

CHAPTER ONE

INTRODUCTION

In our contemporary world, having access to information and knowledge plays a crucial role in advancing economic and social well-being. The improvement of information and communication technologies (ICTs) has enabled larger amounts of information to circulate and be stored at a much higher speed and a much lower cost. The consequences of all these improvements suggest that the relevance of distance has been diminished.

However, the largest impact of ICTs has occurred in the already industrialised societies as the use of these technologies is limited to the high-income countries, and the élite in low-income countries. The exclusion of a major number of potential users in developing countries has raised concerns about a “digital divide” which is the gap between people with effective access to digital and information technology and those with very limited or no access at all (DFID, 2000, p. 26). In an attempt to shrink this gap, donors such as the UN, the World Bank, bilateral aid agencies, non-government organisations (NGOs) and universities alike are working diligently together with national governments in developing countries to incorporate and mainstream the use of ICTs in their development strategies.

Despite the digital divide, Information and communication technologies (ICTs) in developing countries have been harnessed to bring an information age in which economic and social activity has been widened, deepened and transformed. The more optimistic projections suggest that a computerised and networked world would not only ensure a more widespread and rapid growth of employment, productivity and output, but would also improve access to facilities that enhance the quality of life (Vatsa, 2000). Therefore the development of ICTs have brought about considerable technological changes in health conditions and medical research in Zambia and worldwide.

The development and introduction of ICTs has brought a revolutionary change in work processes and procedures in all sectors of human endeavour. Medical research has the potential of enhancing and prolonging human life if ICTs are harnessed. ICTs play an important role in medical research. This is due to the fact that medical research is an activity that requires information that is in modern day acquired

through the use of ICTs. In particular, ICTs can enable information exchange, knowledge sharing and documentation in medical research.

Despite the anticipated benefits of ICTs in the field of medical research, there is ground for investigation regarding the realisation of the full potential of ICTs. The extent to which ICTs have affected the accessibility of medical research information to medical research personnel in Zambia is not well known and therefore this study sought to explore the effects of ICTs on the accessibility of medical research information by medical research personnel in Zambia.

1.1 ZAMBIA'S BACKGROUND

1.1.1 Location

Zambia is located in Southern Africa and shares borders with the Democratic Republic of Congo and Tanzania on the north; Angola on the west; Namibia on the south-west, Malawi and Mozambique on the east and; Zimbabwe and Botswana on the south. It is a landlocked country and occupies an area of 752,612 square kilometres. Administratively, it is made up of nine provinces: Central, Copperbelt, Eastern, Luapula, Lusaka, Northern, North-Western, Southern and Western. The provinces are then further divided into 72 districts. Although English is the official language of communication, there are seven other local languages that are recognized and used on radio and television.



Fig.1. Map of Zambia
(Source: Zambia Travel Information and Travel guide)

1.1.2 Population

Zambia's population is approximately 11,669,534 (CIA World Factbook, 2008 estimate) of which over 1.3 million live in the capital city of Lusaka. Around 38 percent of the population lives in urban areas, giving Zambia one of the lowest rural population rates in Africa. Population growth is 3.1 percent per annum. It is estimated that about 46 percent of the population is between 15 and 64 years of age.

1.1.3 Climate

Zambia has a savannah type of climate with three distinct seasons. Hot, dry summers with mean temperatures of 32 degrees Celsius; warm, wet spring with mean temperatures around 21 degrees Celsius; cooler-drier winters with mean temperatures of 11 degrees Celsius (Basic Education Atlas, 2002).

There is some degree of similarity in the rainfall pattern over the country but the amount varies considerably. The climate is affected by most of the movement of the Inter-Tropical Convergence Zone. Zambia has an average annual rainfall of 760 mm. The higher rainfall amounts of 1, 200 mm falls on high lands of the north with lowlands recording as low as below 600 mm of rainfall per annum (Basic Education Atlas, 1994).

1.2 Health care and medical research in Zambia

Health care is among priority sectors in Zambia: “It is in this context that the Government, together with civil society, has placed priority attention on those sectors that both maximize growth stimulation as well as on those, such as agriculture, education and health, that best address the plight of the poor” (GRZ, 2006: 1). The prioritization of health by the Zambian Government and civil society is because the mortality rate from infectious and other diseases due to poor health care conditions is high. Therefore it is a deliberate move to not only improve health delivery systems and access the much needed information on preventive measure for epidemics such as HIV/AIDS and Malaria, but also to further medical research for prevention and treatment purposes.

Medical research still faces great challenges such as the HIV/AIDS epidemic that has emerged as an international health crisis that requires more concerted efforts from all stakeholders. HIV/AIDS, with other epidemics including Malaria, Tuberculosis and Cholera have presented a tragedy and challenge at both Individual and national level.

Other Health epidemics are also threatening to decimate the future prospects of most developing countries, wiping away years of hard-won improvements in development indicators. As a result of the health epidemics being experienced, there has been deterioration in vital human developmental indicators such as child survival rates, reduced life expectancy, crumbling and overburdened health care systems, the breakdown of family structures and the decimation of a generation in the prime of their working lives (Allen, 2001). Medical Research, development and implementation with public awareness programmes are one of the identified strategies of achieving development in the health sector.

