only 5% of global funding, nations that are developing are 80% more affected by the disease than developed nations. Sub-Saharan Africa is predicted to account for more than 85% of all cancer cases by 2030, though (Wambalaba et al., 2019). Regretfully, nearly all of adults in the 20–60 age range

are still considered to be at increased risk of developing cancer. In Kenya, for example, there are approximately 28,000 fresh instances of cancer annually, with a 22,000 case death rate. Most of these cases affect individuals under the age of sixty. According to Anne Korir et al. (2016), After infectious diseases and cardiovascular disorders, malignancies is the third-leading cause of death in Kenya, with 78.5% of those who receive a diagnosis with the disease not fully recovering. For instance, estimates for cancer-related deaths indicate that 18,000 will occur in 2005 and 22,000 in 2014. According to Huchtko et al. (2011), cancer causes 7% of all deaths in the country each year, with a disproportionate number of young people affected.

2.4 Association of alcohol and cigarette smoking to cancer

There is a great association of lifestyle factors and cancer incidences for example lack of physical activity, substance abuse such as alcohol and cigarette smoking, productive health, radiology exposure, exposure to carcinogens, and other environmental pollutants (Katzke et al., 2015). About 70% of cancer deaths are associated with the above-named lifestyle cancer risk factors (41% in men and 27% in women). 35% of cancer types are associated with these lifestyle factors 34% of these are found among members of low and middle countries like Kenya and 37% in developed countries). The highest mortality rate globally is caused by lung cancer with 71% of these death cases been as a result of tobacco use. Low fruit intake as well as low the vegetable use, air pollutants and solid fuels usage in homes causes 76% of rest of lung cancer deaths. An estimated 60% of cervical cancer is caused by unsafe sex and constantly been exposed to human papillomavirus. Oesophagal cancer(42% cigarette smoking, 26% alcohol intake and 18% by fruit and vegetable intake (Katzke et al., 2015) Women with a B.M.I (30) in the obese category have three times possibility of getting cancer of the breast especially in women who are past menopause women.

There is a 98% increased risk of getting cancer of the prostate in obese men(Khan et al., 2010). Overall lifestyle has a great impact in cancer statics' and this need to be clearly identified in Kenya and Kiambu county to be specific where alcohol intake and obesity in predominant among youths women and older men hence the need of a Kiambu cancer registry. There is need for establishment of more cancer screening diagnosis and treatment centers in Kenyan government hospitals for affordability and increase cancer survival rates especially in the county levels(Subramanian et al., 2018). Kiambu cancer registry information will enhance this need, especially for policymakers.

2.4.1 Association of cigarette smoking and cancer

An estimated 1.1 billion people smoke tobacco worldwide, which equates to one-third of all adults worldwide and means that every sixth adult human is a smoker. Over five million deaths worldwide are probably attributable to tobacco use; however, by addressing the primary issue, smoking cigarettes, these fatalities can be easily avoided (Furrukh, 2013). In upcoming nations, the rate of smoking is either declining or leveling off. However, death related to cigar smoking has been on the rise .notably mostly occurring among the least educated populations. Early research revealed cigar-smoking was higher among the male gender, but current statistics have indicated the gender gap has narrowed and plateaued(Lu et al., 2008).

Tobacco use is the primary cause of almost one out of every five deaths in the United States. According to data from 2012, cigarette smoking and using tobacco products were linked to 109,690 cases of cancer of the lungs in women and 116,470 cases of lung cancer in men. Lawlor et al. (2004) reported that 29% of cancer cases in men and 26% of cancer cases in women were deemed critical. Tobacco smoking is linked to 30% of cancer mortality cases while 87% of cancer mortality cases. According to research, smoking actively raises the risk of developing a number of other cancers, including those of the

upper gastrointestinal tract, kidney, bladder, stomach, colorectum, nasal passages, sinuses, oral cavity, and acute myeloid leukemia (Furrukh, 2013). The World Health Organization has developed criteria for determining smoking prevalence and categorizing people as current smokers, former smokers, or neither. Passive smokers have not been spared either, passive smoking is estimated to cause numerous cancer diseases. 50000 of the deaths that occur annually have been linked to passive smoking. passive smoking occurs as a result of sidestream smoke which comes from the end of the burning tobacco and the mainstream which is usually exhaled by the person smoking (Walser et al., 2018).

Among the numerous other risk factors for cancer of the breast, consuming is one of the main ones, but the percentage of women who smoke is steadily increasing. For instance, young women in the 20–24 age range showed the greatest percentage of use at 25.6%, with 18.1% of Canadian women who were 15 years of age or older reporting that they were currently smokers (Terry & Goodman, 2006). One of the public health concerns that has been linked to several negative health effects in Canadian women is smoking. Apart from non-melanoma skin cancer, which has been associated with notable cancer-related and general mortality in Canada, carcinoma of the female breast is the most prevalent kind of cancer among women there (Gompel, 2011). There is a significant amount of information linking tobacco smoking and breast cancer. research done on animal have indicated that mammary tissues are at risk of carcinogenic exposure during the adolescent to at first full-time pregnancy (Lawlor et al., 2004). This has been connected to a higher rate of division of cells, and at this point, the DNA repair system is typically at its lowest, making it unable to repair the damage prior to cell division takes place. This, however, contradicts the theory that women in this age range are more

susceptible to getting breast cancer due to passive or active cigarette smoking (Walser et al., 2018).

2.4.2. Association of alcohol consumption and cancer

Drinking alcohol is one of the primary adjustable indicators of risk for cancer. Over 2 billion people are thought to drink alcohol every day worldwide. Additionally, the approximate daily allowance of alcohol is 13 grams, or one drink. Spirits, wine, and beer are the most popular categories of alcohol (Roswall & Weiderpass, 2015). According to the International Agency for Research on Cancer, acetaldehyde is categorized as a group 1 carcinogen, which indicates that there is substantial evidence linking it to cancer in both humans and animals, and ethanol is the first metabolite generated by the liver during the disintegration of alcohol (Roswall & Weiderpass, 2015).

Many explanations exist for how alcohol contributes to cancer, according to research. For example, ethanol, a metabolite of alcohol, has been shown to directly affect the cells in the liver, where acetaldehyde is typically converted. This has been cited to cause cirrhosis. However, the digestion of alcohol also occurs in the mouth where there is saliva and also in the large intestines (Schütze et al., 2011). Ethanol produces high active radicals which have a detrimental effect on the DNA, it can also alter the normal DNA methylation process which in turn has a hormonal effect like effect on the oestradiol which contributes to breast cancer (Nelson et al., 2013). Research has shown that the intake of ethanol boosts the body's absorption of carcinogens, such as those from cigarettes, in the mouth and throat, increasing the risk of cancer caused by tobacco use. Moreover, angiogenesis and immunosuppression caused by ethanol and tobacco use exacerbate pre-existing tumors and lessen the effectiveness of cancer treatments like chemotherapy and radiation (Lim et al., 2012). In 2010, globally, there were 988602 new cases and 737419 deaths related to gastric cancer. The significant regional variations in

death and morbidity rates suggest that lifestyle and environmental variables play a major part in the genesis of stomach cancer (Everatt et al., 2012). The development of gastric carcinogenesis is significantly influenced by smoking, alcoholism, poor diet, and genetics.

Studies on epidemiology indicates that there is disagreement over the link between alcohol consumption and stomach cancer risk (Steevens et al., 2010). Group 1 human carcinogens, such as alcohol, have been shown to raise the risk of cancer in the mouth, throat, larynx, liver, colorectum, esophagus, and female breast in females. There is inconsistent data connecting alcohol consumption with female breast cancer. A thorough meta-analysis carried out in June 2010 found that regular drinkers have a higher risk of cancer of the stomach, but moderate alcohol use is probably not linked to the illness (Li et al., 2011). As a result, there was a greater chance of gastric non-cardia than gastric adenocarcinoma. There is a significant study gap regarding the effect of acetaldehyde on cancer risk. Moreover, little is understood about the connection between chronic alcohol consumption and the chance of stomach cancer. Many studies have been conducted on the association between alcohol consumption and stomach cancer; however, few of them look at prospective epidemiological investigations in high-risk groups (Klumbiene et al., 2012).

According to a study done in Lithuania, gastric cancer is becoming more common in both men and women than in most other European countries. In Lithuania, the prevalence of the disease is 14.4 in women and 33.8% in men per 100,000 people, whereas in over 27 European Union member states, it is 7.8 in women and 16.7% in men (Boffetta et al., 2011). In Lithuania, the death rate from stomach cancer is likewise high—10.2% for women and 29.9% for men—while in the rest of Europe, the rates are 5.6% for women and 12% for men. Given the rising prevalence of alcohol consumption, understanding its

role and the connection to cancer is crucial. Lithuania has been found to have inadequate eating habits and alcohol consumption, which increases the risk of cancer of the stomach (Boffetta et al., 2011).

