THE UNIVERSITY OF NAIROBI

EVALUATING THE BENEFITS OF COMMUNITY-BASED HEALTH INFORMATION SYSTEMS (CBHIS) IN HEALTHCARE KENYA (A CASE OF KIAMBU COUNTY)

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DECLARATION

This thesis is my original work and has not been presented for any degree award to any other university.

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This thesis proposal has been submitted for examination with my approval as the University of Nairobi Supervisor

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Signature   Date

Dr. Agnes Wausi

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ABSTRACT

Community-based health information systems (CBHIS) are very essential regarding the quality of healthcare services. In Kenya, mostly the rural and semi-urban areas, there have been challenges when it comes to the way healthcare information is passed. Of late, there has been introduced various systems to ensure the process is timely and there are effective services. One of the major systems in use is the Community-based health information system. The system has been used in the country for a considerable amount of time, but the major issue is that it's not fully adapted by all the people. This paper focuses on gauging the benefits that the introduction of CBHIS has brought in the quality of healthcare services people receive in Kiambu County. The problem is that there may be a system introduced to help make the healthcare services better, but some people may not be willing to use them, hence the need to determine the benefits the community has received. The paper will help understand the actual benefits the system has brought in terms of the delivered services. The data that is collected using various data collection methods such as questionnaires will help make recommendations on the necessary improvements that are needed by understanding the benefits the community has received.

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Key Terms and Abbreviations

CBHIS   -Community based healthcare information system

ICT   -Information communication technology

WHO   -World health organization

CBO   - Community Based Organizations

NGO   -Non-governmental organization

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CHAPTER ONE:

INTRODUCTION

1.1 Background of the Study

A Community based health Information System (CBHIS) is a health information system which is mostly in use in the rural society and informal settlements that exists in urban areas. Its aim is to give pertinent and quality data to sustain decision making and improve the healthcare services people receive.

CBHIS aims at enhancing decision-making, bettering service delivery to the people and finally bringing positive impact on the health results of the specified community at various levels in the health sector. Health systems routine can be made better not only by joining the gap that exists between the community and the health system, but through encouraging speedy decision making and acting on the accessible information. The system makes it easy to get information from a community, analyze it, and present it for use in making conclusions, which at the end makes the health services better.

Information should be the spine of passing healthcare data for any decisions to be made. It is therefore necessary for information that can be utilized in decision making in healthcare to ensure better services. Therefore, this will result into equity in health resource allocation and information passage. The development of all-inclusive community based health information systems is currently turning into an imperative tool for measuring and bettering the quality of healthcare services that are delivered to various communities. Many of the third world countries such as Kenya have put efforts to make stronger their national health information systems to offer information so that health services can be made smooth.

People have noticed that introduction of ICT in healthcare will streamline the services and will come with other advantages such as better customer services that will bring satisfaction and better health to the community. Information and communication technologies (ICTs) utilized in the healthcare have their associated merits. They can encourage patient-centered healthcare, progress quality of care, and educate health professionals and patients. However, implementation of ICTs is still difficult as it is hard to convince people from some communities to take part and give data to the operators of CBHIS. The WHO Report for the World Summit on the Information Society in Tunis (2005) underscores the close link that exists between health and ICT: "Today,

ICT is fundamental for health systems to meet up obligations to collect health data that will be used to convey care, do research, educate students, treat the patients and keep an eye on public health" (Jalayer, 2004).

The performance of Health systems would not only be made better by joining the interface between the community and the health system, but also providing for opportune decision making and acting quickly on the accessible information. Community based Health Information System permits the health leaders and service givers to file, analyze, and utilize the data to advance coverage, continuity, and quality of healthcare at all levels through enhanced planning, monitoring, and evaluation of the health services. Information is necessary in all the listed healthcare services, hence the need for ensuring the systems used in dissemination of healthcare information are up-to-date. The main objective of the research is to systematically give a summary of the best evidence concerning the benefits of CBHIS on healthcare services.

1.2 Research Problem

ICT has been introduced in healthcare in various places around Kenya and systems like CBHIS are in use. The main issue that arises is the usage of the technological devices to pass the relevant information from the communities. There may be introduction of CBHIS in health but the concern is on the acceptance and its usage by many Kenyans to bring benefits to the community. Some people may fail to use CBHIS in their health issues maybe because it is not accessible in their areas of stay such as those living in rural areas or they assume it has no benefits in their life. An example is that in Kenya there is regular collection of health information from the society, but many people fail to take part and most of their concerns are left out (Bourbonnais, 2013).These people do not have access to the means used to collect the information such as mobile phone or some may intentionally stay away. Some people act out of ignorance.

In conclusion, it is clear that CBHIS has had benefits on the way healthcare is delivered around Kenya, but the issue that arises is if the impact it has introduced is enough or there is room for improvement. There is a need to ensure CBHIS benefits all the people in Kenya by allowing them to take part in the data collection and analysis and ensuring they receive better services. Those who do not engage ICT in their healthcare, find it hard to disseminate health

information that can be used to gain an improved understanding of the health concerns in their communities and this ends up affecting the health services negatively.

1.3 Research Objectives

To evaluate the benefits of CBHIS in health care in the Kiambu County

Specific Objectives

- o To assess how CBHIS has helped in the dissemination of quality information in the healthcare sector of Kiambu County.
- o To ascertain whether CBHIS has brought about quality in healthcare services of Kiambu County.
- o To establish the efficiency of CBHIS to the healthcare provision in Kiambu County.

1.4 Value or Significance of the Study

This research will be useful for the whole country of Kenya because the health information will be disseminated effectively making the services better and of quality. Some of the stakeholders to be affected by the research findings are;

- **Community Nurses** will benefit from this study because it will be made easier for them to get and disseminate the patient's information. If the majority of nurses and patients embrace CBHIS, it will be easier to exchange information between them and deliver better services to the community.
- **The general community** will benefit because it will be easy to collect data from them, analyze it, and solve their health problems with much ease.
- **The government and health department** wishes to ensure that there is good health for its citizens. Treatments have been challenged by lack of information and misappropriation of health data. The findings of the research will be useful because health information of a community will be collected and stored, which will make it easy to be accessed when needed and ensure the community receives quality services.

CHAPTER TWO:
LITERATURE REVIEW

2.1 Introduction

Research has been done to uncover the impact that introduction of ICT systems like CBHIS has had in the healthcare sector. Some of the research has focused on specific ICT such as mobile phone. This research is aimed at establishing the benefits that CBHIS has brought in the quality of service in the healthcare.

According to WHO, use of ICT in the healthcare sector is not solely focused on technology (Dzenowagis, 2005), but it aims to achieve some critical outcomes, such as: health workers coming up with improved treatment decisions; having safer and quality care in hospitals; public having informed decisions regarding their health; governments having more concern to the health needs of the citizens; nationwide and local information systems giving hold to the development of helpful and equitable health systems; more health risks awareness to the policymakers and the public; and finally the society gaining improved admittance to the necessary facts and knowledge that is needed for improved health.

2.2 Incorporation of ICT in Healthcare

The utilization of ICT in the Healthcare can be categorized into three extensive categories that have these pillars:

2.2.1. Improving the operation of health care systems via making better the organization and access of information, including: Some activities may involve administration of movement of patient care, administrative systems; patient data; and ordering systems.

2.2.2. Improving the delivery of health care by ensuring there is enhanced diagnosis, improved mapping of public health risks, improved training and dissemination of skills among health staffs, and supporting health providers in their duty, mostly in rural health care. Some information may include biomedical knowledge search and retrieval; continuing professional advancement of health staffs; remote diagnostic; diagnostic imaging; key decision making systems; quality assurance systems; and illness observation and epidemiology. All this is made possible because of the information collected from the society.

2.2.3. Improving communication in health through advanced information movements between society health staffs and the society, improved chances for health endorsement and health

communication; and advanced response on the impact of health services and involvements that may include patient data, interactive communication, health study, and encouragement to better services.

2.3 People who use CBHIS in Healthcare

There are a number of areas where CBHIS has been introduced in health. Some areas are;

2.3.1 National and County Governments health departments

The national government checks the data found in the CBHIS and use it to update the health records and give measures that are necessary to mitigate the risks of certain epidemics. The CBHIS is necessary at the county level as it gives the exact information regarding the health of the community by identifying the epidemics in different sub-counties and planning how to control them.

2.3.2 Community Health Workers

In most cases, the community health workers are the nurses and they benefit from the CBHIS as there is ready information regarding the epidemics that they are dealing with. The data helps them identify the most affected areas and give more focus during their daily activities.

2.3.3 Healthcare Non-Governmental Organizations (NGOs)

The NGOs that are concerned with health issues utilize CBHIS to gain data that helps them know the exact health challenges facing an area. An example is that an NGO can get the data regarding the prevalence of Malaria in a certain location from the system.

2.3.4 Community Based Organizations (CBOs)

The main task of CBOs is to empower the community. One way the CBOs empower the community is by ensuring there is good health. The CBOs have to depend on the CBHIS for the community data to make decisions on the areas they will concentrate on.

2.4 Areas where ICT has had Impact on Healthcare

According to the past research there are areas that ICTs have evidently made a major impact on. They have:

- **Improved distribution** of public health data and enabled communal talk around key public health problems (Wollersheim, 2009).
- **Enabled remote consultation** as the community health information is easily accessible

- **Facilitated collaboration** of the health workers, such as distribution of learning and training mechanisms as there is ready information of the affected community

- **Supported more successful health study and** movement and access to the study findings

- **Strengthened the capability to observe** the occurrence of public health risks and react in a quick and useful way as the CBHIS provides readily available data

2.5 Impact Assessment Models to Evaluate the Quality of Healthcare Services Delivered

2.5.1 The CIPP Evaluation Model

The CIPP Evaluation Model is a broad framework used to guide assessment of programs, projects, institutions, and systems mainly those that effect long-term, sustainable advancements (Stufflebeam, 2004). The acronym CIPP means context, input, process, and product evaluation. The questions asked in the model are: What is to be done? How it should be performed and is it being done? Was it successful?

The product assessment in this model is mainly used for impact research such as this one on the benefits of CBHIS deployment in dissemination healthcare information for decision making process. This research is a summative evaluation that is performed for the reason of responsibility that needs determining the generally effectiveness or advantage of implemented technology (Stufflebeam, 2004). It needs the utilization of impact or result assessment methods, measuring expected results, spotting unexpected results and gauging the value of the program. It also makes the society to aim towards get imperative results and to assist the entire users gauge the success in achieving the targets.