Medical Research is the branch of scientific research with the purpose of investigating, discovering and applying the information for the improvement or creation of new remedial strategies to prevent, cure or

treat sickness, disease and damage to the body (Sharav, 2003). Medical Research involves the testing and appraisal of new medications, treatments procedures, investigative products and devices, and treatments for safety, effectiveness and efficacy. Medical Research adds to the body of knowledge for the development of prevention, treatment, identification and analysis or for the reduction of symptoms in a disease (Mcharazo, Sjoerd, Koopman: 2007).

1.3 Information Communication Technologies (ICTs)

Sustainable social and economic development in today's Information Age is contingent upon each citizen's ability to access, process and create information. In times past, civilizations searched for gold, precious stones, minerals and ore. In modern time it is knowledge that makes civilizations rich and access to information is cardinal in enabling national and regional progress.

Information Communication Technologies (ICTs) has been described by UNDP (2001) as "the building blocks of the Networked World".

"ICTs represent the combination of microelectronics, computer hardware and software, telecommunications, and opto-electronics such as microprocessors, semiconductors and fiber optics that enable the processing and storage of huge amounts of information, and its rapid dissemination through computer networks." (UNDP, 2001:30).

These technological innovations (ICTs) make it possible to process and store gargantuan amounts of information, and also quick circulation of information through communications network.

1.4 Medical research and ICT information

Medical Researchers are actually professionals who require information, in an effort to help or add to the body of knowledge in the field of medicine. The need for information requires medical researchers to use information communication technologies (ICTs) to gather information, in order to conduct medical research. ICT possesses the ultimate potential of application and improvement in every activity or process that requires information.

The theme of Zambia's Fifth National Development Plan (GRZ, 2006:68) being "broad based wealth and job creation through citizenry participation and technological advancement" encompasses a great potential in using Information and Communications Technologies (ICTs). ICTs can be used to save human lives not just by improving health delivery systems and access to much needed information on preventive measure for epidemics such as HIV/AIDS and Malaria, but also to further medical research for prevention and treatment.

1.5 Statement of the Problem

The global use of ICTs has had a diverse effect on medical research through its effect on the accessibility factor of medical research information to medical researchers. The global development, widespread use and integration of ICTs have affected the efficiency and effectiveness of all processes. Medical research is not an exception as it is seen to harness ICTs in its operations. It is generally assumed that integration of ICTs in any sector has resulted in improvements, however there is little research or available knowledge on the actual effects of the integration of ICTs in Medical Research. It is against this background that the study sought to investigate the effect that ICTs have had in improving medical researchers' access to research information in Zambia.

1.6 Objective

To assess the effects of ICTs on the accessibility of medical research information by medical research personnel in Zambia.

1.6.1 Specific Objectives

- a. To investigate the extent to which ICTs are utilized in accessing medical research information by medical research personnel.
- b. To assess if medical research information is more accessible by medical research personnel with the introduction of ICTs.
- c. To analyze the satisfaction levels of medical research personnel in Zambia with their use of ICTs in accessing medical research information.

1.7 Research Questions

- a. To what extent do medical research personnel utilize/use ICTs in accessing medical research information?
- b. With the use of ICTs, has medical research information become more accessible?
- c. Are medical research personnel satisfied with the use of ICTs in accessing medical research information?

1.8 Significance of the Study

The innovation of ICTs has resulted in changes in all aspects of human activities and processes. These changes have widely been positive but have presented various challenges in the best ways of harnessing ICTs for optimum improvement in all sectors. However, for optimum implementation and use of ICTs it is necessary to assess the effects of ICTs in each individual sector.

It is hoped that the study would bring out the effects that ICTs have had on accessing medical research information and reveal the ICTs that are most used. Having knowledge of effects of ICTs and the ICTs most used by medical research personnel in accessing medical research information will thereby provide direction for ICT policy and implementation. The findings would also add to the already existing body of knowledge for harnessing ICTs.

1.9 Conceptual and Operational Definitions of Concepts

A conceptual framework is the definition of a concept by a set of other concepts. A conceptual definition simply states the distinctive characteristics of that which is being defined. What distinguishes an operational definition from the other is that it is easily testable and what is testable is easily observable. In order to facilitate understanding, the definitions significant to the study should be considered.

1.9.1 Information

Information as a concept has a diversity of meanings, from everyday usage to technical settings. Information is a basic element in any development activity. Therefore information must be available and accessible to all, be it scientific, economic, social, political, institutional and cultural. (Mundy and Sultan, 2001).

1.9.2 Information Communication Technologies (ICTS)

ICTs are tools that facilitate the production, processing, transmission and storage of information (Grace et al, 2004). ICTs include telecommunications technologies such as telephone, cable, satellite and radio, as well as digital technologies, such as computers, information networks and software. Henceforth (ICT) is the convergence of computing, Information and communications technology. ICT makes it possible for the rapid and global trade of information to take place. It brings about the capacity to transform work processes, service and delivery.

Different ICTs include: Databases and Networking, Electronic Mail, The Internet, Mobile Telephone, Radio, Telephone (land line), Satellite Transmissions (for TV, Data, etc). These ICTs can be utilized through different means including: E-mail; websites; CD-ROM, Information provision, databases, documentation and library access, List-serves & online discussions, Web-based discussion groups, workshops & symposia, Networking, Information sources, question and answer sites (e-mail or web) and chat rooms for personal support /information, Online publications, Distance education, Video-conferencing, Involvement with community organizations.