Another investigation carried out in China discovered that industrialized countries like China are likely to account for two thirds of gastric cancer deaths and morbidities. However, the number of cancers of the stomach cases and deaths worldwide is declining daily (Ma et al., 2017). This may be related to the identification of *Helicobacter pylori* as the primary causative agent and other risk factors from the environment. Gastric cancer was found to rank third in terms of overall mortality from cancer in a retrospective sampling survey carried out between 2004 and 2005, despite the fact that there is insufficient data on cases of cancer of the stomach in China. Regretfully, China accounts for 42% of all cases of gastric cancer that have been reported worldwide (Tramacere et al., 2012).

The intricate stage of cancer growth involves numerous processes, and no one factor has been found to be the sole cause of cancer in the stomach. However, research being conducted globally indicates that alcohol consumption may increase the risk of cancer of the stomach. The primary cause of this is acetaldehyde, a byproduct of the liver's breakdown of alcohol. Even with research, it is not possible to conclude that alcohol consumption increases the risk of cancer of the stomach (Tramacere et al., 2012).

Another Columbian cohort investigation found that alcohol consumption increases the risk of cancer of the breast by 7–10%. According to Li et al. (2011), a meta-analysis of 49 epidemiological investigations revealed that smokers had an 11% higher risk of cancer of the breast than non-smokers. It is known that there is a small chance of getting breast cancer if you drink alcohol. Investigators trying to find a connection between cigarette smoking and the incidence of breast cancer have voiced serious concerns regarding

remaining confusion brought on by alcohol consumption. There is a need to concentrate more on women in those at greatest risk because most studies have concentrated on women from the general public and very few have focused on women from high-risk groups (Li et al., 2011).

2.4 Theoretical framework

This research was guided by the health belief model. The Health Belief Model (HBM) was relevant to this research as it provided a framework for understanding the potential factors that influence individuals' decisions regarding cancer prevention, screening, and treatment. Although the study focuses on cancer incidence trends, applying the HBM can offer insights into the behavioral aspects that may impact these trends and highlight areas for future health interventions. The HBM suggests that individuals' health behaviors are influenced by the following six components, which can help explain the observed trends in cancer incidence:

Perceived Susceptibility:

This refers to individuals' beliefs about their likelihood of developing cancer. If people in Kiambu County perceive themselves as not being at risk, they may be less likely to participate in preventive screenings or adopt health-protective behaviors. High rates of late-stage cancer diagnoses in the trend data could indicate low perceived susceptibility within the community.

Perceived Severity:

This is the belief about the seriousness of cancer and its potential health impacts. If the population views cancer as a severe condition with serious consequences, it could encourage early detection behaviors. Conversely, if cancer is not viewed as a significant threat, people may delay seeking care. A trend showing high rates of advanced cancer could suggest low perceived severity, where individuals may underestimate the importance of early intervention.

Perceived Benefits:

This involves the belief in the effectiveness of preventive actions, such as cancer screening. If individuals believe that screening can lead to early detection and better outcomes, they may be more likely to participate in such programs. The incidence data could reveal whether increasing early-stage diagnoses reflect a growing awareness of the benefits of screening.

Perceived Barriers:

Barriers include any obstacles or difficulties that prevent individuals from taking preventive action. In Kiambu County, potential barriers might include limited access to

healthcare facilities, financial constraints, or cultural beliefs that discourage seeking medical care. High rates of advanced cancer cases might reflect these barriers, suggesting that significant portions of the population may find it challenging to access or engage with screening programs.

Cues to Action:

Cues to action are factors that prompt individuals to take health-protective actions, such as mass media campaigns, community health programs, or advice from healthcare providers. If there were awareness campaigns or community-based interventions during the study period, they may have influenced the trends in cancer incidence by prompting people to seek screening services. Increasing early-stage cancer cases could indicate effective cues to action in the community.

Self-Efficacy:

Self-efficacy is confidence in one's ability to take the necessary action. For cancer prevention, individuals need to feel capable of attending screenings, making lifestyle changes, or seeking treatment if diagnosed. Low self-efficacy could prevent people from engaging in preventive behaviors, potentially contributing to a higher incidence of late-stage cancer cases.



2.5 Conceptual Framework

The study conceptualized the study variables as prsnted in Figure 1.

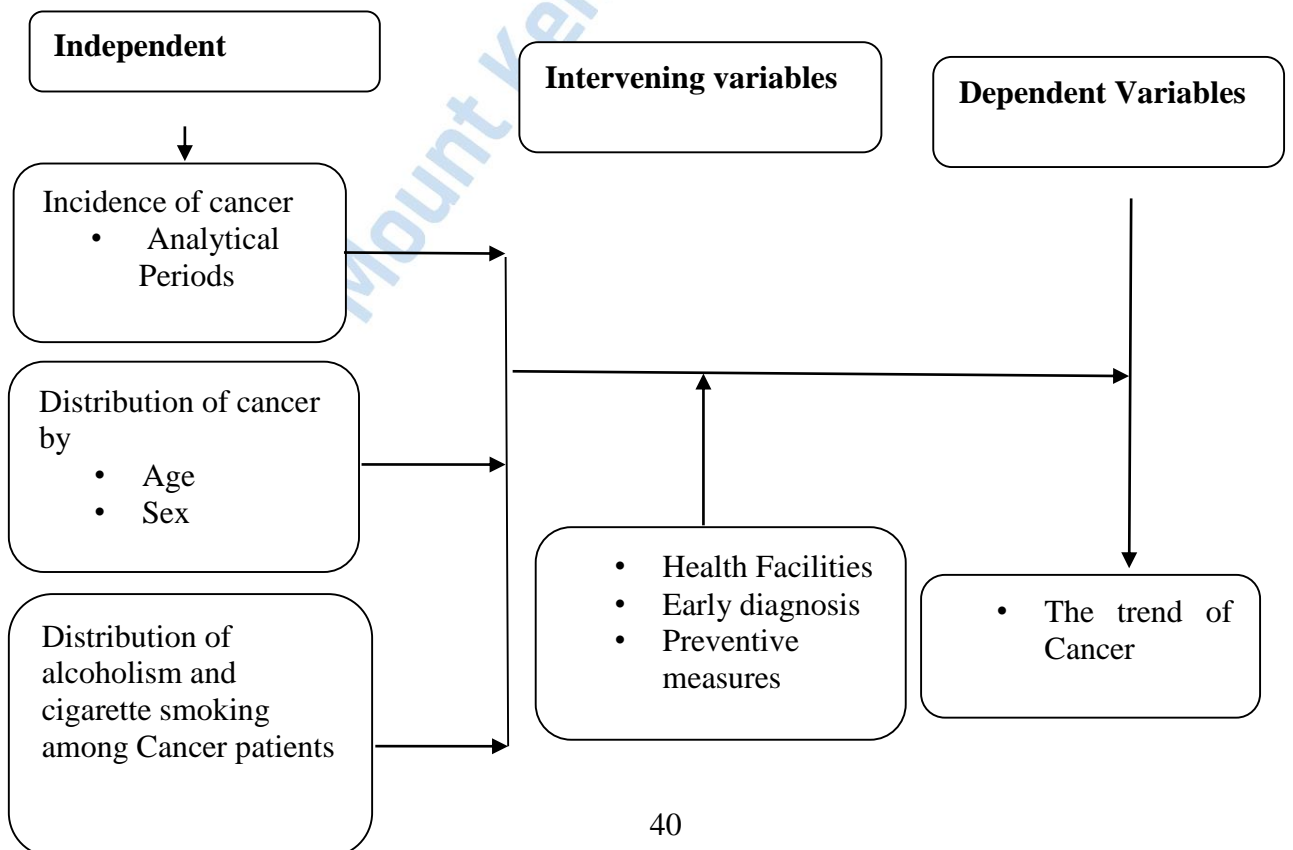


Figure 1 Conceptual Framework

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Preamble

The investigation study design utilized to ascertain the patterns of cancer incidence in Kiambu County's level 5 and Gatundu level 5 hospitals was documented in this chapter. The target population, the research tools used to gather data, the process for gathering and evaluating data, and, lastly, ethical considerations made during the research period are all included.

3.2 Research Design

A cross-sectional, descriptive investigation was used in the investigation. Data were gathered for the investigation using a follow-up questionnaire and WHO Abstract forms. Information from the five-year period 2013-2017 was filled in the abstract forms using data from the records of Kiambu Level Five Hospital and Gatundu Level Five Hospital. These records guided in retrieving of patients files in order to collect the personal social information of each patient as well as the status of cancer during the first contact with

the health providers in selected health facilities. This was to determine if the primary diagnosis of whatever cancer was made at these health facilities or it was a referral or provision of palliative services with the diagnosis already made elsewhere.