The first aspect, impact, assesses if the implementation of CBHIS in the society has a direct consequence on the health of the people, what the effects are there and if other features of the system were altered after its deployment? Effectiveness checks if the system gets the intended and unintended benefits, or if it improves health as it was intended? Transportability assesses if the changes in healthcare can be openly accredited or linked to the implementation of CBHIS facilities. Finally, sustainability tries to gauge how lasting will be the outcome of the CBHIS after its operation to the society and the health staffs and how well they use it for healthcare delivery (Stufflebeam, 2007).
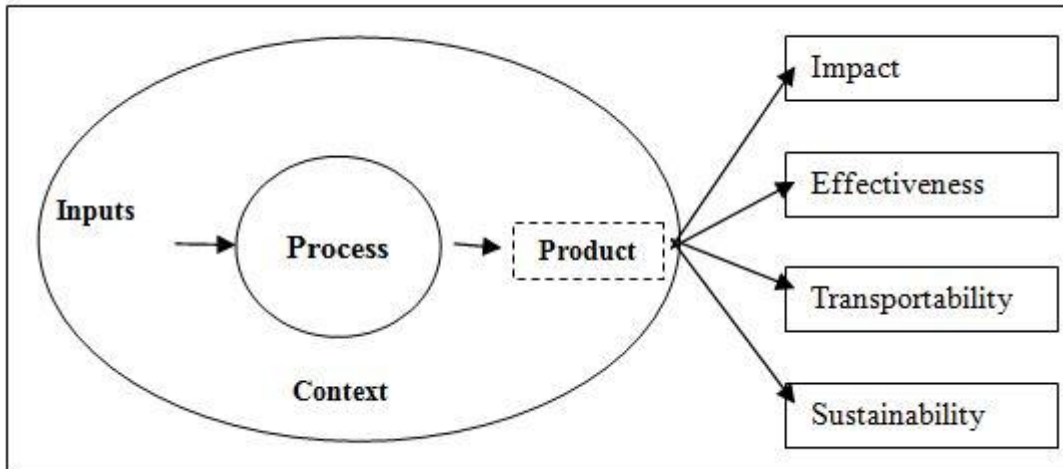
Figure 1: CIPP Evaluation model

2.5.2 Kirkpatrick Model of Evaluation

Kirkpatrick's successive four-level model of evaluation is a critical way to gauge the reaction, learning, behavior and results the users of a program receive, as a way to resolve the effectiveness of the program. The model is helpful in understanding the contact of technology incorporation and deployment in organizations (Lee, 2008; Owston, 2008). The reaction gauges the significance of the goals of the plan and its expected worth and contentment from the user viewpoint. The next one is learning that assess the knowledge and attitudes got throughout and after the project. It is the degree to which user change attitudes, develop their facts, or augment their skills because of the program or the intervention. It also gauges if the impact that took place is desired or non-desired. There is the transfer level in which the behavior of the users is assessed to determine if the newly acquired knowledge is transferred to the working setting or if it has caused any significant change in users' deeds. It also covers processes and systems that strengthen, monitor, support, and reward act of critical behaviors and continuing training. The last step is results which gauge the achievement of the course by determining improved production, better quality, reduced costs, better return on investment and if the expected results are achieved (Kirkpatrick & Kirkpatrick, 2007).
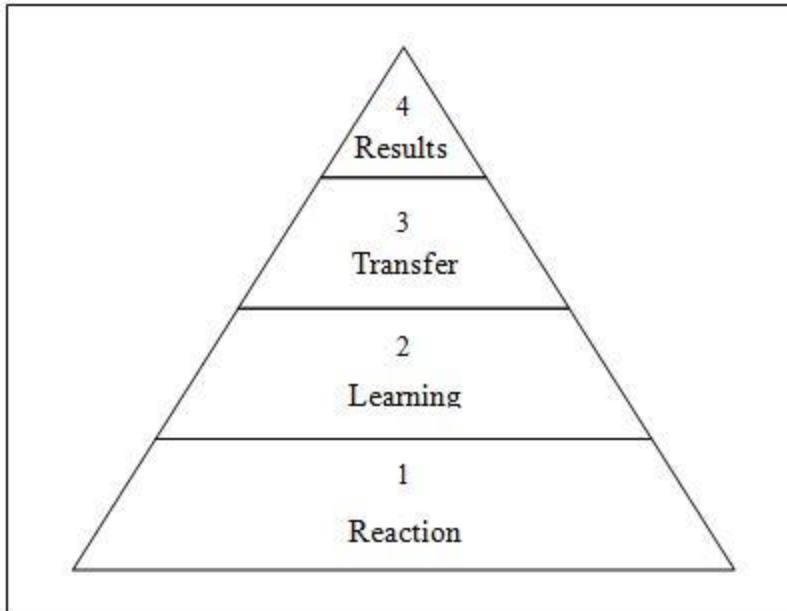
Figure 2: Kirkpatrick Model of Evaluation

2.5.3 Delone and Mc Lean IS Success Model

There was need to give a comprehensive definition of the success of any IS on all the perspectives To get the actual success of the Information Systems, Delone and McLean classified all the measures into six main categories. The model developed was a multidimensional measuring model that has interdependencies among the various achievement classes (DeLone & McLean 1992). Many researchers have modified the model to make it more inclusive. The updated model still has six dimensions that include; information, quality of service, quality of the system, intention to use, the satisfaction of the user, and finally the actual or net benefits.

The interpretation of the system is as follows; any system is evaluated in relation to its information, quality of service, system quality, as the traits have a straight outcome on the utilization or the intention to exploit and also the actual pleasure of the user. Finally as the people use the system, there are various benefits that the users get. The benefits may be negative or positive, which has a direct sway on the satisfaction of the user and may motivate the users to continue using the system or discourage them against the use.
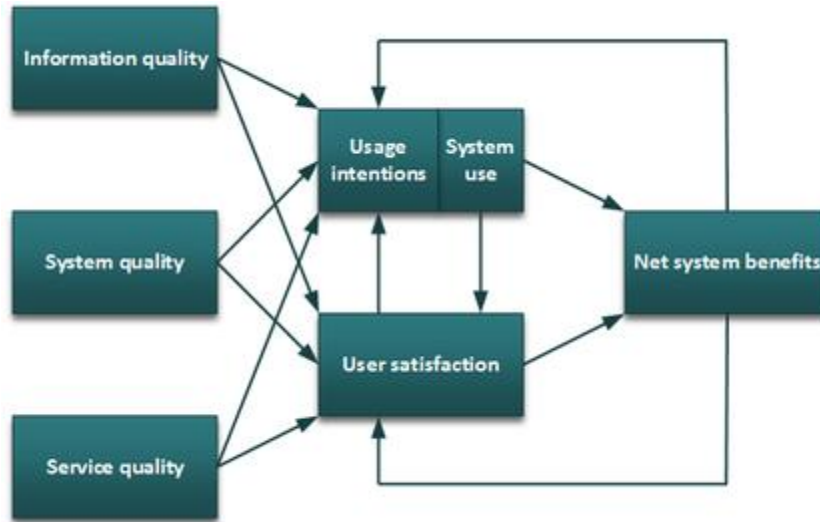
Figure 3: DeLone and McLean IS Success Model

Information Quality gives an evaluation of the quality of information that the information system has. It tends to seek clarification if the information fits the user in terms of relevance, completeness, and the ease of understanding.

System Quality it focuses on availability, usability, adoptability, and reliability of the technology or system.

Service Quality gives a comparison between the expectations of the user and the satisfaction received.

This model is useful in this project has it helps measure the actual success that CBHIS has brought to the healthcare system in Kenya, mainly in Kiambu. The Model focuses on the quality of service that the healthcare users, which the community receives from having quality information and system. Having quality services and CBHIS system will improve satisfaction and at the end there will be net benefits which include quality healthcare services that will help keep the community healthy.

2.6 Conceptual Framework

The study include various research based on the benefits that CBHIS has had on the dissemination of healthcare information to progress the worth of healthcare. The evidence retrieved from the literature guides the improvement of the conceptual framework. Some of the concerned relationships are the community health providers' service to the community and community to the CBHIS services. Multiple studies have been done to check the impact that CBHIS has brought to the delivery of quality healthcare services in the community. The model is

a customization of the Delone IS success model and uses three dimensional one which includes; CBHIS usage, CBHIS service and net benefits of CBHIS in community healthcare.
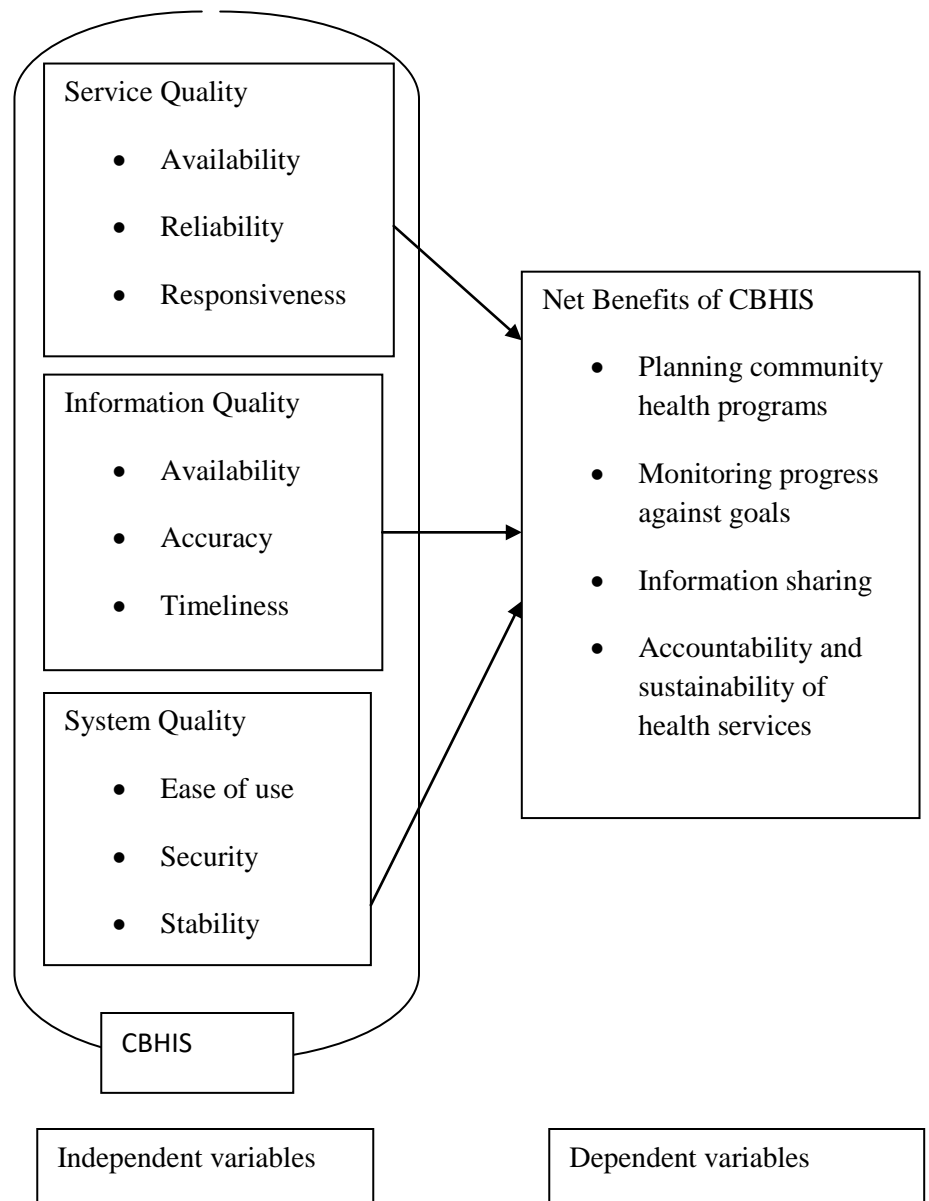
Figure 4: Conceptual Framework