1.9.3 Information Access

Information access is an area of informatics in library and science which concerns ensuring free and open access to information. Information access covers many issues such as copyright, open source, privacy and security. Mundy and Sultan, 2001 argue that information is useful only if it is available and users/prospective users have access to it in the appropriate form and language.

1.9.4 Information Provision

Information provision is based on the principles of information science, which are providing accurate and reliable information equally to all members of the society. Information provision is governed by the standards of quality, confidentiality and equity (Smith, 2003). Therefore information provision is contingent on the extent to which potential adopters can access information from previous adopters and past experience at their local subunit.

1.9.5 Medical Research

Medical Research is aimed at discovering and making use of knowledge for the development of new therapeutic strategies to prevent, cure or treat disease, infection and damage that deviates from the optimum function of the body (Sharav, 2003). It involves the evaluation of new medications, devices, diagnostic products, and treatments for both safety and efficacy. Medical Research also involves all other research that contributes to the development of prevention, treatment, diagnosis or for relief of symptoms in a disease. In this vein, a Medical Researcher is simply a person who conducts Medical Research in an effort to help or add to the body of knowledge in the field of medicine (Mcharazo, Sjoerd, Koopman: 2007).

According to the United States, Department of Labour, 2008 Occupational Outlook Handbook, Medical research exists in the following fields:

- a. Basic Medicine** - Anatomy and morphology; Human genetics; Immunology; Neurosciences (including psychophysiology); Pharmacology and pharmacy; Medicinal chemistry; Toxicology; Physiology (including cytology); and Pathology.

- b. Clinical Medicine** - Andrology; Obstetrics and gynaecology; Paediatrics; Cardiac and Cardiovascular systems; Peripheral vascular disease; Hematology; Respiratory systems; Critical care medicine and Emergency medicine; Anaesthesiology; Orthopaedics; Surgery; Radiology, nuclear medicine and medical imaging; Transplantation; Dentistry, oral surgery and medicine; Dermatology and venereal diseases; Allergy; Rheumatology; Endocrinology and metabolism; Gastroenterology and

hepatology; Urology and nephrology; Oncology, Ophthalmology; Otorhinolaryngology; Psychiatry; Clinical neurology; Geriatrics and gerontology; General and internal medicine; other clinical medicine subjects; Integrative and complementary medicine.

- c. **Health Sciences** - Health care sciences and services (including hospital administration, health care financing); Health policy, economics and services; Nursing; Nutrition, Dietetics; Public and environmental health; Tropical medicine; Parasitology; Infectious diseases; epidemiology; Occupational health; Sport and fitness sciences; Social biomedical sciences (includes family planning, sexual health, psycho-oncology, political and social effects of biomedical research); Medical ethics; Substance abuse.
- d. **Medical Biotechnology** - Health-related biotechnology; Technologies involving the manipulation of cells, tissues, organs or the whole organism (assisted reproduction); Technologies involving identifying the functioning of DNA, proteins and enzymes and how they influence the onset of disease and maintenance of well-being (gene-based diagnostics and therapeutic interventions (pharmacogenomics, gene-based therapeutics); Biomaterials (as related to medical implants, devices, sensors); Medical biotechnology related ethics.
- e. **Forensic Science** - Scientific research and investigation to deal with legal matters or crime.
- f. **Biological and Chemical Sciences** - Cell biology, Microbiology; Virology; Biochemistry and molecular biology; Biochemical research methods; Mycology; Biophysics; Genetics and heredity (excluding medical genetics); reproductive biology(excluding medical aspects); developmental biology; Plant sciences, botany; Zoology, Ornithology, Entomology, Behavioural sciences biology; Marine biology, freshwater biology, limnology; Ecology; Biodiversity conservation; Biology, Evolutionary biology; other biological topics; Organic chemistry; Inorganic and nuclear chemistry; Physical chemistry, Polymer science, Electrochemistry; Colloid chemistry; and Analytical chemistry.

1.9.6 Medical Research Personnel

Medical research personnel are also referred to as medical scientists, who study biological systems to understand the causes of disease and other health problems. They develop treatments and design research tools and techniques that have medical applications (United States Department of Labour, 2000).

Medical research personnel can also be physicians who administer drugs to patients in clinical trials, monitor their reactions, and observe the results.

A Ph.D. in the biological sciences typically qualifies people to research basic life processes or particular medical problems and to analyze the results of experiments. Some medical scientists obtain a medical degree, instead of a Ph.D., but do not become licensed physicians, because they prefer research to clinical practice. It is particularly helpful for medical scientists to earn both a Ph.D. and a medical degree. (United States Department of Labour, 2008).

1.9.7 Health Care

Health care (healthcare in American English), refers to the treatment and management of illness, and the preservation of health through services offered by the medical and health professions. Health care embraces all the goods and services designed to promote health, including “preventive, curative and palliative interventions, whether directed to individuals or to populations” (United States Department of Labour, 2008).

1.10 Theoretical Framework

A theoretical framework is an outline that inter-relates the theories involved in the subject matter. It simply explains how the different concepts relate to one another and what will be considered in analysing their relationship.