3.3 Study Location

The study was conducted in Kiambu County, Kenya, and two hospitals were selected: Kiambu Level Five Hospital and Gatundu Level Five Hospital. In the county, 40% is rural and 60% is urban. Its capital is Kiambu, with Thika being the biggest town. Nairobi County to the south, Kajiado County to the east, Machakos County to the east, Muranga County to the north and northeast, Nyandarua County to the north-west, and Nakuru County to the west are the counties that border Kiambu County. Githunguri, Kabete, Rari, Gatundu North, Gatundu South, Juja, Thika, and Kiambu are the twelve sub-counties that make up the county. It is covered by 2543.5 km² of forest cover, or 476.3 km².

Kiambu County lies in longitudes of 36° 31' and 37° 15' to the east of the equator, and latitudes of 0° 25' and 1° 20' to the south.

A 2009 population and housing census conducted in Kenya determined that 1,623,282 people lived in Kiambu County.

3.4 Study Population

The study focused on records of all patients who sought cancer treatment in Kiambu and Gatundu level five hospitals from the year 2013-2017.

3.5 inclusion and exclusion criteria

3.5.1 Inclusion criteria

1. Patients who received a confirmed diagnosis of any form of cancer at Kiambu or Gatundu Level Five Hospitals between 2013 and 2017.
2. Patients whose cancer diagnoses are documented in the hospital records or cancer registries of Kiambu or Gatundu Level Five Hospitals.

3. Patients with complete medical records during the study period, including age, gender, type of cancer, and stage at diagnosis, to enable comprehensive data analysis.

3.5.2 Exclusion criteria

1. Patients with diagnoses of benign tumors or other non-cancerous conditions, as these do not contribute to cancer incidence trends.
2. Patients with missing or incomplete data (e.g., lack of confirmed diagnosis date, cancer type, or other critical information), could limit the accuracy and reliability of the trend analysis.
3. Cancer cases diagnosed outside the specified period of 2013 to 2017, as the study focuses on trends within this defined time frame.
4. Patients with records indicating repeat visits, secondary referrals, or follow-ups for previously diagnosed cancers in other facilities to avoid duplication of data and focus on first-time diagnoses within the study hospitals.

3.6 Sampling procedure

Kiambu County was purposively selected due to the high prevalence of cancer cases in Kenya which can also be attributed to the large population in the county. Gatundu level 5 and Kiambu level five hospitals were purposively selected as they are the only referral hospitals in Kiambu County offering cancer care services. Systematic and simple random sampling was employed to select patient files from selected hospitals.

3.7 Data collection tools

A data extraction tool was used in this study. Section of the data collection tool consisted of a section on the distribution of cancer by sex, Section B captured data on the

distribution of sex by age while Section C captured data on the association of alcohol and cigarette smoking and their influence on cancer incidence.

3.8 Validity and reliability

3.8.1 Validity

The study clearly defined which cancer types were included in the trend analysis. Construct validity was strengthened when there was a clear operational definition for “cancer incidence,” ensuring all cases were categorized consistently. To ensure that all relevant cases were included, the study used complete and comprehensive hospital data. Missing cases or incomplete data would limit the study’s ability to represent true cancer trends. In addition, the data collection tools were reviewed by the supervisors as a cancer specialist or reviewed the data collection tools.

3.8.2 Reliability

Reliability refers to the consistency and repeatability of the data collection, measurement, and analysis processes used in the study. A pretest study was done in KNH where 10% of the sample size was used to test for internal consistency. SPSS version 23 was employed to test for the reliability of the data-gathering tools. A Cronbach alpha coefficient of 80% was obtained meaning the tools were reliable for data gathering.

3.9 Data Analysis Techniques

The number of cancer cases was abstracted from hospital files and used to calculate incidence within five years. Cancer patient ages recorded from the patient’s data were analyzed to determine age distribution per cancer type. Recorded lifestyle factors (e.g. smoking, alcohol consumption) was used to calculate the relative risk/odds of getting a specific cancer. The data was coded and entered into the "Statistical Package for Social Sciences (SPSS) software version 23" for in-depth analysis after a careful review to make

sure it was all collected. Charts, graphs, and tables were used to examine and present each descriptive statistic. The qualitative data were coded using content analysis and then shown in tables, graphs, and charts.

3.10 Ethical Clearance

The research was approved and cleared by Mount Kenya University's Ethical and Research Committee. An introduction letter was obtained by Mount Kenya Postgraduate School, and a research permit was issued by the National Commission for Science, Technology, and Innovation (NACOSTI).approval to conduct the investigation in Kiambu County from the Kiambu Ministry of Health. Requests for access to code data and medical records were made to the medical superintendents of level five hospitals in Kiambu and Gatundu. Data was password-protected, and confidentiality was strictly enforced. The privacy of the patients was upheld by ensuring that identifiable information (such as patient names, addresses, and other personal details) was kept confidential. Data was anonymized or de-identified to prevent patient identification.

CHAPTER 4: RESULTS AND DISCUSSIONS

4.1 Preamble

This chapter presents the study findings. It starts with the demographics of the research participants and presents findings objectively.

4.2 Social demographic characteristics

The findings regarding the people who provided unique social-demographic traits are shown in this section. The study population included all patients who looked for cancer treatment between 2013 and 2017 at Kiambu and Gatundu level five hospitals. One hundred and sixty data abstract forms were sampled. All 180 patients' data were analyzed. Based on this investigation, 123 men and 57 women made up the total size of the sample. Age group category 41–60 years had the highest number of patients (76), followed closely by age group 61–80 years with 40 patients, and age group 21–40 years with 26 patients. The age group with the least number of patients was between 0-20 years which had only five patients and finally, only eight respondents had an age of 81 years and above. However, 25 patients from the abstract forms obtained from the hospital's age were missing.

From this study, A majority (49.4%)of the patients were married, 11.1% were windowed, 4.4% had unknown status,3.9% responded being separated,0.6% were divorced, 3% of the respondents were children. While the marital status of 3.3% of the respondents reported being single.

Table 1 Social demographic characteristics of the respondents

Variable		N=180	%
Gender	Male	57	68.3%
	Female	123	31.7%
Age group	0-20	5	2.8%
	21-40	26	14.4%
	41-60	76	42.2%
	61-80	40	22.2%
	Above 81years	8	4.4%
	Missing Variables	25	13.9%
	Total	180	100%
Marital Status	Child	3	1.7%
	Divorced	1	0.6%
	Married	89	49.4%
	Separated	7	3.9%
	Single	6	3.3%
	Unknown	8	4.4%
	Windowed	20	11.1%
	Total	180	100%

4.3 Incidence of Cancer

The investigation shows that 180 those with cancer were registered in Kiambu and Gatundu level 5 hospitals over the course of the last five years, or 2013–2017. 33.3% (60) at Kiambu level 5 hospital and 66.7% (120) at Gatundu level 5 hospital.

Among the sampled respondents, Kiambu level 5 Hospital had 41 females who had cancer cases and 19 males with cancer cases. lastly, Gatundu level 5 hospital had 82 females who had cancer cases and 38 males with cancer cases.