Conceptual Framework Variable Operationalization

Factors	Indicators	Description
Information quality	Accuracy	The data found in the CBHIS is free of errors
	Timeliness	Data storage, management, and communication is done timely
	Availability	The information is readily available when needed
System quality	Security	Information collected via CBHIS should remain secure from any interruptions
	Ease of use	CBHIS users do not experience challenges in getting information from the CBHIS
	Stability	The CBHIS is stable for use at any time with limited downtime
Service quality	Responsiveness	The CBHIS is responsive to user needs once requests are made
	Data availability	Is the data always available for the users?
	Reliability	The CBHIS gives reliable data that can be used in decision making

Table 1: Conceptual Framework Variable Operationalization

2.7 Conclusion

Research is being done continuously to discover the exact benefits that CBHIS has in the sector and determine if it is the maximum that can be achieved or more can be done. Once the research is done, the stakeholders will know what has been achieved and what more is needed to ensure healthcare services are effective.

CHAPTER THREE:
RESEARCH METHODOLOGY

3.0 Introduction

This part shows the study methodology utilized during the research. It includes research philosophy, research design, target population, sampling and sample size, data collection, validity and reliability. In addition, there is inclusion of the methods that were used in data analysis to get answers to the study questions and the ethical subjects that were faced during the study.

3.1 Research Philosophy

There are two major philosophies that include positivism and phenomenological, that can be looked from two sides that are quantitative and qualitative (Cooper & Schindler, 2008). This research adopted positivism philosophy that asserts that awareness is based from intent and expressed numerically with the explanatory and predictive control and not on subjective rank of a personal view. Positivism philosophy is dependent on testing and proof of empirical data to recognize the relationships that exists between some variables in a phenomenon.

Research based on positivistic approach facts is only factored valid if it is based and measured empirically via the quantitative means and statistical analysis leading to the establishment of theoretical models that can be used to describe the relationship between two variables. This study used quantitative data objectively collected from the decentralised healthcare sector in Kenya.

3.2 Research Design

The research used the quantitative research design to establish the benefits of CBHIS on the delivery of community-based healthcare services and decision-making in Kiambu Kenya. The study utilized the survey as its research strategy since the researcher collected large amount of data and analyzed it to make a conclusion. The first step involved exploratory design which involved developing a hypothetical statement. The hypothetical statement in this research was "CBHIS has greatly benefited the community-based healthcare services in Kiambu County. Descriptive design involved assessing the study happening without the manipulation of variables, and thus required the researcher to get data and establish relationships without inferring causality. In this step, data was collected to check if the hypothetical statement is true or false.

Saunders (2009) argued that descriptive studies need to be viewed as a means to an end and not the actual end. Explanatory study tries to clarify 'why' and 'how' there is a relation between multiple aspects of an occurrence. The explanatory study design explained best the traits of variables and how to ascertain cause-and-effect affiliation between variables. The stress is on studying a problem to explain the relationship between the variables (Saunders *et al.,* 2007). Exploratory, descriptive, and explanatory research were done to justify the impact ICT has brought to the delivery of ICT-based services in Kenya.

The hypotheses to test are;

H1:   There is no relationship between information quality and Net benefits of CBHIS.

H2:   There is no relationship between system quality and Net benefits of CBHIS.

H3:   There is no relationship between service quality and Net benefits of CBHIS.

3.3 Target Sample

There are many people affected by the CBHIS in the healthcare industry of Kiambu County, but there is the need to get a target population as it is difficult to involve the total affected population in Kiambu. The research focuses on the health related NGOs, Kiambu health sub-county departments, Community based organization, and community health workers as they are the ones who need information from the system to help the community. In Kiambu, there are 38 main NGOs and according to a Kiambu County Integrated Development Plan, there are 30 of them that concentrate of health issues such as HIV and AIDS. The same study shows that there are 10,000 community based organizations and half of them deal with health issues and community empowerment, which gives a round 5000. Health matters are handled at the sub-county levels and in Kiambu there are 12 sub-counties which benefit from the CBHIS. In each sub-county, there are 12 health records and information officers who are tasked with collecting and handling health related data that can be used in CBHIS. According to a County Government of Kiambu department of health services HIV&AIDS strategic plan, there are 4025, health workers, with an estimated 1500 being community based practitioners, and hence they have interactions with the CBHIS. From the above data, the total population of those who should be involved in the study to know the benefits of CBHIS in Kiambu County is (12*12) +30+5000+1500=6674. To find the target sample, I used the online sample size calculator by

Qualtricks. I set the confidence levels at 90% because the population was very large. The confidence levels were set at 7% as for a large population the interval does not matter much since the target sample is just a depiction of the large population and the slight difference may not have any significance as the sample will still be a true representation of the total population. From the calculator the output was 136, which means I had to administer 136 questionnaires in Kiambu to get enough respondents to use and make a conclusion.

3.4 Data Collection Procedures

For any research to be valid there must be data that is collected from the target population to support it. The two common types of data are the primary and secondary sources. For this research, the researcher used primary data since it gave a more accurate concern of the situation. According to Creswell (2000), the data collection procedures for primary facts are: structured and semi-structure questionnaires, mailed questionnaires, structured and semi-structured interviews done via telephone and personal interviews, scrutiny and focus group discussions. Questionnaires are mainly utilized techniques when respondents are co-operative. The reason for choosing questionnaires is that they helped get a bigger number of subjects. The research utilized questionnaires that have closed-ended questions. Likert scale was used since it is suitable as it abides by the principles of validity and reliability. Any other method of collection of primary data could be allowed if a special case arose on the way.

3.5 Validity of Data Collection Instruments

Any instruments that are used to get the research data should be valid to give the most accurate evidence. Pilot tests were used for content validity. The results were used to derive adjustments to make sure the instrument work as required (Saunders *et al*., 2007). Pilot test tested if the respondents were to face any challenges in accepting the items, if they will leave out some items, estimated the time one would take to fill the instrument to give an indication of the expected success of the instrument application in the field.

Experts were consulted to give their opinions on the words used in the questionnaires and ensure the questions were clear and precise. The study had to borrow from other past research works since the mechanisms used in literature collection and review does not change regularly (Arumugum, 2008).

3.6 Reliability of Data Collection Instrument

Reliability is the determination of the level to which study instruments will give steady

outcome (Mugenda and Mugenda, 2003). To avoid bias and ensure there is reliability in this research, ten respondents who were not the actual target population were given the questionnaires to see if it was easy for them to understand it. SPSS software was utilized to confirm the reliability of all the gathered facts.According to Zikmund (2003), if reliability is used to a measurement that is not erroneous, it will give consistent result. Garson (2006) stated that reliability could be measured using the Cronbach's Alpha. This is the percentage of discrepancy where the observed scale would explain in hypothetical true scale composed of all probable items in the space. Reliability below 0.6 are poor, and for them to be considered acceptable, they have to be over 0.7 and lastly reliability above 0.8 are perfect.

3.7 Data Processing and Analysis

Data analysis is an use of reasoning to gain a clear understanding and interpretation of the data or information collected using questionnaires (Zikmund,2003). Descriptive statistics that may include mean, standard deviation, bars, charts percentages and frequency distribution was used to describe variables. Inferential statistics and regression was used to analyse the data using Software Package for Social Science (SPSS).

Regression was utilized to test the relation that exists between the independent and dependent variables. A hypothesis finding of this research was evaluated using SPSS to determine if the research supported the hypothesis.

3.8 Study Limitations and Ethical Considerations

Research involves multiple ethical issues that should be well monitored so that the research will not violate the ethics. There can be failure or inappropriate referencing. Any data that was got from other researchers work had to be properly cited to avoid plagiarism. Integrity and honesty was fully observed from the time the researcher started the work, to the data collection time, and during the analysis. The rights of the respondents should not be violated as they can file legal suites. Finances can be a limitation in data collection. To solve the challenge of finances, data collection was only conducted in Kiambu County. When the researcher went to the field, they started by giving a small introduction regarding what they were doing. The researcher sought consent from the targeted respondents on if to continue with the process or not. They sought the acceptance of the respondents to avoid any form of coercion. Once the respondents were willing to take part in the study, there was the need to respect their confidentiality and this was made possible by ensuring their personal identifying details never

appeared on the questionnaires. The collected data was analyzed without any prior manipulations.

CHAPTER FOUR:

DATA ANALYSIS AND PRESENTATION

4.1 Introduction

This section is a presentation of the data analysis and findings that was got from the study as per the research methodology. The data that was collected during the research was summarized in form of tables and graphs to help get a better understanding of the data. All the data was collected from Kiambu County to get the benefits that the CBHIS has brought to the healthcare of the people of Kiambu. This chapter helps discuss the findings from the data that was collected. SPSS was the main analytical tool used during the analysis.