The necessity of information in the modern world which is increasingly being strongly influenced by the on coming of globalization. This is influencing the process of interface and interaction between individuals and organizations across time and space essential. This interaction is fundamental for the

exchange of information and knowledge, and is globally supported by the swift expansion of information and communication technologies (ICTs). Information, autonomous of the modes used to relay it is an essential resource for development, and primarily, the basis upon which Individuals and organizations make decisions. Within the organizational framework, information permits individuals to communicate, whether face-to-face or through a relaying medium, about their work, lives and other experiences.

ICTs present mankind with great opportunities to permit the processes of social changes, for example the Internet has fundamentally changed our modes of communication. The accessibility and use of ICTs are becoming more and more a requirement for economic and social development in conditions of globalization (Castells, 1999).

However, according to (Braa and Nermunkh, 2000; Walsahm, 2000) technology itself does not lead to empower individuals, but it can be configured in alternative ways that are need-based, that enhance social benefits, and can help to empower individuals (Joshi, 1991).

In this study, it is noted that for medical research to be undertaken successfully, it requires access to medical research information. Medical research information being information already generated by other medical researchers is a crucial component of medical research that facilitates progressiveness and prevents repetition or duplication of efforts. The accessibility of information is a requirement to any value adding activity of human endeavor. The information accessibility factor becomes central to the process and activities of medical research. It is further recognized that information access given global and technological trends has its main foundation on ICTs.

The basis of this theoretical framework is to regard ICTs as tools that facilitate the production, processing, transmission and storage of information (Grace et al, 2004).

Consequently ICTs are treated as modern tools that facilitate ‘accessibility of information’. The implication is that ICTs will be assessed in relation to the role or extent to which they can play as aids or tools to accessibility of information.

Furthermore ICTs are tools used in the social system (Walsham, 1993, Kling, 1987 and Land, 1992). This implies that ICTs cannot be understood independently of the people around it, their social relationships,

and the work practices that they are engaged in within everyday life. Therefore, this is an inherent process in social systems through a structuration perspective (Giddens, 1998). Structuration implies an interaction of human action and structures and in our case mediated theory of ICTs. This reflects a dynamic process of production and reproduction of human action over time. People's behaviour is influenced by the social context but this social context is also being re-produced by human agency. Social structures thus do not exist independent of human action. A central aspect of the structuration process is communication among people, processes and systems. Communication is a carrier of norms and meanings, which through their use in everyday action, help to reinforce and change social structure.

However, effective communication and interaction are outcomes of a complex process that is influenced by the personal and situational characteristics of the context and participants. Human behaviour always is attached to actions individuals perform (Walsham et al, 1988).

This research sought to explore the use of ICTs in accessing medical research information by medical research personnel in Zambia.

In recent years, African countries such as Mozambique have been introducing various ICTs in different sectors. The diffusion of these technologies which to some extent shaped processes of globalization, are not monolithic and homogeneous (Walsham, 2000). Impacts of globalization vary with history, geography, infrastructure and culture. In Zambia, most medical research institutions are located in urban areas, however inadequate access to reliable electricity supply, telephone networks and internet connectivity contribute to some institutions being excluded from accessing the much needed medical research information.

This theoretical framework is based upon Castells' concepts of inclusion and exclusion which emphasizes an understanding of this dilemma of social systems seeing, excluded from broader network memberships (Castells, 1999). One of the primary objectives of the Ministry of Health is to interconnect the various health institutions in order to get the "real" status of the health situation of the country.

However, that objective is still a long way to go due to amongst other things the constraints on communication issues. Access to ICTs is limited in the majority of medical research institutions which

can safely be classified as “have-nots”. In the context of communication, this difference between have and have-nots is crucial as it can potentially lead to further and systematic marginalization and social exclusion of those have-nots. These issues of exclusion play an important role in the process of adoption and spread of new technologies.

Traditionally, access to ICTs and information has not been viewed as a basic need. However, if needs are interpreted as being dynamic and changing over time and through culture (Max-Neef, 1986), access to information and knowledge could be regarded as a basic need nowadays. Information and knowledge have become increasingly important in the contemporary globalized economy, as advancement in ICTs has enabled larger amounts of information to circulate at a much higher speed and at lower costs. This is partly because the balance between knowledge and natural resources, with regard to being the most important factor in determining the standard of living in a country, is said to have shifted in favour of knowledge. This has led many authors to claim that we now live in an information society or a knowledge-based economy (Drucker, 1993). Nowadays, it is a country’s ability to assimilate, use and diffuse knowledge that will essentially determine its chances of succeeding in the new economy. The knowledge economy is defined as an economy where “the exploitation of knowledge has come to play the predominant part in the creation of wealth” (DTI, 1998, p. 2).

Policy makers, taking advantage of phenomenon of globalization, have developed various projects to introduce ICTs in the country. For example: the reduced taxes on the importation of computers and other electronic ICTs and accessories, the usage of ICTs in telecommunication, and large ICTs based initiatives in the health sector such as the Health Management Information System (HIMS). While it is still relatively early to conclusively comment on the impacts of ICTs on development processes, on-going micro-level studies of new initiatives allow for the evaluation and design of strategies to help better exploit the opportunities that these new technologies provide in different sectors particularly in health.