Table 2 Distribution of Cancer cases by Facility

Facility	Frequency	Percent
Gatundu	120	66.7
Kiambu	60	33.3
Total	180	100.0

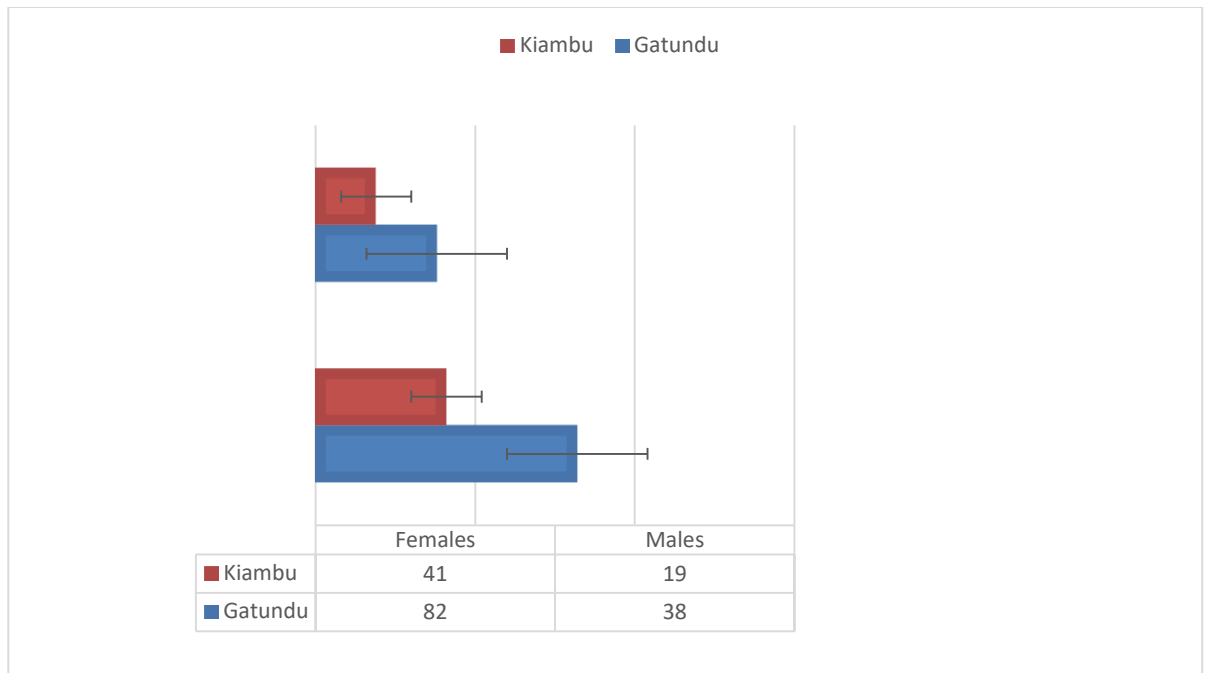


Figure 4. 1 Distribution of cancer incidences by facility and sex

Cumulatively a total of 37 cancer types were identified from both facilities. Cervical cancer was leading among the top cancer incidences in both facilities with 33.3% (60) followed by breast cancer 11.7% (21), cancer of the oesophagus 10.6% (19), stomach cancer 8.3% (15) while prostate and lung cancer accounted for 3.9% (7) each.

Table 3 Cancer Incidences by Primary Site

Primary site	Gatundu	Kiambu	Total
Anorectal	1	0	1
Anus	1	0	1
Bladder	0	2	2
Blood	1	0	1
Brain	1	0	1
Breast	10	11	21
Breast met to brain / liver	1	0	1
Carotid	1	0	1
Cervix	45	15	60
Cervix met uterus / colon	1	0	1
Colon	1	3	4
Colorectal	1	0	1
Cystic Teratoma	1	0	1
Duet.	1	0	1
Endometrium	3	0	3
Gastric	3	0	3
Larynx	2	0	2
Leg	1	0	1
Limb (Bone)	1	0	1
Liver	2	1	3
Liver (Gastroesophageal CA with met to liver/ thorax	1	0	1
Lung	5	2	7
Maxilla	0	1	1
Non- Hodskins lymphoma	1	0	1
Oesophagus	6	13	19
Oropharyngeal	1	0	1
Ovary	3	1	4

Pancreas	2	1	3
Prostate	6	1	7
Rectum	2	0	2
Renal	1	0	1
Stomach	10	5	15
Stomach/Oesophagus	0	1	1
Tongue	2	3	5
Uterus	1	0	1
Vulva	1	0	1
Total	120	60	180

4.4 Distribution of cancer by Sex in Both Facilities

According to this study, the most cancers that are prevalent reported in health care facilities among women were breast as well as cervical cancer, respectively accounting for 33.4% and 11.7% of all malignancies between the sexes. These were closely followed by esophageal cancer, which accounted for 10.6% of cases, stomach cancer, which accounted for 8.35%, and lung cancer, which came in fifth with 3.9%.

Table 4 Cancer Incidences by Primary Site

Primary site	Female	Male	Total
Anorectal	1	0	1
Anus	1	0	1
Bladder	0	2	2
Blood	1	0	1
Brain	0	1	1
Breast	21	0	21
Breast met to brain / liver	1	0	1
Carotid	0	1	1
Cervical	60	0	60
Cervix met uterus / colon	1	0	1
Colon	3	1	4
Colorectal	0	1	1
Cystic Teratoma	1	0	1
Duet.	1	0	1
Endometrium	3	0	3
Gastric	1	2	3
Larynx	0	2	2
Leg	1	0	1
Limb (Bone)	0	1	1
Liver	1	2	3
Liver (Gastroesophageal CA with met to liver/ thorax	1	0	1
Lung	1	4	5
Lungs	1	1	2
Maxilla	0	1	1
Non- Hodskins lymphoma	0	1	1

Oesophagus	7	12	19
Oropharyngeal	1	0	1
Ovary	4	0	4
Pancreas	1	2	3
Prostate	0	7	7
Rectum	1	1	2
Renal	0	1	1
Stomach	6	9	15
Stomach/Oesophagus	0	1	1
Tongue	1	4	5
Uterus	1	0	1
Vulva	1	0	1
Total	123	57	180

According to this investigation, there were more cancer cases at Gatundu Level 5 Hospital than at the other two medical facilities. According to the investigation's findings, cancer of the breast, with 10 cases, trailed closely behind cervical cancer, which accounted for 45 cases among females. With 10 cases, cancer of the stomach was more common in men. Prostate and ovarian cancer followed with 7 cases apiece. Finally, with an incidence of one (1) in each respective area, the least common cancer cases were found in the anus, anorectal, blood, brain, carotid, cervix, colon, colorectal, cystic teratoma, duet, leg, limb, liver, oropharyngeal, renal uterus, and vulva.

Table 5 Gatundu Level 5 Distribution of Cancer by Sex

Primary Site	Female	Male	Total
Anorectal	1	0	1
Anus	1	0	1
Blood	1	0	1
Brain	0	1	1
Breast	10	0	10
Breast met to brain / liver	1	0	1
Carotid	0	1	1
Cervix	45	0	45
Cervix met uterus / colon	1	0	1
Colon	1	0	1
Colorectal	0	1	1
Cystic Teratoma	1	0	1
Duet.	1	0	1
Endometrium	3	0	3
Gastric	1	2	3
Larynx	0	2	2
Leg	1	0	1
Limb (Bone)	0	1	1
Liver	1	1	2
Liver (Gastroesophageal CA with met to liver/ thorax	1	0	1
Lung	1	4	5
Non- Hodskins lymphoma	0	1	1
Oesophagus	0	6	6
Oropharyngeal	1	0	1
Ovary	3	0	3
Pancreas	1	1	2
Prostate	0	6	6
Rectum	1	1	2
Renal	0	1	1
Stomach	3	7	10
Tongue	0	2	2
Uterus	1	0	1
Vulva	1	0	1
Total	82	38	120

According to this investigation, there was a similar trend in cancer incidences by sex and health facility. Female breast cancer cases came in second place at Kiambu Level 5 hospital, with 11 cases, while cervical cancer accounted for 15 of the reported cases. The most frequent type of cancer among men was oesophageal carcinoma, with over six cases reported to the hospital. Bladder cancer followed with two cases. It was observed, nevertheless, that two incidences of cases each were related to stomach cancer, tongue cancer, bladder cancer, and prostate cancer. The lowest incidence cases were reported for colon, liver, lung, and prostate cancers, in that order (1).

Table 6 Kiambu Level 5 Distribution of Cancer by Sex

Primary Site	Female	Male	Total
Bladder	0	2	2
Breast	11	0	11
Cervix	15	0	15
Colon	2	1	3
Liver	0	1	1
Lung	1	1	2
Maxilla	0	1	1
Oesophagus	7	6	13
Ovary	1	0	1
Pancreas	0	1	1
Prostate	0	1	1
Stomach	3	2	5
Stomach/Oesophagus	0	1	1
Tongue	1	2	3
Total	41	19	60

Figure 4.3 illustrates the top 5 cancer incidences among men and women in both Gatundu and Kiambu level 5 hospitals as documented during the 5 year period.