4.2 Response Rate

150 questionnaires were administered to the people in Kiambu and 140 were received correctly answered, which is 93% response rate. The returned questionnaires were enough for the analysis.

4.3 Questionnaire Analysis

The section gives an analysis of the questionnaires to help make a conclusion. The first section involves basic information of the respondents. The second part of the questionnaire helps determine the category the respondents belong to and the duration of usage of the CBHIS. The third section helps get the actual benefits that the CBHIS has brought to the Kiambu County.

4.3.1 Demographic Information

This section gives the general information of the respondents. Some of the information covered is the age, gender, and the category they belong to in terms of the usage of CBHIS.

4.3.1.1 The age of the respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		2	1.4	1.4	1.4
	18-28	44	31.0	31.0	32.4
	29-39	36	25.4	25.4	57.7
	40-50	30	21.1	21.1	78.9
	51-61	26	18.3	18.3	97.2
	62-72	4	2.8	2.8	100.0
	Total	142	100.0	100.0	

Table 2: Age bracket

The highest percentage of the respondents was aged between 18 and 28 years. This is the age of the most productive people in any societal setup.

4.3.1.2 Gender of the respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	86	60.6	61.4	61.4
	Female	54	38.0	38.6	100.0
	Total	140	98.6	100.0	
Missing	System	2	1.4		
Total		142	100.0		

Table 3: Gender

Most of the respondents who took part in the survey were male. They were 61.4% of the total respondents.

4.3.1.3 Category of belonging of respondents in the society

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Community Member	4	2.8	2.9	2.9
	Community health staff	26	18.3	18.6	21.4
	Healthcare NGO staff	20	14.1	14.3	35.7
	National or County government healthcare staff	90	63.4	64.3	100.0
	Total	140	98.6	100.0	
Missing	System	2	1.4		
Total		142	100.0		

Table 4: Respondents categories

The highest percentage belonged to national or county government healthcare staff, followed by the community health staff, the NGOs, and finally the community members. Few community members were involved because they do not directly benefit from the CBHIS. The health practitioners directly benefit from the CBHIS and then indirectly pass these benefits to the community.

4.3.1.4 Duration of usage

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never used	2	1.4	1.4	1.4
	1 to 2 years	96	67.6	68.6	70.0
	3 to 4 years	32	22.5	22.9	92.9
	5 years and above	10	7.0	7.1	100.0
	Total	140	98.6	100.0	
Missing	System	2	1.4		
Total		142	100.0		

Table 5: Duration of use

68.6% of the respondents used data from the Community Based Healthcare Information System (CBHIS) for 1 to 2 years. The 68.6% usage is convincing enough to show that the involved respondents have had enough experience with the CBHIS.

4.3.2 Information Quality

This section helps understand the quality of information that is received from the CBHIS in use in Kiambu County. This section covers the accuracy, timeliness, and availability of the CBHIS data.

4.3.2.1 Data Accuracy

Data from the CBHIS is accurate
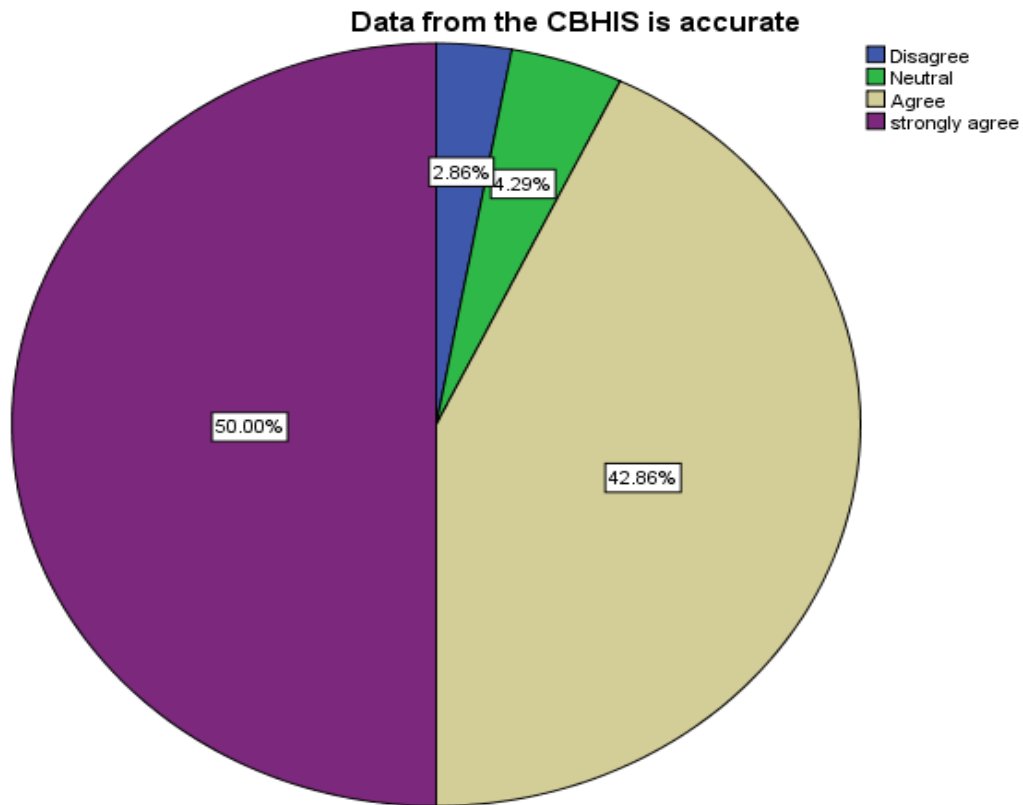
Figure 5: Data accuracy

50% of the respondents strongly agreed, while 42.86% agree data from the CBHIS is accurate. 92.86% of the respondents agree that the data from the CBHIS is accurate, which means the retrieved information is of high quality.

4.3.2.2 Data timeliness during retrieval

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Neutral	8	5.6	5.7	5.7
	Agree	45	31.7	32.1	37.9
	strongly agree	87	61.3	62.1	100.0
	Total	140	98.6	100.0	
Missing	System	2	1.4		
Total		142	100.0		

Table 6: Timeliness during retrieval

62.1% of the respondents agreed that data from the CBHIS is timely during retrieval. There are no respondents who disagree that information retrieval from the system is not timely, meaning that the users of the CBHIS retrieve their data within the allowed time periods.

4.3.2.3 CBHIS Availability
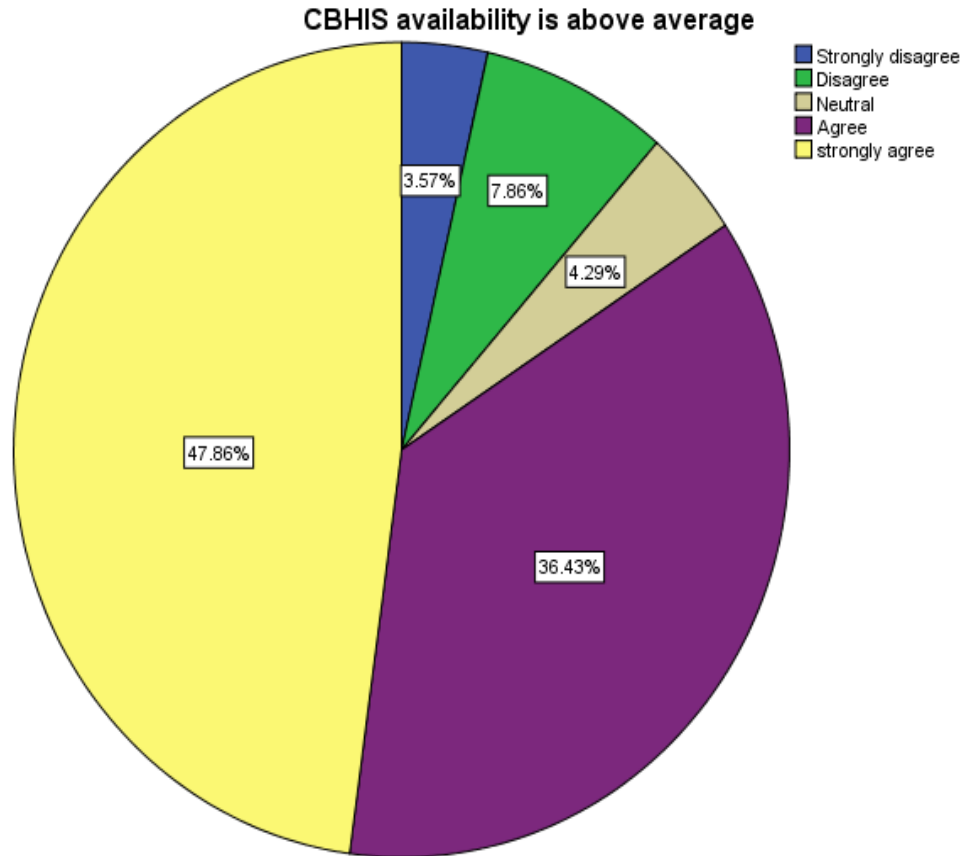
Figure 6: Availability of the CBHIS

47.9% of the participants strongly agreed and 37% agree that CBHIS availability is above average. Having more than 80% of the respondents agree that CBHIS is readily available, is a clear sign that the system quality is reliable.

4.3.3 System Quality

This section focuses on the actual operations of the CBHIS system.

4.3.3.1 CBHIS data is secure from any interruptions

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	9	6.3	6.4	6.4
	Neutral	7	4.9	5.0	11.4
	Agree	86	60.6	61.4	72.9
	strongly agree	38	26.8	27.1	100.0
	Total	140	98.6	100.0	
Missing	System	2	1.4		
Total		142	100.0		

Table 7: Security of the CBHIS

61.4% agreed that CBHIS data is secure from any interruptions. More people are likely to use the CBHIS because they trust that the data remains secure and not easily to be interrupted.