ICTs require “communication infrastructure” to operate successfully. Moreover the infrastructure refers not only to the hardware or software but to the practices, procedures and routines which make the infrastructure work. Drawing from this, we use the term “communication infrastructure” to describe the infrastructure required to support the operations and use of ICTs Infrastructure (Monteiro and Hanseth, 1995) is viewed as part of the means of communication between all parts of the HIS [Health Information Systems]. Lack of communication infrastructures present a serious obstacle to the flow of information in the health sector. Moreover, poor infrastructure leads to poor coordination and information sharing

between sectors like health, education and contributes to an absence of coherent socio economic development initiatives with benefits to the people. Braa et al, (2000) states that implementation of infrastructure of communication is a key to support development and to make planning effective.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter focuses on the literature review, it shows the trends in ICTs and how they affect access to medical research information.

2.2 ICTs and Health

Research is a major driver of social and technological innovation that can lead to health and equity improvements through a knowledge-to-action process. Recognizing that ICTs are important not only as technologies per se, but for the social innovation they can enable, including new ways to manage information and people to strengthen health and medical systems. It is quite notable that there is a disparity in the provision of ICTs in medical and health research. One such example is the Sustainable Science Institute (SSI) which is embarking on a new initiative in Health Information Technologies (HITs). SSI is building on the Nicaragua experience with the current mandate to improve vaccination efficiency and prenatal care in Managua. SSI is working to identify, test, and implement low-cost, open-source ICTs solutions that facilitate infectious disease research, control, and prevention in limited-resource settings. It is also evaluating the potential impacts of ICTs solutions (such as electronic medical records [eHealth], mobile phone applications [mHealth], and laboratory information management systems [LIMS]) on improving targeted public health outcomes for priority health problems in underserved communities (Coloma & Harris 2009).

The use of ICTs not only empowers the clinical and laboratory medical researchers with improved access to medical research information but more broadly strengthens partnerships and capacity-building networks in the developing world that promote knowledge exchange about sustainable best-practices in HIT implementation at a local level (Coloma & Harris 2009).

One of the most notable ICTs in use is the Internet, which is today the most sophisticated and contemporary way of interactive networking, and has offered global access to all kinds of information generation and sharing across the world, thus plummeting the world to a global village. By 2004, internet users per 1000 in USA had reached 569 as compared to 15 in sub Saharan Africa and 5 in Zambia (World Bank, 2006). The internet has become an important tool for information access because through the Internet, one can record, access, search and retrieve information anywhere in the world in minutes. One of the recent forms of information sharing with the use of the internet is Data casting. It allows forwarding and storing of data via an Internet protocol (IP) satellite platform. It is being used to complement the broadcasts into sites, making it possible for users to view content stored on a local PC storage device “on demand” daily.

According to McConnell et al (2006: 1) Information and communication technologies (ICTs) are increasingly being recognized as essential health technology, giving individuals at all levels of the health workforce and other stakeholders’ access to information that helps them protect and improve health and save lives. At the clinical and laboratory level, ICTs are used to track and provide patient information, to facilitate research, diagnosis and testing, and to deliver services through telemedicine despite distance and time barriers.

According to Hoffman (2001:59) the information and communication technologies (ICTs) have accelerated the shift to a knowledge economy where many organizations especially those in the north have capitalized on the communications revolution to accelerate and widen the dissemination of, and access to, knowledge and information.

ICTs have further increased the capacity to generate new knowledge through international networks and partnerships; this is because of the understanding that generating and sharing publicly-funded research provides evidence for social and health policy-making and practice and knowledge for public services and infrastructure.

Hoffman (2001:59), states however, that organizations [and countries] in the south, having faced numerous obstacles in development, have not been able to benefit significantly from dissemination of research on the internet and participation in international research networks. This is because organizations

[and countries] in the south often lack stable, broadband internet access and technical capacity to maintain a network and they also face price barriers to basic research in the form of peer-reviewed literature. Therefore successful implementation of ICTs needs to address six interlocking frameworks for change: the infrastructure, attitude, staff development, support (technical and administrative), legally mandated coordinating bodies and also sustainability and transferability of the ICTs used.

According to UNESCO (1982), “*the research base of a country has a profound effect on its economic development and its ability to address problems in such areas as public health, infectious diseases, agriculture, environmental management, or industrial progress.*” Therefore ICTs as tools for research find essential relevance on the health and medical research potential and ultimately in the development process of a country. In addition, Researchers from the developing world comprise a fraction of participation in research, even though they are best positioned to contribute on the key challenges facing the world, resulting in a growing recognition of gaping holes of ‘missing knowledge’ and ‘inaccessible knowledge’.

According to Bedi (1999: 1), the use of ICTs in the development process is on the rise. Many donors are specialising in this field and even earmark aid to mainstream the use of ICTs in their programmes. This is because the link between development and the increased use of ICTs in development is based on two assumptions: that a new kind of economy is emerging – an information economy; and second, that the main constraint to development is knowledge or information gaps. As a result this prevents developing countries from being fully part of the emerging global ICT infrastructure because they lack resources, both financial and human, to acquire and apply the technologies. This can be seen, especially in public health and medical research. Even if the government or donor agencies are prepared to invest in the required infrastructure, at present it is assumed there are not enough skilled people within the health sector, especially in the rural areas, who are able or willing to use most ICTs effectively

Kirkman (1999: 7) contends that it is in the field of health and medicine that ICTs, specifically the Internet, have been used extensively from their inception. Undoubtedly, telemedicine has a range of immediate and practical benefits. However it is well-known that lack of up-to-date information is a common problem in developing countries. Kirkman (1999: 7) further states that training textbooks are

often outdated and access to information on the latest drugs or preventive treatments, as well as appropriate expertise for accurate diagnosis, are also limited this is particularly so in rural areas.