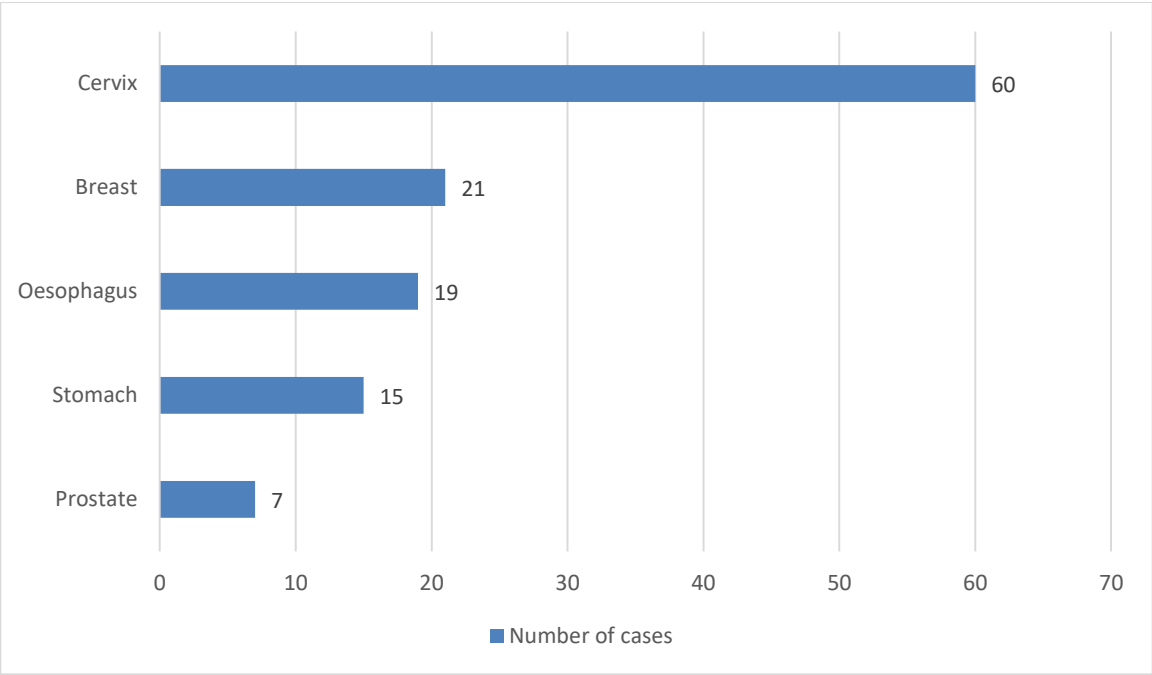


Figure 2 Top 5 Cancer Incidences in Gatundu and Kiambu Level 5 Hospitals

Figure 2 illustrates the top 5 cancer incidences among females in both Gatundu and Kiambu level 5 hospitals as documented during the 5 year period.

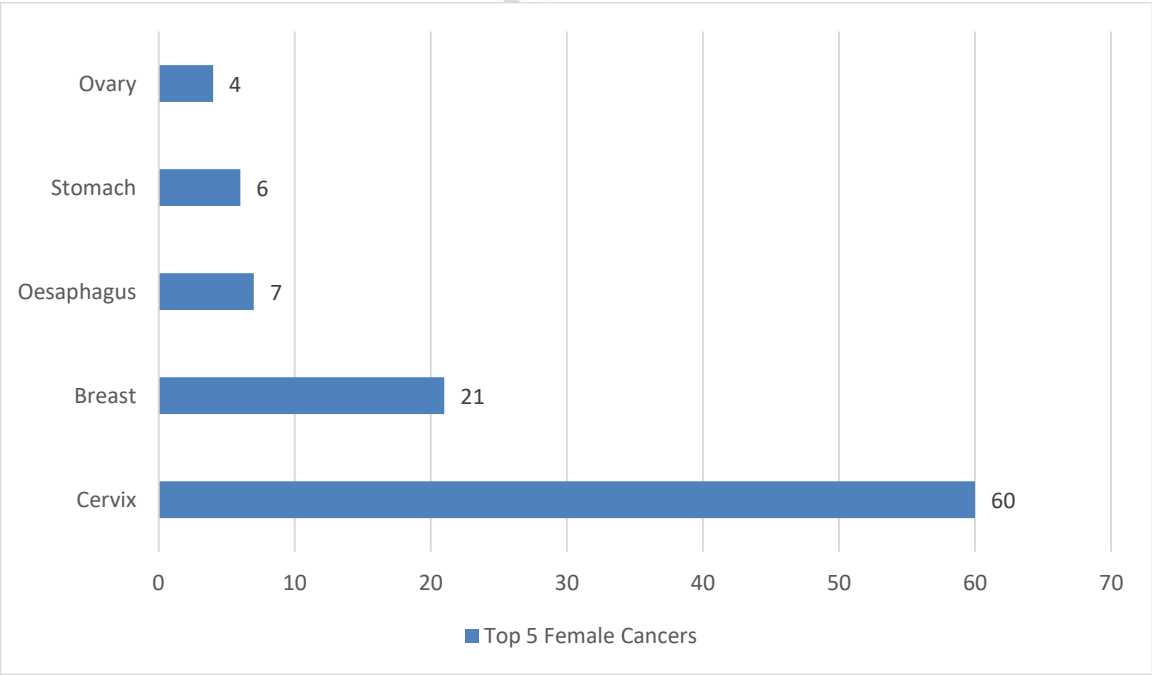


Figure 3 Top 5 Female Cancers in Gatundu and Kiambu level 5 hospitals

Figure 3 illustrates the top 5 cancer incidences among males in both Gatundu and Kiambu level 5 hospitals as documented during the 5 year period.

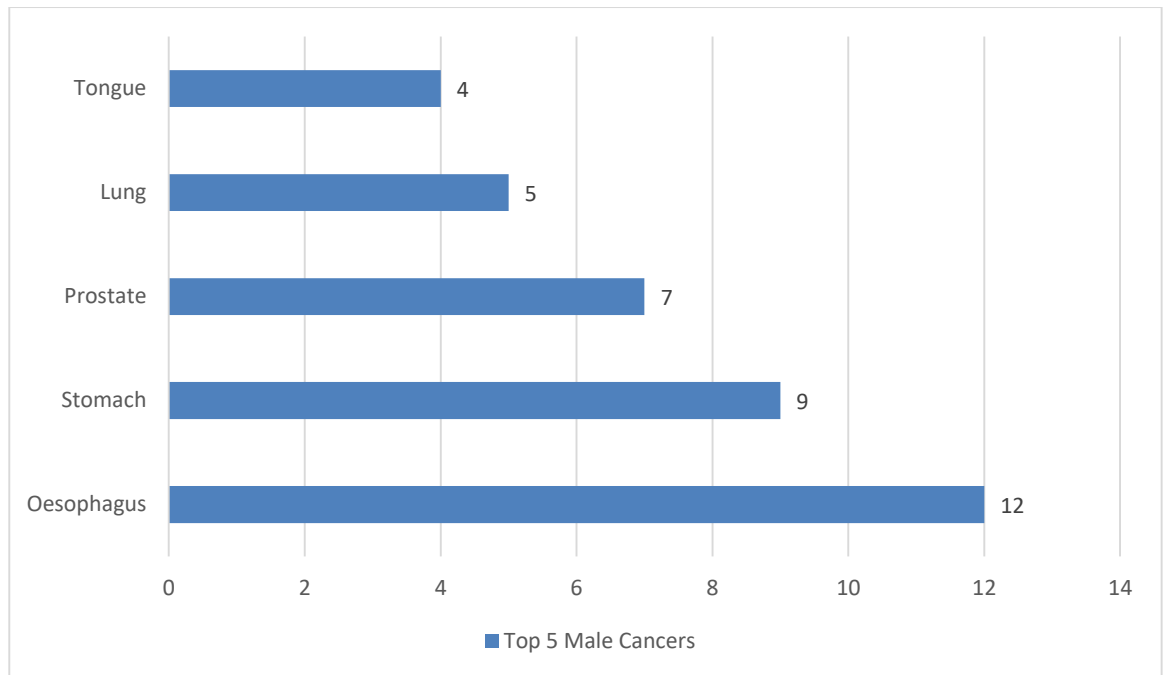


Figure 4 Top 5 male cancers in Gatundu and Kiambu Level 5 hospitals

Using Chi-Square test of association, the study reported the statistics in Table 7.

Table 7 Chi-Square Tests between Sex and Primary sites of cancer

Table 7 shows a Pearson Chi-Square of 134.183 with $df=74$ and significance =.000. This implies the existence of association between sex and primary sites of cancer. The association was significant as sig-level =.000 is less than the critical p-value of 0.05. World data on cancer shows differences in cancer cases based on sex where cases such

as breast cancer are more prevalent among women compared to men. On the other hand, lung cancer is associated with more men than women (Kim, Lim and Moon, 2018).

4.5 Distribution of cancer by Age

The study demonstrated that there were more cancer incidences between the age of 41-60 in both health facilities. Patients 61 to 80 years of age followed, which may have been related to exposure to different factors that have been shown likely to cause different types of cancer, explaining the exceptionally high rates of cancer cases in the aforementioned age groups. Ages 21 to 40 were closely behind, and 81 years and older had the lowest number of cancer cases. However, a sizeable portion of the population lacked age-related data. For example, in Gatundu Level 5 Hospital, the age cluster of 41 to 60 years old accounted for 39.2% of all reported cancer cases, the age cluster of 61 to 80 years old accounted for 21.7%, and the age group of 21 to 40 years old had 13.3% of all stated cancer cases. Finally, in Kiambu level 5 hospital, the age group of 41 to 60 years old accounted for 48.3% of all the reported cancer cases while the age category of 21 to 40 years old accounted for 16.7% of the reported cancer cases. lastly, patients with 81 years and above had the least incidence of cancer cases which only accounted for 3.3%.