4.3.3.2 Challenges when getting data from CBHIS
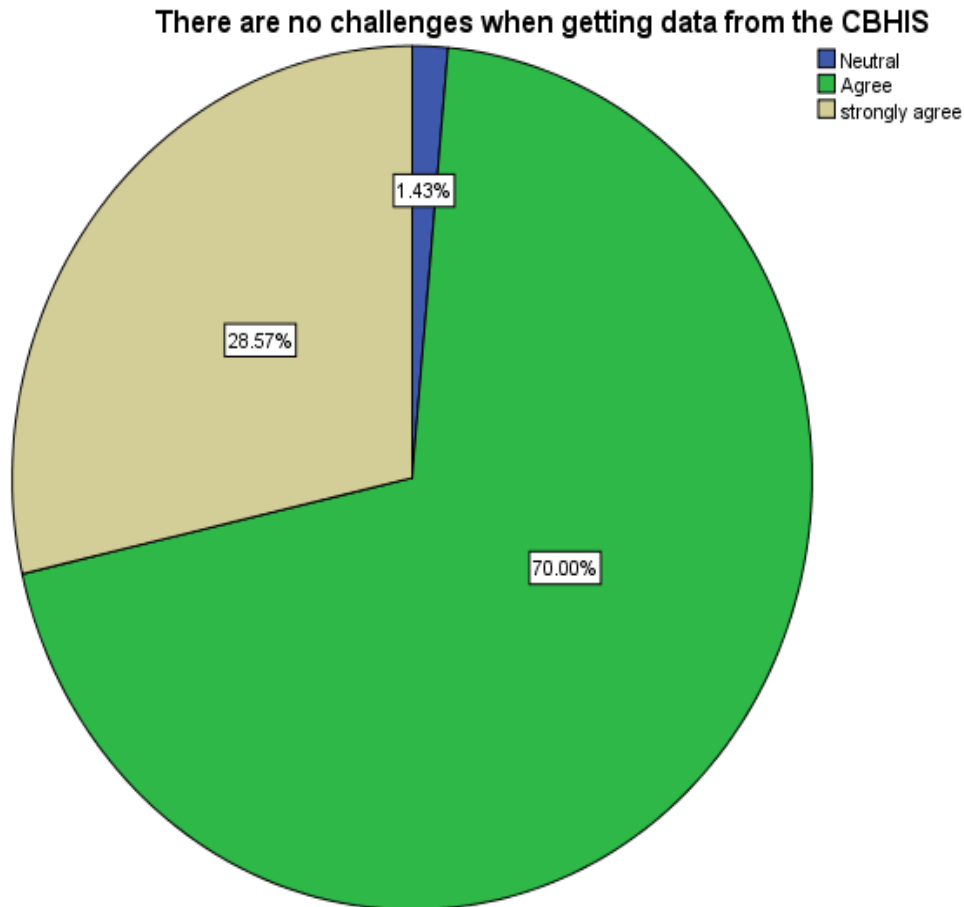
Figure 7: challenges when getting data from the CBHIS

70% of the respondents agreed that there are no challenges when getting data from the CBHIS. Having no challenges in retrieving data from the CBHIS encourages more people to use it.

4.3.3.3 CBHIS Stability

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	10	7.0	7.1	7.1
	Neutral	10	7.0	7.1	14.3
	Agree	90	63.4	64.3	78.6
	strongly agree	30	21.1	21.4	100.0
	Total	140	98.6	100.0	
Missing	System	2	1.4		
Total		142	100.0		

Table 8: Stability

64.3% of the respondents agreed that CBHIS system is stable for use. Users are encouraged to use a system that is stable and this is the case for the CBHIS.

4.3.4 Service Quality

4.3.4.1 Data meets user requests
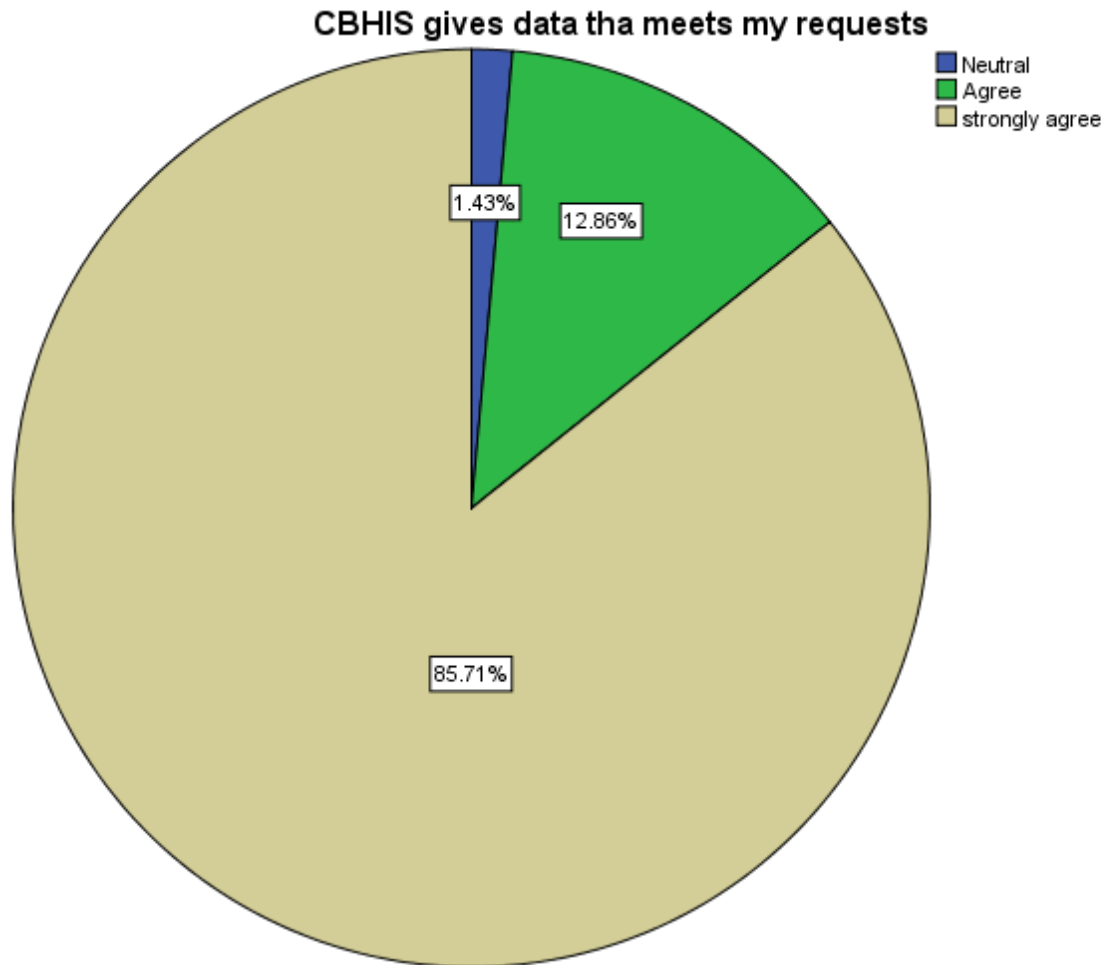
Figure 8: User requests

85.7% of the respondents strongly agreed that CBHIS gives data that meets requests. This percentage means that the users will be motivated to use CBHIS since their requests are fulfilled.

4.3.4.2 Data Availability

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	7	4.9	5.0	5.0
	Disagree	31	21.8	22.1	27.1
	Neutral	22	15.5	15.7	42.9
	Agree	41	28.9	29.3	72.1
	strongly agree	39	27.5	27.9	100.0
	Total	140	98.6	100.0	
Missing	System	2	1.4		
Total		142	100.0		

Table 9: Data availability

29.3% of the respondents agreed that all the healthcare data that is needed is available in the CBHIS. 27% of the respondents strongly agree that data from the CBHIS is always available, which means that over 50% of the respondents agree that CBHIS readily avails data for their use.

4.3.4.3 Reliability- Data from the CBHIS is reliable for decision making

Data from the CBHIS is reliable for decision making

Legend:
- Disagree
- Neutral
- Agree
- strongly agree

2.86%

29.29%

65.71%
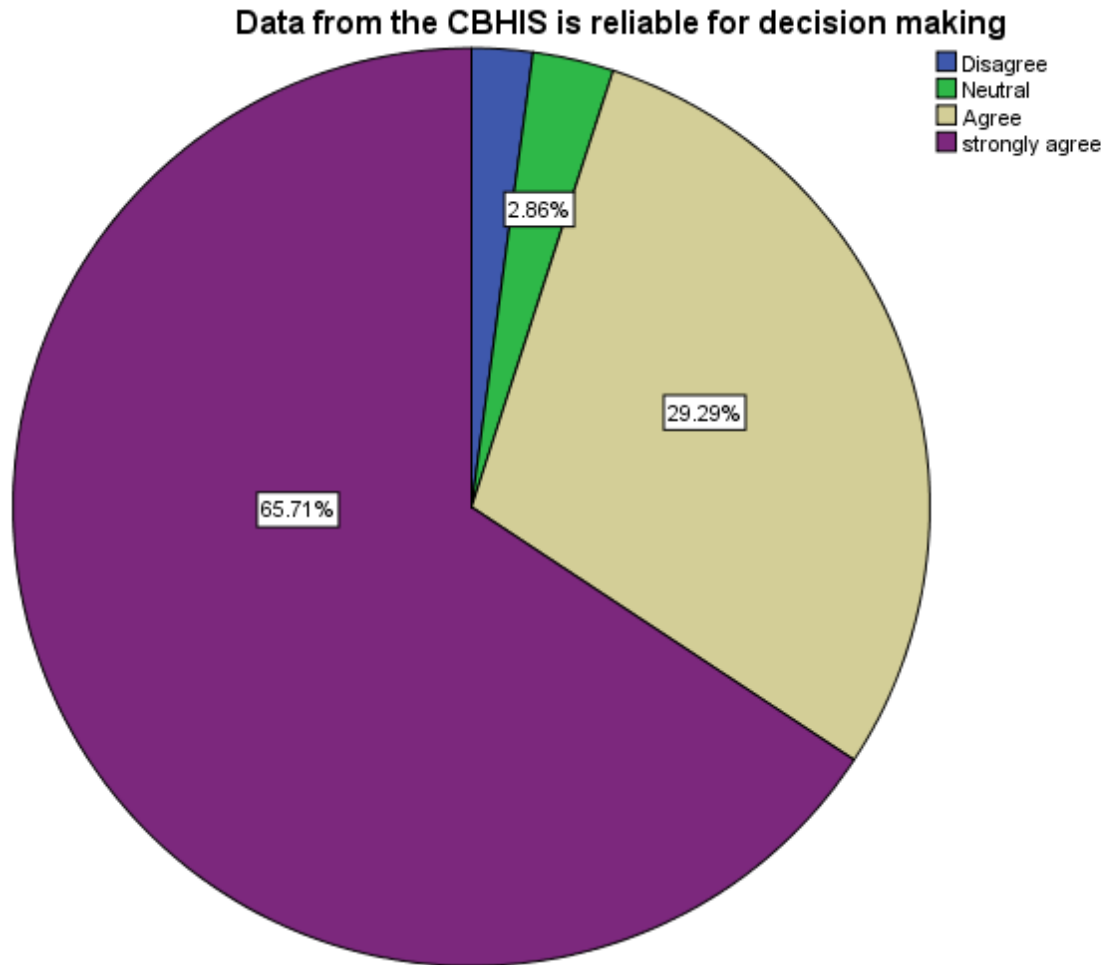
Figure 9: Reliability

65.7% of the participants strongly agreed that data from the CBHIS is reliable for decision making. Users of the system are motivated to use the CBHIS since they retrieve information that is reliable in decision making.