ICTs in recent times have been developed, spread and used widely (Unwin, 2009). This has necessitated a worldwide shift in the creation, storage, exchange and ultimately the accessibility of information. The field of medical research is not an exception. Worldwide application of ICTs has had varied influences and outcomes on medical research through its effect on the accessibility factor of medical research information to medical researchers. ICTs can further be described as hardware and software that enables the creation, collection, consolidation and transmitting of information in multiple forms of media to suite different uses of purposes.

ICTs can have a tremendous effect on accelerating the development process of the country. ICTs make it possible to deliver information by means of voice, text, data, video and graphics faster and more efficiently than before. Furthermore, the constantly evolving range and quality of ICT delivery platforms is improving the availability and affordability of accessing of information. These developments provide an enabling environment for government to work with the private sector and civil society to improve and expand access to information for all its citizens (UNESCO, 1996).

The UN hopes that if the very poor in Africa have mobile phones they will be able to use them effectively in medical emergencies and also to access appropriate and useful health information. A rural hospital would be able to make a call to the nearest specialty hospital or specialist and thus help save lives during emergencies Mobile web browsing, at the very least, could provide instant access to the most relevant and up-to-date health information to health practitioners, especially if the most relevant and appropriate information were available in easily accessible forms, and it would offer a private and personal form of learning experience. The mobile web can be a “knowledge repository” for both providers and consumers of health care (UNESCO, 1996).

Medical record-keeping is an area which begs for leapfrogging. In the tsunami-hit hospitals in Sri Lanka and other countries, for example, paper-based health records and patient records were washed away or destroyed. Having one’s medical records available on a mobile phone would also help doctors, nurses and pharmacists make the right decisions based on a patient’s health history (McConnell et al, 2006).

2.3 ICTs and Improving Poor People's Health

Health care is one of the most promising areas for poverty alleviation and achievement of Millennium Development Goals (MDGs) with ICTs, based largely as it is on information resources and knowledge. There are many ways in which ICTs can be applied to achieve desirable health outcomes. ICTs are being used in developing countries to facilitate remote consultation, diagnosis, and treatment. Thus, physicians in remote locations can take advantage of the professional skills and experiences of colleagues and collaborating institutions (DOI, 2001). Health workers in developing countries are accessing relevant medical training through ICT-enabled delivery mechanisms. Several new malaria Internet sites for health professionals include innovative “teach-and-test” self-assessment modules. In addition, centralized data repositories connected to ICT networks enable remote health care professionals to keep abreast of the rapidly evolving stock of medical knowledge.

When applied to disease prevention and epidemic response efforts, ICT can provide considerable benefits and capabilities. Public broadcast media such as radio and television have a long history of effectively facilitating the dissemination of public health messages and disease prevention techniques in developing countries. The Internet can also be utilized to improve disease prevention by enabling more effective monitoring and response mechanisms (Mayanja, 2007).

The World Health Organization and the world's six biggest medical journal publishers are providing access to vital scientific information to close to 100 developing countries that otherwise could not afford such information. The arrangement makes available through the Internet, for free or at reduced rates, almost 1,000 of the world's leading medical and scientific journals to medical schools and research institutions in developing countries. Previously, biomedical journal subscriptions, both electronic and print, were priced uniformly for medical schools, research centres and similar institutions, regardless of geographical location. Annual subscription prices cost on average several hundred dollars per title. Many key titles cost more than US\$1500 per year, making it all but impossible for the large majority of health and research institutions in the poorest countries to access critical scientific information (World Health Organisation, 2004.).

Additionally, Apollo Hospitals has set up a telemedicine centre at Aragonda in Andhra Pradesh, to offer medical advice to the rural population using ICTs. The centre links healthcare specialists with remote clinics, hospitals, and primary care physicians to facilitate medical diagnosis and treatment. The rural telemedicine centre caters to the 50,000 people living in Aragonda and the surrounding six villages. As part of the project, the group has constructed in the village a 50-bed multi-speciality hospital with a CT scan, X-ray, eight-bed intensive care unit, and blood bank. It also has equipment to scan, convert and send data images to the tele-consultant stations at Chennai and Hyderabad. The centre provides free health screening camps for detection of a variety of diseases. There is a VSAT facility at Aragonda for connectivity to Hyderabad and Chennai. The scheme is available to all the families in the villages at a cost of Rs.1 per day for a family of five (Harris, 2002).

In Ginnack, a remote island village on the Gambia River, nurses use a digital camera to take pictures of symptoms for examination by a doctor in a nearby town. The physician can send the pictures over the Internet to a medical institute in the UK for further evaluation. X-ray images can also be compressed and sent through existing telecommunications networks (World Bank, 2002).