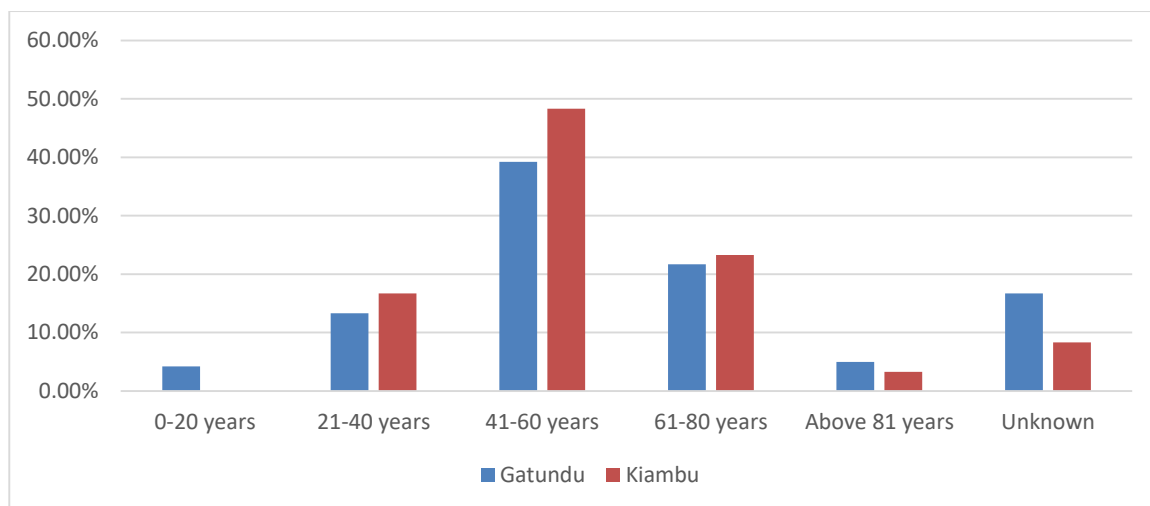


Figure 5 Distribution of cancer by Age Gatundu and Kiambu level 5 hospitals.

Table 5 demonstrates a similar trend that both facilities had more cancer patients aged 41-60 years followed by those aged 61-80 years.

Table 8 Distribution of Cancer cases by Age and Facility

Facility	Age	Frequency	Percent(%)
Gatundu	0-20 Years Old	5	4.2
	21-40 Years Old	16	13.3
	41-60 Years Old	47	39.2
	61-80 Years Old	26	21.7
	Above 81 Years Old	6	5.0
	Unknown	20	16.7
	Total	120	100
Kiambu	21-40 Years Old	10	16.7
	41-60 Years Old	29	48.3
	61-80 Years Old	14	23.3
	Above 81 Years Old	2	3.3
	Unknown	5	8.3
	Total	60	100
		180	100%

A more thorough examination of the data from the current study that relate malignancies instances to age revealed that women between the ages of 41 and 60 had the greatest

incidence of cervical cavity cancer, followed by those between the ages of 21 and 40. The age group of 41 to 60 years old was the most common for cancer of the breast cases, followed by the age group of 21 to 40 years old. Cancer of the esophageal tract was more common in patients between the ages of 41 and 60 and 61 and 80, with seven cases in each age group. Another interesting finding is that men were more probable than women to have an oesophagus. Compared to male patients, patients between the ages of 61 and 80 had a higher risk of cancer of the stomach. The most common type of cancer among those over 81 who responded was cancer of the esophageal tract.

Table 9 Distribution of Cancer cases by Age and Primary site

Patients_Age	Primary Site	Gatundu	Kiambu	Total
0-20 Years Old	Blood	1		1
	Breast	2		2
	Limb (Bone)	1		1
	Vulva	1		1
	Total	5		5
21-40 Years Old	Breast	1	4	5
	Breast met to brain / liver	1	0	1
	Cervix	8	3	11
	Cystic Teratoma	1	0	1
	Endometrim	1	0	1
	Liver	0	1	1
	Lung	1	0	1
	Prostate	1	0	1
	Rectum	1	0	1
	Stomach	0	1	1
	Tongue	1	1	2
	Total	16	10	26
	41-60 Years Old	Anus	1	0
Bladder		0	1	1
Brain		1	0	1
Breast		3	6	9
Cervix		24	8	32
Colon		0	1	1
Colorectal		1	0	1
Gastric		2	0	2
Liver		1	0	1
Liver (Gastroesophageal		1	0	1

	CA with met to liver/ thorax			
	Lung	1	0	1
	Maxilla	0	1	1
	Non- Hodskins lymphoma	1	0	1
	Oesophagus	2	5	7
	Oropharyngeal	1	0	1
	Ovary	1	1	2
	Pancreas	1	1	2
	Prostate	1	0	1
	Rectum	1	0	1
	Stomach	3	2	5
	Stomach/Oesophagus	0	1	1
	Tongue	1	2	3
	Total	47	29	76
61-80 Years Old	Anorectal	1	0	1
	Bladder	0	1	1
	Breast	3	1	4
	Carotid	1	0	1
	Cervix	4	2	6
	Cervix met uterus / colon	1	0	1
	Colon	0	2	2
	Endometrium	2	0	2
	Larynx	1	0	1
	Leg	1	0	1
	Liver	1	0	1
	Lung	0	1	1
	Oesophagus	2	5	7
	Ovary	1	0	1
	Prostate	3	1	4
	Stomach	4	1	5
	Uterus	1	0	1
	Total	26	14	40
Above 81 Years Old	Breast	1	0	1
	Duet.	1	0	1
	Gastric	1	0	1
	Larynx	1	0	1
	Lung	1	0	1
	Oesophagus	1	1	2
	Stomach	0	1	1
	Total	6	2	8
Unknown Age	Cervix	9	2	11
	Colon	1	0	1
	Lung	2	1	3
	Oesophagus	1	2	3
	Ovary	1	0	1

Pancreas	1	0	1
Prostate	1	0	1
Renal	1	0	1
Stomach	3	0	3
Total	20	5	25
Total	120	60	180

Using Pearson Chi-Square test of association, an analysis processed the results in Table 10.

Table 10 Pearson Chi-Square test of association between age and cancer

Table 10 shows a Pearson Chi-Square value of 2096.26 which is very high. The Df of 1960 shows that many independent pieces of information used in the processing of the Chi-Square. A significant level = .016 which is less than critical p-value of .05 implies that the association is substantial. Thus, the association between age and cancer was found to be significant.

4.6 Distribution of alcohol and cigarette smoking status among cancer patients

Regarding alcohol use among cancer patients, the main limitation was the lack of information on the alcoholism status. From this study, 28.9% of the respondents, reported they have never used alcohol, while 9.4% of the respondents were ex-smokers. Among 5.6% of the respondents in this study were alcoholics. However, Notably, the alcoholism status of 56.1% of the cancer patients in this study was Unknown.

Table 11 Distribution of alcohol among cancer patients

Takes Alcohol	Frequency	Percent
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Alcoholic	10	5.6
Ex	17	9.4
Never	52	28.9
Unknown	101	56.1
Total	180	100.0

From this study, The smoking status of 55.6% of the study participants remained to be unknown as it was not recorded in the hospital records, 30.6% of the respondents reported to have never smoked, while 8.3% of the respondents reported being ex-smokers. Finally, 5.6% of the respondents confirmed were smokers.

Table 12 Distribution of smokers among cancer patients

Smokes Cigarettes	Frequency	Percent
Ex-Smoker	15	8.3
Never	55	30.6
Smoker	10	5.6
Unknown	100	55.6
Total	180	100.0

Chi-square analysis on the test of association between smoking and cancer was presented the results in Table 13.

Table 13 Chi-Square test of association between Smoking and Primary site of Cancer

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	211.192 ^a	148	.001
Likelihood Ratio	165.529	148	.154
N of Valid Cases	180		

a. 182 cells (95.8%) have expected count less than 5. The minimum expected count is .06.

Table 13 shows a Pearson Chi-Square of 211.192 at $df = 148$. There is fewer associations than the significant p-value of 0.05. It is at the .001 level of statistical significance. This

implies that cigarette smoking and the distribution of cancer initial sites were significantly correlated. Smokers were more likely to experience cancer attacks in particular primary sites. These findings corroborate the findings of Ritchie and Roser's (2013) study, which indicates that smokers are more likely to develop cancer than non-smokers.

In another Chi-square analysis, the study analyzed the association between alcohol and primary site of cancer. The results are presented in Table 14.