4.3.5 Net Benefits of the CBHIS

This section seeks to outline all the benefits that CBHIS has brought to the people of Kiambu County.

4.3.5.1 Simplification of planning of the community healthcare programs

CBHIS has simplified planning of the community healthcare programs

- Strongly disagree
- Disagree
- Neutral
- Agree
- strongly agree

4.29%

14.29%

8.57%

51.43%

21.43%
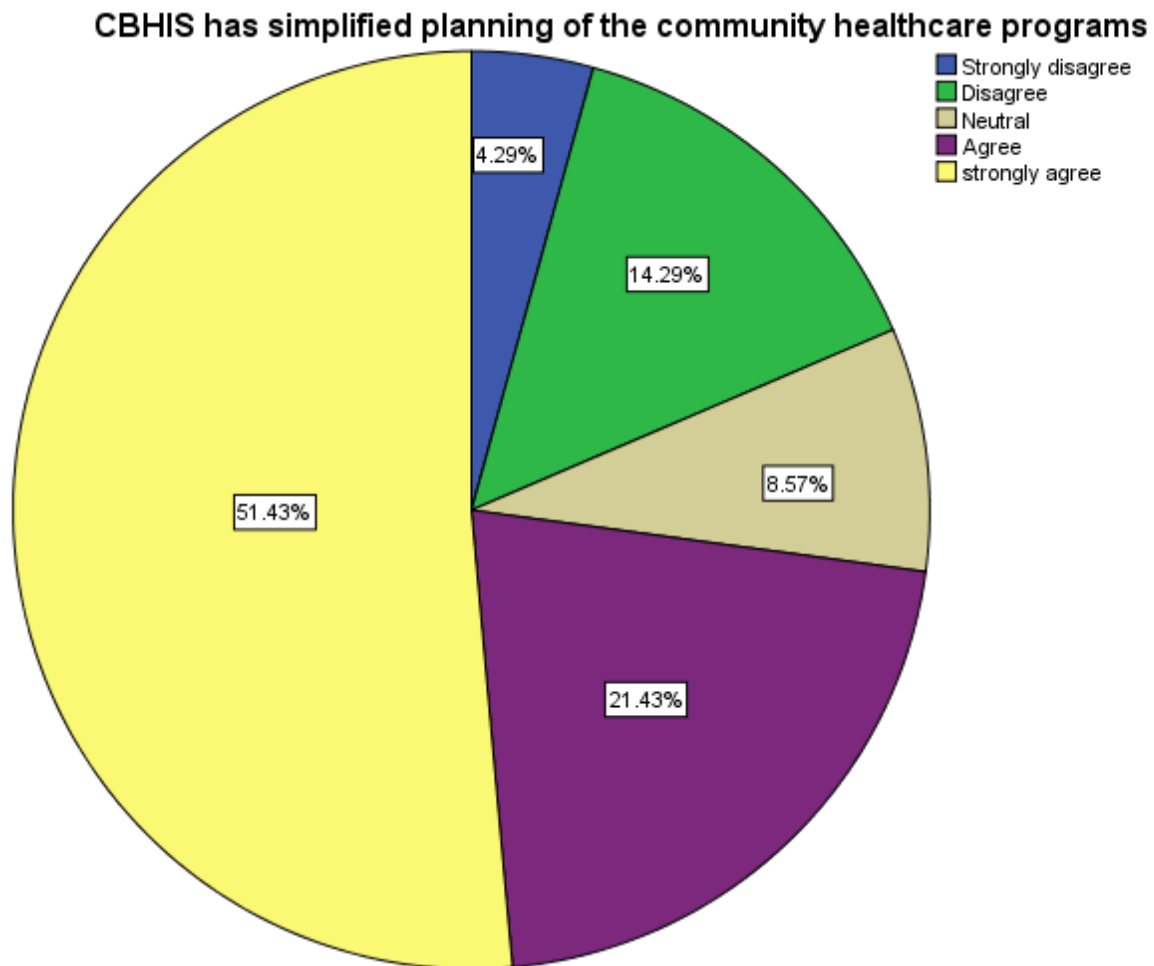
Figure 10: Simplified planning of community healthcare programs

51.4% of the participants strongly agreed that CBHIS has simplified planning of the community healthcare programs.

4.3.5.2 Ease of monitoring progress of community healthcare against the set goals

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	2	1.4	1.4	1.4
	Disagree	3	2.1	2.1	3.6
	Neutral	13	9.2	9.3	12.9
	Agree	83	58.5	59.3	72.1
	strongly agree	39	27.5	27.9	100.0
	Total	140	98.6	100.0	
Missing	System	2	1.4		
Total		142	100.0		

Table 10: Ease of monitoring progress

59.3% of the respondents agreed that it is easy to monitor the progress of the community healthcare against the set goals. The CBHIS avails enough data that can be used to compare the progress of the community healthcare programs to the goals that are initially set.

4.3.5.3 Simplified sharing of the community healthcare information

CBHIS has simplified the sharing of the community healthcare information
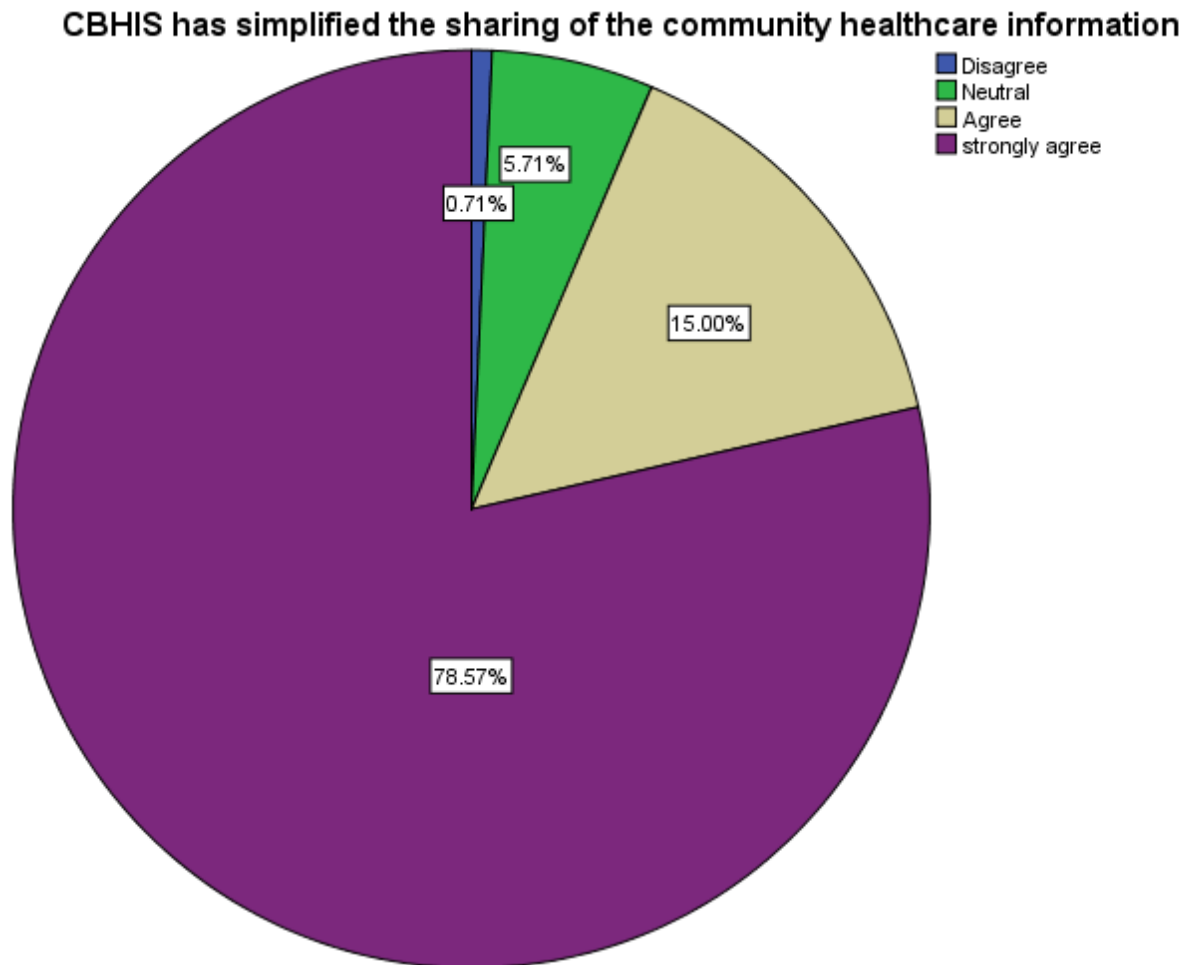
Figure 11: Simplified sharing of the community healthcare information

78.6% of the participants strongly agreed that CBHIS has simplified the sharing of the community healthcare information. It is simple to communicate any healthcare information in Kiambu County using the CBHIS.