In Andhra Pradesh again, handheld computers are enabling auxiliary nurse midwives to eliminate redundant paperwork and data entry, freeing time to deliver health care to poor people. Midwives provide most health services in the state's vast rural areas, with each serving about 5,000 people, typically across multiple villages and hamlets. They administer immunizations, offer advice on family planning, educate people on mother-child health programs and collect data on birth and immunization rates. Midwives usually spend 15–20 days a month collecting and registering data. But with handheld computers they can cut that time by up to 40 percent, increasing the impact and reach of limited resources (World Bank, 2002).

In Nigeria, 0.5% of the populations are Internet users: the same statistic in the United States is 54%. (Central Intelligence Agency, 2004) Results from a previous study of Nigerian libraries suggested that the high cost of hardware, software and – particularly - ISPs were a significant barrier to provision of electronic information resources. (Ashcroft and Watts, 2005) Of late, a new expression has emerged that refers to some of the issues previously covered by the term digital divide. The “know-do gap” describes the discrepancy between having access to knowledge, and translating that knowledge into practice. In the

World Health Organization report World Report on Knowledge for Better Health: Strengthening Health Systems, LEE Jong-Wook, the Director General of the World Health Organization states that ‘There is a gap between today’s scientific advances and their application: between what we know and what is actually being done.’ (World Health Organization, 2004) Godlee et al (2004) refer to the “know-do gap” being as great in developed countries as it is in developing countries.

This is an interesting shift in rhetoric, suggesting a possible consensus that knowledge is both more freely available and increasingly accessible to all; the difficulty now is how to transform that knowledge into effective practice.

There is some existing research into the provision of electronic information in developing countries; there is a lack of research specifically into electronic healthcare resources. Commentators continue to call for an increase into research in this area. (Godlee et al, 2004b; World Health Organisation, 2004; World Summit on the Information Society, 2003) The literature presented here is drawn both from general studies in this area, and also from literature that specifically discusses the situation in Nigeria.

Chisenga (2004) carried out a survey of the use of ICTs in ten African Public Library Services. The survey found that, although most libraries had Internet connectivity, almost none were offering Web-based information services to their users. Lack of funding remains problematic in developing ICT services, with many libraries relying on donor assistance, or choosing to establish cyber cafes as a means of providing Internet access and generate revenue. Few libraries had ICT strategies for development. Chisenga identifies four principle barriers to the effective provision of ICTs in the surveyed libraries: a lack of adequate or reliable funding; a lack of strategic planning; a lack of use of Internet to provide information services to users; and a lack of consistent training for library users in new ICT services.

There is evidence that access to ICTs themselves remains a problem. Ondari-Okemwa (2004) carried out a survey of 46 sub-Saharan countries to discover the impediments to providing access to “global knowledge” in sub-Saharan Africa. Respondents suggested that unreliable electricity supply and high cost of ICTs were significant barriers to accessing online information.

Similarly, in a study of access to electronic information resources in Nigerian libraries, Ashcroft and Watts (2005) found that unreliable electricity supplies and prohibitively high costs of Internet Service Providers (ISPs), hardware and software were barriers to ICT provision. In a discussion about ICTs in African universities, Karbo (2002) also identifies the problem of the cost of providing ICTs as well as a suitable infrastructure to house them. A study of use of electronic information resources at the University of Agriculture Library in Abeokuta, Nigeria, also found that constraints to accessing resources were principally infrastructural; specifically, a lack of computer terminals and power supply outages (Oduwole and Akpati, 2003).

Lack of adequate ICT skills and training causes difficulties, both amongst staff providing access to ICTs and their users. (Ashcroft and Watts, 2005; Idiodi, 2005; Karbo, 2002) This may be compounded in some countries by low basic literacy levels amongst the population. (Ondari-Okemwa, 2004) Funding itself may be poor. Okiy (2005) describes the situation in Nigerian libraries, which receive poor allocations from Government, and therefore look elsewhere for income. Costs may be passed on to users themselves. For example, the University of Jos introduced library fees for its students. Akporhonor (2005) reports a similar situation at Ambrose Alli University and Delta State University.

There is some evidence that many ICT users in developing countries gain access to Internet facilities through cybercafés, again passing costs on to users. Jagboro (2003) conducted a study of Internet usage in Nigerian universities and found that 45.2% of respondents accessed the Internet in cybercafés. Jagboro suggests that this high score may be due to the proximity of cybercafés to user facilities, such as hostels and lecture halls.

However, access to cybercafés may also be problematic. Adomi (2005) reports on a price increase in cybercafé services in Abraka, Nigeria. This was brought about after cybercafé owners invested in generators in order to provide a reliable electricity supply, as well as meeting high costs of ISPs. The price increase was reversed as it led to a decrease in customer patronage.

Some research exists about the use of electronic healthcare resources in Nigeria. Ajuwon et al (2003) carried out a study of uptake of ICTs by health science students at the University College Hospital, Ibadan. This study found that 57.4% of students sampled could not use a computer, that there was a need

for ICT literacy to be added to the curriculum and that there was a need for adequate computer laboratories to be established. Ogunyade (2003) examined the use of Medline - the database of life sciences and biomedical bibliographic information – by medical students at the University of Lagos. The study found that use of the database was poor, due to lack of awareness, lack of access to computers, insufficient training and the high cost of provision.

Across Sub-Saharan Africa, the Internet is used to report daily cases of meningitis to monitor emerging epidemics. When threshold levels are reached, mass vaccination is required and the Internet is used to rapidly mobilize medical personnel and effectively coordinate laboratories and specialist services.