Table 14 Chi-Square test of association between Alcohol and Primary site of cancer

Table 14 shows a Pearson Chi-Square =212.237 at df=148. This implies that there was an association between Alcohol use and the primary site of cancer. At the significance of .000, the association was significant as the significance level was less than the critical p-value of .05. This conforms to the findings of Rungay, Murphy, Ferrari and Soerjomataram (2021) that put 4% of cancer patients attributed to alcoholism. The authors opine that the commonly affected primary sites as a result of cancer are liver, colorectum, aerodigestive tract and breast. The National Toxicology Program of the US Department of Health and Human Services, which identifies alcohol's carcinogenic content as a cause of the disease, concurs with this.



CHAPTER FIVE:

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

5.1 Preamble

This section provides an overview of the results of the investigation, which were covered in Chapter 4, along with conclusions drawn from the data and suggestions offered by the researcher in light of the findings. Additionally, the chapter includes the suggestions made for further research areas.

5.2 Summary of findings

To determine the pattern of malignancy incidences in Kiambu and Gatundu level 5 hospitals, the study examined the occurrence of cancer by age and sex as well as the relationship between alcohol and cigarette smoking and cancer.

5.2.1 Incidence of Cancer

This research was a retrospective study focusing on incidences of cancer in five years, that is between 2013 and 2017. It was carried out in two-level five hospitals in Kiambu County, Kenya; Kiambu level five hospital and Gatundu level five hospital. In the five years, a total number of 180 cancer patients were registered in the two hospitals with Gatundu level five hospital accounting for 66.7%(120) of these cases and Kiambu level five accounting for the other 33.3%(60) cases. In terms of the gender distribution of these cancer patients, females were more with a record of 123 cases while that of males was 57 cases in both facilities. Gatundu level five hospital had registered 82 females and 38 males while Kiambu level five hospital had a record of 41 females and 19 males. The higher incidences of cancer among females in the two hospitals was Contrary to the findings of (Facts, 2018)which recorded more male cancer cases than those of females. In general, there were a total number of 37 cancer types with cervical cancer as the number one cancer in both health facilities with 60 cases(33,3%), followed by breast cancer 21(11.7%) esophagus 10.6% (19), stomach 8.3% (15) while prostate and lung cancer which accounted for 3.9% (7) each. However, cancer of the colon ranked third most common type of cancer after cancer of the prostate and cancer of the stomach, according to a research study by the International Agency for Research on Cancer (GLOBOCCAN) (Ferlay et al., 2015). In terms of new cases and mortality, cancer of the lungs was the most common type of cancer, followed by breast cancer, which was also one of the top five causes of cancer death. On the other hand, carcinoma of the breast ranked second in terms of incidence as well as death rates, while cancer of the lungs was among the most prevalent kinds of cancer worldwide and the cause of the biggest number of deaths, according to another investigation (Ott et al., 2011).

5.2.2 Distribution of cancer by Sex

The most common forms of cancers among women in both health facilities accounted for 33.4% and 11.7% of total cancers between both sexes, these were cervical and breast cancer respectively. They were closely followed by Oesophagus cancer which accounted for 10.6%, stomach cancer 8.35 %, and lung cancer came in fifth with 3.9%. Gatundu level five hospital had more cancer incidences between the two facilities. The results demonstrated that cancer of the cervix was the leading cancer among females accounting for 45 incidences, this was closely followed by breast cancer with 10 incidences. Stomach cancer was more common among Males with 10 cases, this was followed by Prostate and Oesophagus cancer which had 7 incidences each in the same facility. Cancer incidences by sex and health facility revealed a similar trend. In Kiambu Level 5 hospital where Cervical was leading cancer among females, breast cancer came in second. Oesophagus cancer was the most common form of cancer among Males, this was followed by Cancer of the Bladder, stomach cancer, and prostate cancer which had 2 incidences each. This didn't replicate previous studies which previously reported that among males the number one cancer type was lung cancer while breast cancer was the number one type of cancer among females(Ott et al., 2011).

5.2.3 Distribution of cancer by age

Findings showed that there were higher events of cancer in patients between the ages of 41 and 60 in both medical facilities. Patients 61–80 years old came next, followed by those 21–40 years old. Patients 81 years old and older had the fewest tumors incidences; however, a sizeable portion of the population lacked age-related data. In addition to the data above, a more thorough examination of the relationship between age and tumors incidences revealed that women between the ages of 41 and 60 had the highest incidence of cervical cancer, followed by those between the ages of 21 and 40 . Women aged 41 to

60 were most likely to develop cancer of the breast, followed by those aged 21 to 40. With seven cases in each age group, patients between the ages of 41 and 60 and 61 and 80 had a higher risk of developing esophageal cancer. Another interesting finding is that men were much more probable than women to have an oesophagus. Patients with stomach cancer were far more likely to be female than male and usually ranged in age from 61 to 80 years.

5.2.4 Distribution of alcohol and cigarette smoking status among cancer patients

There was a lack of information on the alcoholism status among the cancer patients which was a huge limitation when carrying out the study, 28.9% reported they had never used alcohol, 9.4% were ex-smokers and 5.6% were alcoholics. Notably, the alcoholism status of 56.1% of the cancer patients was Unknown while 55.6% smoking status of these patients was unknown. 30.6% reported to have never smoked. 8.3% were ex-smokers while 5.6 were smokers.

5.3 Conclusion

In the five years, a total number of 180 cancer patients were registered in the two hospitals. In terms of the gender distribution of these cancer patients females were more with a record of 123 cases while that of males was 57 cases in both facilities. Cervical cancer was leading cancer among females closely followed by breast cancer. Oesophagus cancer was fourth while stomach cancer lung cancer came in fifth. Stomach cancer was more common among Males followed by Prostate and Oesophagus cancer. There were more cancer incidences between the age of 41-60. There was a lack of data on alcoholism and cigarette smoking thus a huge limitation to the study. The study also concludes that available cancer data is wanting and scanty.

The research findings indicate a statistically significant correlation between gender and primary cancer sites (sig-level =.000), a significant association between age and cancer (sign.-level =.016), a significant association between smoking and primary cancer sites (sign. level =.001), and a statistically significant relationship between alcohol and primary cancer sites (sign. Level =.000).

5.4 Recommendations

5.4.1 Recommendations from this study

1. All Patients admission files and forms should be filled wholesomely so they contain all the necessary information for easier future reference
2. Hospitals should adopt a computer-based program to key in patients records to ensure data is accurate and collected at the right time for purposes of quality data and provision of timely care services for cancer patients
3. All hospitals should have a standard way of reporting and staging cancer cases to ensure data uniformity is used to create cancer registries for better future planning of care services to cancer patients
4. Cancer treatment and screening machines should be available in all level five hospitals to ensure patients are treated wholesomely in one health facility and to ensure it is easy to track patients data
5. There should be a collaboration of public and private facilities to ensure there is a linkage of cancer data.
6. More cancer awareness programs should be adopted by the public to reduce preventable cancer cases and eventually eradicated cancer.
7. Researchers should be encouraged to carry out more research on cancer that will aid in making informed decisions, better health policies and frameworks.

5.4.2 Recommendation for further research

Future studies should extend the analysis beyond 2017 to capture more recent trends in cancer incidences. A longitudinal approach that examines data from 2018 to the present would provide an updated picture of cancer trends in the region, accounting for changes in healthcare access, diagnostic practices, and public health initiatives.

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APPENDICES

Appendix 1: Questionnaire

Mount Kenya University (Research & Development) And COKIA (HRDU) Kiambu
County Cancer Registry Cancer Abstract Form

Registry Number									
------------------------	--	--	--	--	--	--	--	--	--

A. PATIENT:

1. Name

First Name	Given	Family	maiden

2. Number for identification _____

3. Status of marriage [1=single, 2=wedded, 3=widowed, 4=disjointed,
5=cohabiting, 6=divorced, 7=child, 9=unknown]

4. Tel No (Patient) _____

5. Age: _____ Date _____ of Birth (DD/MM/YY)

_____ Sex _____ [1=male, 2=female, 9=unknown]

6. Residence area

County	Sub-County	Location	Sub-Location	Village

7. Place of Birth _____ Ethnicity _____

8. Belief [ristian, 2=Muslim, 3=Hindu, 4=Other]

9. Educational

Level _____

10. Occupation

type_____

11. Time spent at work in the job type mentioned above (No. of years)

12. Status of smoking [1=Certainly not, 2=Smoker, 3. Ex-smoker, 9=Unknown]

13. Smoking standing of the spouse (Where applicable) [1=Never, 2=Smoker, 3. Ex-smoker]

14. Consumption status [1=Never, 2=Alcoholic, 3. Ex- Alcoholic, 9=Unknown]

15. domestic fuel source Kerosene, 2=Firewood, 3. Charcoal, 9=LPG] 4.