4.3.5.4 Accountability
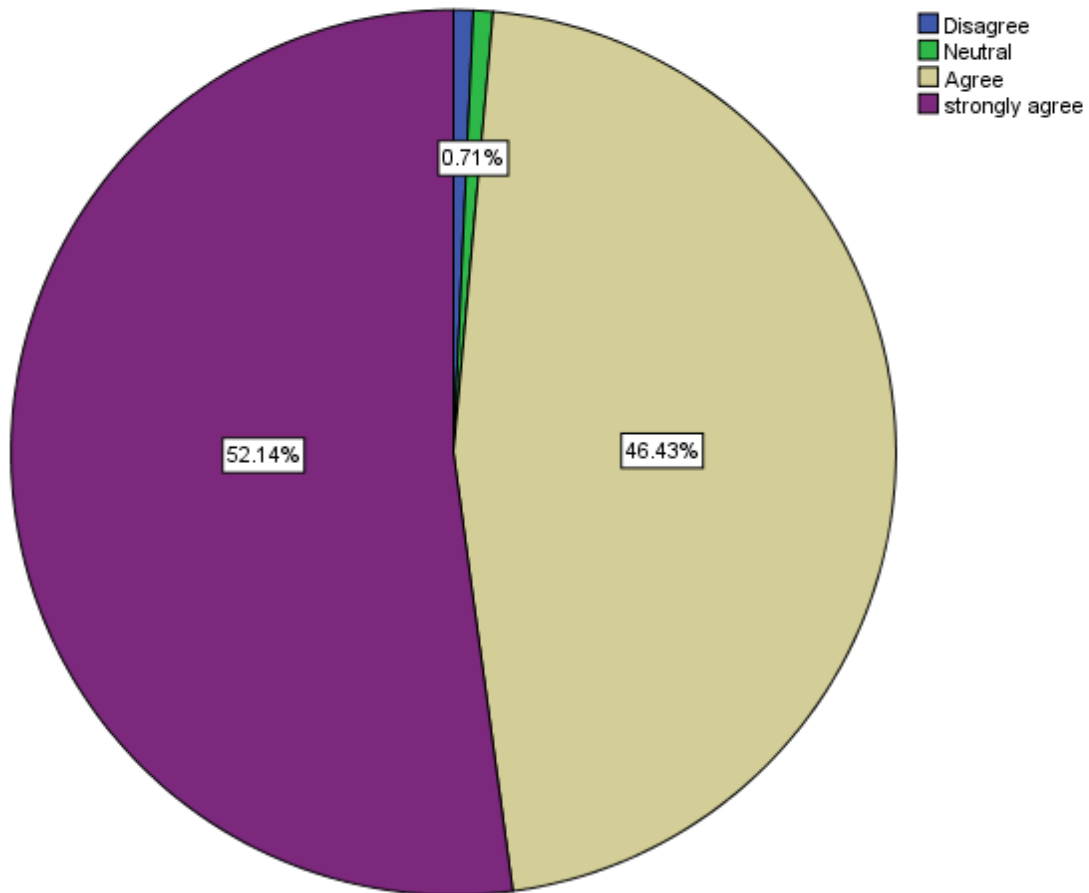
Figure 12: Accountability

52.1% of the respondents strongly agreed that CHBIS has brought accountability and sustainability in the community healthcare services. Data retrieved from the CBHIS brings more accountability on the healthcare services that take place in Kiambu County.

4.3.5.5 Recommendation
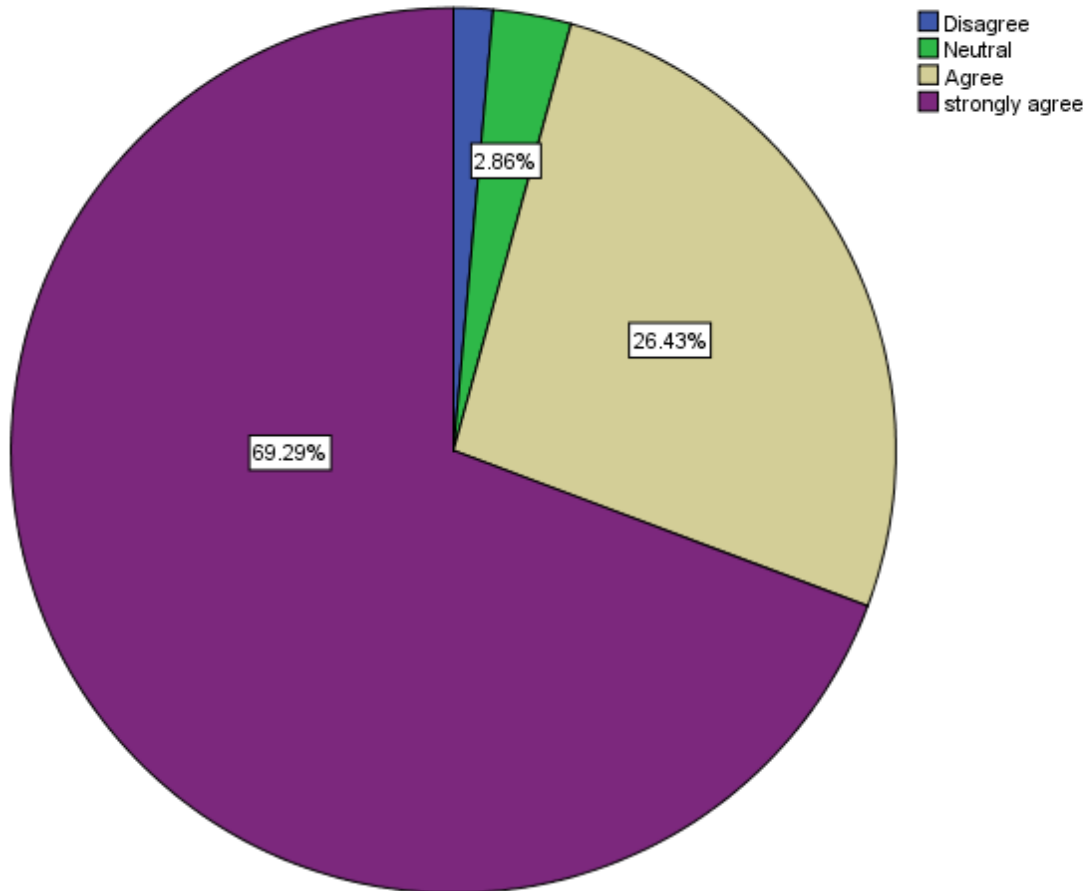
Figure 13: Recommendation of the CBHIS

69.29% of the respondents strongly agreed to recommend the use of the CBHIS to their friends and other organizations. This shows that it is a good system since nobody can recommend a bad system to other users.

4.4 Regression Analysis

Reliability Statistics

Cronbach's Alpha	N of Items
.87	4

Table11: Cronbach's alpha

Cronbach's alpha is a measure of how closely related some items are in a group. A reliability coefficient of above 70% is acceptable. The value of Cronbach's Alpha indicates that the four

variables used in the study are 87% reliable. Hence the variables that are used in the study are reliable to make an appropriate conclusion.

4.5 Hypothesis Testing

H1:   There is no relationship between information quality and Net benefits of CBHIS.

H2:   There is no relationship between system quality and Net benefits of CBHIS.

H3:   There is no relationship between service quality and Net benefits of CBHIS.

Correlations

		Information Quality	System Quality	Service Quality	Net Benefits of CBHIS
Information Quality	Pearson Correlation	1	-.023	.009	-.041
	Sig. (2-tailed)		.787	.912	.628
	N	140	140	140	140
System Quality	Pearson Correlation	-.023	1	-.040	.150
	Sig. (2-tailed)	.787		.642	.078
	N	140	140	140	140
Service Quality	Pearson Correlation	.009	-.040	1	.231[**]
	Sig. (2-tailed)	.912	.642		.006
	N	140	140	140	140
Net Benefits of CBHIS	Pearson Correlation	-.041	.150	.231[**]	1
	Sig. (2-tailed)	.628	.078	.006	
	N	140	140	140	140

**. Correlation is significant at the 0.01 level (2-tailed).

Table 12: Correlations

According to the table above, Pearson moment correlation indicates that there is a positive linear relationship between the independent variables and the dependent variable. All the dependent variables have a statistically significant linear relationship at the 0.01 level. Therefore, we do not accept all the null hypotheses that independent variables do not have a relationship with the dependent variable. And the conclusion is that there is a significant relationship between the information quality, system quality, and service quality and the net benefits received from the use of the CBHIS.

4.6 Results and Discussion

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Service Quality, Information Quality, System Quality[b]	.	Enter

a. Dependent Variable: Net Benefits of CBHIS

b. All requested variables entered.

Table 13: Regression analysis

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	2.83[a]	.80	.60	2.01947

a. Predictors: (Constant), Service Quality, Information Quality, System Quality

Table 14: Model analysis

From the table above R is 2.83, which is a positive figure to mean the association between the independent variables and dependent variables is positive. The model summary indicates that 80% of variability in y variable can be explained by the X variables. Hence, 80% of the variability in the dependent variable is explained using the independent variables and it signifies

that there is a well-built relationship between the variables. Hence it is clear that an alteration in the independent variables will bring a strong change in the dependent variables. If the information quality, system quality and service quality of the CBHIS increases, we expect an increase in the net benefits to the healthcare services to the community of Kiambu County.

Correlation Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	9.998	2.991		3.342	.001
	Information Quality	.058	.119	.040	.485	.628
	System Quality	.308	.161	.158	1.921	.057
	Service Quality	.330	.114	.237	2.882	.005

 a. Dependent Variable: Net Benefits of CBHIS

Table 15: Coefficients

Net benefits of CBHIS can be forecasted using the following model as per the table above.

Net benefits of CBHIS = 9.998 + 0.058 information quality + 0.308 system quality + 0.330 service quality.

Results and Findings

A unit change in information quality brings a 0.058 change in the net benefits of the CBHIS. A unit change in system quality brings a 0.308 change in the net benefits of the CBHIS. A unit change in service quality of the CBHIS brings 0.330 change in the net benefits received from the use of the CBHIS. The unit change can be positive or negative and it will bring about a positive or negative change respectively in the net benefits received.

The results from the above table shows the regression coefficient of the study to signify that there is a positive relationship between the information, system, and service quality to the net benefits that the CBHIS gives to the healthcare sector of Kiambu County. Increasing any of the listed variables will have a positive influence on the benefits the people of Kiambu receive from the CBHIS. From the analysis the significance level is 0.001. From the analysis, all the variables used in this study are significant statistically, with the P-values as follows; 0.628, 0.57, and 0.05. The variables have sufficient evidence to make a conclusion that a non-zero correlation exists.

From the study it is clear that the information, system, and service quality of the CBHIS are positively correlated to the net benefits the people of Kiambu County receive from the system.

It is clear that the CBHIS has a direct influence on the net benefits because if the three variables found in the systems changes we get a significant change on the net benefits received. If the quality of the information, service, and system goes down, it means the users will get lesser benefits from the CBHIS.

The CBHIS has helped link the community to the Ministry of health by availing data to the ministry regarding the community health. Once the data reaches the ministry, they use it for planning various health issues in the county, which is a similar approach to that Braa et al, (2012) got in trying to assess how the quality of data can be made better in Zanzibar. The actual data users are engaged to get ways to improve the quality of data and use it in decision making.

The CBHIS has bridged the gap that existed between the community and the health department because there are constant links that ensure data is available to be used in making decisions. The improved flow has enabled the community to take part in ensuring their health is right as it is evident from the research by the 52.1% of the respondents who strongly agree that CBHIS has brought sustainability in the healthcare sector.

Using the system, the community can follow the progress of the planned healthcare activities and determine if they are successful or not, then come up with objectives to solve the likely constraints. Involving the locals in planning is useful since they help in information searching since they are directly affected.

Information quality is the core element in any decision making process. From the study, it is clear that the CBHIS has sufficient, accurate, and timely information that is retrieved from the community. Information that is readily available for the user and in accurate format is very beneficial for any system users because it is used to make quick inferences. Users of the information who may be the county government, national government, NGOs, and other community health workers benefit from the CBHIS since they use the data to make decisions on how to improve the health of the community, which ends up benefiting the people of Kiambu health wise.

System quality should always be considered. For this case, system quality is determined by the way the CBHIS is stable, easy to use, and secure. A system that meets all the listed qualities will help hold and distribute quality healthcare information (Beall, 2017). From the data that was

collected and analyzed, the CBHIS meets all the quality requirements, which means the people of Kiambu have benefitted from the use of the system. For the CBHIS to be considered of good quality that brings efficiency in the healthcare of Kiambu County, it must have a good service quality. The data that was analyzed shows that the CBHIS is responsive to user requests, data is always available when needed, and in a reliable format.

4.7 Conceptual Framework Validation

The framework had three independent and one dependent variable. Test was done on the framework to understand how the net benefits of the usage of CBHIS were affected by the independent variables. The test was enabled by generating questions from the variables and testing them.

System quality and service quality variables have a positive correlation to mean they have positive effects on the net benefits achieved from the use of the CBHIS. There is 87% reliability of the variables used to validate the framework, which means that the conclusions made from the analyzed data are reliable.

The positive correlations show that CBHIS has positively influenced the way healthcare services are delivered in Kiambu County, meaning the population has benefitted from the system.

CHAPTER 5:

CONCLUSION AND RECOMMENDATION

5.1 Introduction

This chapter includes the challenges faced during the study, suggestion for further research, recommendations, and conclusions made from the study.

The purpose of this study was to evaluate the benefits that the use of CBHIS has brought to the healthcare sector of Kiambu County. Questionnaires were administered to all the groups of people who are directly affected by the usage of the CBHIS.

Healthcare is a delicate sector for each county and having accurate and reliable health records can help ensure the services are running smoothly and the community is benefiting.

The first objective was to assess how CBHIS has helped in the dissemination of quality information in the healthcare sector of Kiambu County. From the research, it shows that information that is retrieved from the CBHIS is accurate, timely, and readily available. The system has ensured there is quality information disseminated because for any data to be termed as quality, it must be accurate. During data dissemination, timeliness is a key factor because some systems may have delays that will hinder data dissemination. CBHIS is timely meaning the data that is shared reaches the users within the allowed time.

The second objective was to ascertain whether CBHIS has brought about quality in the healthcare services of Kiambu County. For users to receive quality services from a system, it must be stable, secure, and easy to use. Data collected from the research shows that the CBHIS is secure, easy to use, and stable; hence the users get the necessary services as per their requests.

The third objective was to establish the efficiency of CBHIS to the healthcare provision in Kiambu County. According to Hill, Schmidt, Edmondson & Gokhale, 2010, for a system to be considered efficient in delivery of information, it must be responsive to user requests, reliable, and data should be readily available. From the data collected, the respondents have agreed that the system possesses the three listed qualities; hence it means that the people of Kiambu have benefited from the CBHIS.

5.2 Study Limitations

The study was successful, but there were various limitations faced. The major challenge was retrieval of data from the respondents. Most respondents were not willing to take part in the study as they were busy, while some others just ignored. Budget and time were the other issues. The study involved printing the questionnaires and moving around Kiambu County to get the respondents, which was expensive and time consuming. There was the need to balance between cost incurred and time, because the more the time spent in the field, the more the costs incurred.

5.3 Suggestion for Further Research

The study helped understand that the introduction of the CBHIS has greatly benefited the healthcare sector of Kiambu County. The benefits of the CBHIS have trickled down to the community because the people who are concerned with healthcare in the county are able to receive all necessary information with ease and use it to make decisions that help streamline the health sector. Kiambu does not experience many epidemics such as the remote counties. Semi arid and arid areas experience multiple epidemics such as malaria and cholera, which need to have a proper system to collect, store, and disseminate data that will be used to make the decisions on the ways to fight the diseases. Having a functional CBHIS installed and not just the supporting tools being used in these counties that face more epidemics will help get more information on how to mitigate them. It would be necessary to have a similar research done in the nomadic counties since they are highly affected by the lack of sufficient systems to store and use data to make healthcare decisions. It is necessary to have an established CBHIS that will function as a complete system, rather than using it as tools to support other systems. If the system is fully established, it will make data handling and dissemination simple since it will not have to depend on other systems.

There is the need to research more on how to incorporate data analysis in CBHIS (Beall, 2017). There is a lot of data that is collected and held by the CBHIS and if there is no proper analysis done, it means it will remain useless and may not be very helpful to the people and the community. Incorporation of data analysis mechanisms in CBHIS will help in analyzing the data that is held in the system and make better decisions that will bring more health benefits to the community.

5.4 Recommendations

Data collected and analyzed from this study shows that the introduction of CBHIS in Kiambu County has benefited the users in the way the healthcare services are delivered. The biggest beneficiaries are the National and County Health staffs, Community health workers, and the NGO staffs who deal with healthcare activities. CBHIS has made data retrieval simple because the groups get data they need for their healthcare activities with ease from the system. It is recommended that all the healthcare givers in Kiambu and many other counties adapt the use of CBHIS as a secondary source of data useful in the health industry. The CBHIS should be updated regularly so that the users will receive the current information and records since some data may be outdated and will give irrelevant message to the users.

It is recommended that appropriate measures be put in place to ensure the CBHIS remains secure from any malicious actions so that the users will access the needed information without any downtime.

It is recommended that more funds should be allocated to help raise the ICT awareness in the healthcare industry because it will enable more users utilize data from the CBHIS.

5.5 Conclusion

The study was successful. From the study outcomes, it is clear that the people of Kiambu County have benefited from the use of the CBHIS. The healthcare givers have directly benefitted from the CBHIS since they get sufficient information to help make decisions. Some of the benefits they have received are timely data, reliable information, up to date information, easily retrieved data, and sufficient information among others. The healthcare givers have used all the data from the CBHIS to make healthcare decisions that have ensured the people of Kiambu County get good and reliable healthcare. The benefits that have reached the people are that the planning of various healthcare programs has been simplified, monitoring of the progress of community health programs has been made easy, it is simple to share healthcare information, and there is accountability in the healthcare activities. The benefits of the CBHIS have trickled down to ensure the community healthcare is running smoothly. We can conclude that if the CBHIS incorporates a data analysis mechanism, there are high chances of getting more benefits to the users because the data collection, storage, and dissemination will be simplified. Introduction of data analysis simplifies the task of making inferences from the stored data as it supports analysis

and storage of the healthcare data in the cloud, which is a safer and reliable way to complement the CBHIS.

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Appendix

Questionnaire

EVALUATING THE BENEFITS OF COMMUNITY-BASED HEALTH INFORMATION SYSTEMS (CBHIS) IN HEALTHCARE KENYA (A CASE OF KIAMBU COUNTY)

Data Collection Questionnaire

1. Section One

A**.** In which age bracket are you?

     i.   (18-28) ☐

    ii.   (29-39) ☐

   iii. (40-50) ☐

   iv. (51-61) ☐

    v.   (62-72) ☐

   vi. Over 72 ☐

B. Which is your gender?

     i.   Male ☐

    ii.   Female ☐

2. Section Two

A. Which among these categories do you belong to?

     i.   Community member ☐

    ii.   Community health staff ☐

   iii. Healthcare NGO staff ☐

   iv. National or County government healthcare staff ☐

    v.   Others (specify)……………………..

B. For how long have you used data from the Community Based Healthcare Information System (CBHIS)?

     i.   Never used ☐

    ii.   1 to 2 years ☐

   iii. 3 to 4 years ☐

   iv. 5 years and above ☐

Section Three

A. Rate these key drivers why you or your organization use CBHIS

5=strongly agree, 4=agree, 3=neutral, 2=disagree, 1=strongly disagree

	Key Drivers	5	4	3	2	1
1	Data is easy to access					
2	Data is accurate and up to date					
3	The needed data is readily available					
4	IT resources used to access the CBHIS data are available					

Other (specify)……………………………………….

B. Answer each question separately by showing the extent to which you agree to the statement regarding the use of CBHIS

5=strongly agree, 4=agree, 3=neutral, 2=disagree, 1=strongly disagree

A	INFORMATION QUALITY	5	4	3	2	1
1	Data from the CBHIS is accurate					
2	Data from the CBHIS is timely during retrieval					
3	CBHIS availability is above average					
B	SYSTEM QUALITY					
1	CBHIS data is secure from any interruptions					
2	There are no challenges when getting data from the CBHIS					
3	CBHIS system is stable for use					
C	SERVICE QUALITY					
1	CBHIS gives data that meets my requests					
2	All the healthcare data I need is always available in the CBHIS					
3	Data from the CBHIS is reliable for decision making					

D	NET BENEFITS OF CBHIS					
1	CBHIS has simplified planning of the community healthcare programs					
2	It is easy to monitor the progress of the community healthcare against the set goals					
3	CBHIS has simplified the sharing of the community healthcare information					
4	CBHIS has brought accountability and sustainability in the community healthcare services					

D. Please state other benefits you have received from the use of CBHIS (if any)

       i.

      ii.

     iii.

     iv.

      v.

E. Would you recommend the use of CBHIS to other individuals or organizations that need access to healthcare data?

     i. (Strongly agree) ☐

    ii. (Agree) ☐

    ii. (Neutral) ☐

    iv. (Disagree) ☐

    v. (Strongly disagree) ☐