Electricity

16. History of family of similar illness [1=Yes, 2=No]

B. TUMOUR:

17. Date of incidence (dd/mm/yy)_____

Basis of Analysis [0=Death permit only, 2=Clinical only, 3=Clinical

Invest/Ultra sound, 4=Biochem. Immuno Test, 5=Cytology/Haematology, 6=metastasis histology,

18. , 7=rimary histology, 9=Unknown]

19. Primary

Site

20. Laterality Rt Lt. Bil Unk. N/A

21. Histology

22. Conduct [0=Benign, 1=Uncertain, 2=In situ, 3=Malignant]

23. Grade [1=Well diff, 2=Abstemiously diff, 3=Poorly diff, 4=Undifferentiated/Ana plastic, 5=T-cell, 6=B-cell, 7=Null cell, 8=Killer cell, 9=Unidentified]

24. Stage [0=Insitu, 1=Stage I, 2=Stage II, 3=Stage III, 4=Stage IV, 9=Unknown]

C. TREATMENT:

25. INITIAL OPTION OF TREATMENT

Surgery <input type="checkbox"/> Date _____	Radiotherapy <input type="checkbox"/> Date _____
Chemotherapy <input type="checkbox"/> Date _____	Hormone Therapy <input type="checkbox"/> Date _____
Immuno <input type="checkbox"/> Date _____	Other <input type="checkbox"/> Date _____

D. CONCURRENT ILLNESS:

26. RECORDS OF HIV STATUS

Lab report presented in Pt. files Yes No Lab

No. ___

Status specified in medical notes Yes No

27. Exactly (-ve)

28. Precisely (+ve)

29. Other _____ Concurrent _____ illness _____

E. SOURCES:

30. Source 1. Hosp _____ Hosp. No. _____ SRC Date _____

31. Source 1. Lab _____ Lab. No. _____ SRC Date _____

32. Referred from _____ IP No. _____

33. Referred to _____ IP
No. _____

F. FOLLOW UP:

34. Status [1=Alive, 2=Dead]

35. Hospice _____ No.

36. Date of Last Contact (visit)/Date of
Death _____

37. If deceased, cause of demise

38. Comments if any

Form completed by _____ Date _____ Checked by

Data keyed in by _____ Date

(A Korir et al., 2014)

Appendix 2: Introduction Letter Kiambu Level 5 Hospital

LINET WARUI

PO BOX 287- 10303

Cell Phone: 0707357719

MEDICAL SUPERINTENDENT

Kiambu Level 5 Hospital

P.O BOX 39-00900 Kiambu

Dear sir/Madam

I am a Mount Kenya University student pursuing a public health master's degree. Estimating patterns in the incidence of cancer in Kiambu and Gatundu level five hospitals in Kiambu county, Kenya, between 2013 and 2017 is the subject of my scholarly research. The cancer registry will receive initial information from this study. It will be determined how common cancer is in Kiambu County's population. The study aims to identify the lifestyle factors that lead to cancer and utilize the collected data to enhance medical care and implement prevention strategies for the county. This letter serves as a appeal for approval to carry out this research at your organization.

I would like to declare that I will completely respect privacy and strictly abide by the necessary rules of conduct. Unless authorized by you or another party, every record and data gathered will be preserved with discretion, professionalism, and privacy. I look forward to hearing from you favorably and with kindness.

Yours Faithfully

Linet Warui

Appendix 3: Introduction Letter Gatundu Level 5 Hospital

LINET WARUI

PO BOX 287- 10303
Cell Phone: 0707357719

MEDICAL SUPERINTENDENT

Gatundu Level 5 Hospital

P.O BOX 84-10233 Gatundu

Dear sir/Madam

I am a Mount Kenya University student pursuing a public health master's degree. Estimating patterns in the incidence of cancer in Kiambu and Gatundu level five hospitals in Kiambu county, Kenya, between 2013 and 2017 is the subject of my scholarly research. The cancer registry will receive baseline data from this research project. It will be determined how common cancer is in Kiambu County's population. The study aims to identify the lifestyle factors that cause malignancies and utilize the collected data to enhance medical care and implement cancer prevention strategies for the county. The enclosed letter serves as a request for permission to carry out this investigation at your organization. I would like to declare that I will completely respect confidentiality and strictly abide by the required code of conduct. Unless authorized by you or another party, all records and information gathered will be handled with discretion, professionalism, and confidentiality. I sincerely await your thoughtful and beneficial consideration.

Yours Faithfully

Linnet Warui

Appendix 4: ERC certificate

Mount Kenya University



REF: MKU/ERC/1640
TO: LINET WAMBUI WARUI

REG: MPH/49232/2016

Date: 26 October 2020

Dear Sir/Madam,

RE: ESTIMATION OF TREND IN CANCER INCIDENCE IN KIAMBU AND GATUNDU LEVEL FIVE HOSPITALS, KIAMBU COUNTY KENYA BETWEEN 2013 AND 2017

This is to inform you that **Mount Kenya University** has reviewed and approved your above research proposal. Your application approval number is **713**. The approval period is **22/10/2020 – 21/10/2021**.

This approval is subject to compliance with the following requirements;

- i. Only approved documents including informed consents, study instruments, MTA will be used
- ii. All changes including amendments, deviations and violations are submitted for review and approval by **Mount Kenya University**
- iii. Death and life threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to **Mount Kenya University** within 72 hours of notification
- iv. Any changes, anticipated or otherwise that may increase the risks or affect the safety or welfare of study participants and others or affect the integrity of the research must be reported to **Mount Kenya University** within 72 hours
- v. Clearance for export of biological specimens must be obtained from relevant institutions
- vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal
- vii. Submission of an executive summary report within 90 days upon completion of the study to **Mount Kenya University**

Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) <https://oris.nacosti.go.ke> and also obtain other clearances needed.

Yours sincerely,

Prof. Francis W. Muregi
Chairman, Mount Kenya University IERC

The Chairman
Mount Kenya University
Ethics Review Committee
P. O. Box 342 - 0100, Thika

Appendix 5: Turnitin Report

Linet Wambui

Linet Thesis

- THESIS
- STUDENT THESIS
- Mount Kenya University

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Appendix 6:Nacosti Permit


REPUBLIC OF KENYA


**NATIONAL COMMISSION FOR
SCIENCE, TECHNOLOGY & INNOVATION**

Ref No: 980786 **Date of Issue: 21/July/2021**


RESEARCH LICENSE




**This is to Certify that Ms.. LINET Wambui WAMBUI of Mount Kenya University, has been licensed to conduct research in
Kiambu on the topic: ESTIMATION OF TREND IN CANCER INCIDENCES IN KIAMBU AND GATUNDU LEVEL
HOSPITALS, KIAMBU COUNTY KENYA BETWEEN 2013 AND 2017 for the period ending : 21/July/2022.**

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980786
 Applicant Identification Number

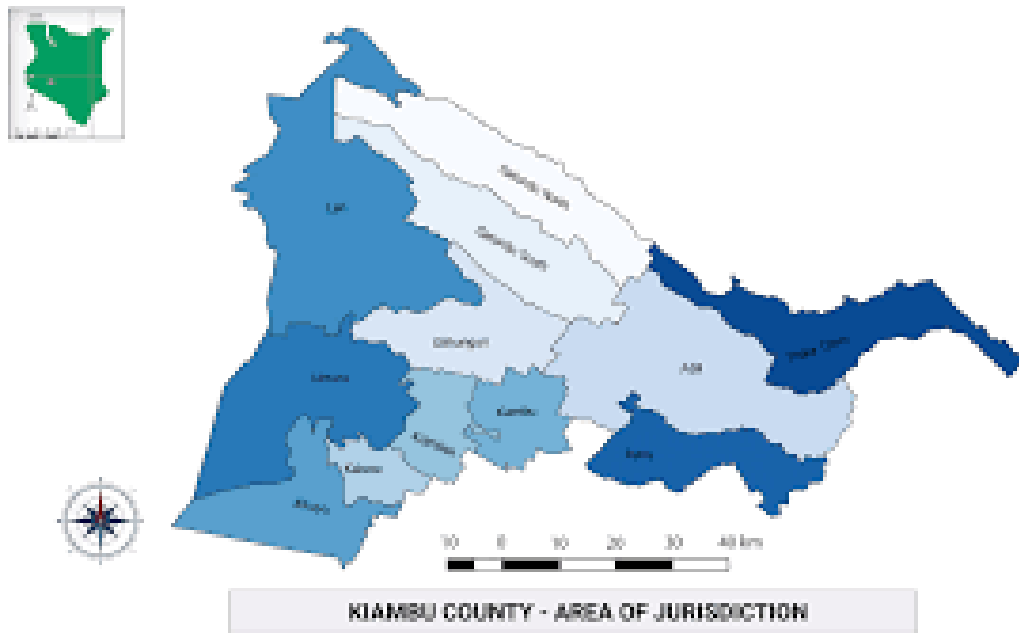

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Appendix 6:Map of the study area



Mount Kenya