However, Sub-Saharan Africa has fewer than 10 doctors per 100,000 people, and 14 countries in the region do not have a single radiologist. The few specialists and services available are concentrated in cities. Rural health workers, who serve most of the population, are isolated from specialist support and up-to-date information by poor roads, scarce and expensive telephones, and a lack of library facilities (Fraser and McGrath, 2000).

In a bid to find a solution to the growing medical problems of sub-Saharan Africa, many governmental, non-governmental, and international developmental organizations are tinkering with the notion of telemedicine. The International Telecommunication Union has organized several missions of telemedicine experts to selected African countries. These missions have tried to identify Africa's needs and priorities for the introduction of telemedicine services (ITU, 2000). HealthNet, the most developed Africa-wide initiative, has conducted numerous projects since the mid-1980s, involving physician collaborations, medical data collection, health care delivery, medical alerts, access to medical libraries, and medical research (SATELLIFE, 2001).

Despite the various obstacles, there have been some success stories of telemedicine penetration in the African continent such as HealthNet. HealthNet is a computer network project, which was initiated in 1989. It employs satellite, telephone and Internet technology to provide health information and communication among professionals and thereby attempts to overcome a shortage of current health information and the isolation of health professionals. It provides concrete benefits to health-care workers

such as physician collaborations, data collection, health-care delivery, medical alerts, access to medical libraries and user databases, to name a few. (HealthNet, 2001).

Thus, the arguments we have made for the need to establish comprehensive ICT infrastructure is very pertinent for the potentials of telemedicine to be realized. Even in urban areas that have some telecommunications infrastructure, the limited bandwidth and shortage of telemedicine expertise limits its adoption. Most African countries cannot afford the very sophisticated telemedicine solutions involving ATM, virtual networks, and other advanced technologies.

There's a growing evidence that the digital revolution driven by ICTs has the power to transform production process, government efficiency and effectiveness, education , health, citizen participation and others aspects of our individual and collective lives (Amoussougbo, 2008). Therefore it can create new form of economic growth and social development in third world countries, Zambia inclusive.

It is also important to note that the existing Digital Divide works as a barrier to the existence of a true Information Society's existence in the developing world, Zambia inclusive. Digital Divide is the technological gap between countries that have fully exploited ICTs and those that have not. The digital divide is often associated with the resulting gap in terms of economic development.

2.4 ICTs, Health and Medical Research in Zambia

Zambia being a country with a low level of technological development in Africa and one of the most economically poor in Sub-Saharan Africa has low information and communications technology (ICT) development. Research has shown that ICT is a key for economic growth and development in virtually all countries in the present information age (Mbarika et al., 2005; Meso et al., 2006). With the development of complex and modern ICT, both developed and underdeveloped countries are exploring ways to enjoy the many benefits of these technologies (Musa et al., 2005; Straub et al., 2001).

With the variance in ICTs between Zambia and other countries, it is essential to take into consideration that application of ICTs in medical research varies. A digital divide between underdeveloped and developed countries looms large and brings differential capabilities of entire social [or regional] groups to

access and utilize electronic forms of knowledge (Straub, 2003). This segregates the “haves” from the “have-nots” in the information society. While much discussion on the digital divide has focused on that which occurs among different social [and professional] groups within a single country (Hoffman and Novak, 1998), its cardinal to note the importance of the international digital divide between different countries.

An example of the “haves” is the International Network for the Availability of Scientific Publications. It has a (INASP 2005) Health Links, an Internet subject gateway to selected websites for health professionals, medical library communities, and publishers in developing and transitional countries. But how can medical researchers utilise the Internet Gateway with the varying national ICT capacity.

Another example is the Health Internetwork Access to Research Initiative (HINARI), with users gaining access to this resource online through the cybercafé. HINARI provides free or very low cost online access to over 2,000 full-text journals in bio-medical and associated social sciences, is just one of the online resources that can bring beneficial medical research information to research institutions in Zambia. The initiative has been supporting medical institutions and began in July 2001, with six major publishers – Blackwell, Elsevier Science, Harcourt Worldwide STM Group, Wolters Kluwer International Health and Science, Springer Verlag and John Wiley - signing up to a statement of intent.

But, do medical researchers have the skills necessary to exploit ICT to access the vast online resources for their medical research information needs? How does the region develop and retain qualified personnel for development, operation and maintenance of ICT equipment and infrastructure for medical research? There is an acute shortage of local expertise (Mbarika, 2000). Often, many in sub-Saharan African countries do not even trust their own local experts, but would rather bring in expatriates from Europe and the US [IDRC, 1998].

In terms of health, the region’s growing medical epidemics in the face of an acute shortage of medical facilities and personnel, the delivery of healthcare is inarguably one of the most fundamental needs for Sub Saharan Africa (Musa et al., 2005). The World Health Organization (WHO) reported that by the end of 2004, an estimated 38 million people worldwide, 2.7 million of them younger than 15 years were living with HIV/AIDS. More than 70% (28 million) of the total infected live in sub-Saharan Africa

(Fowler, 2004; Musa et al., 2005). Furthermore, malaria kills more than 2,800 each day in Africa; in some areas, 40% of toddlers may die of acute malaria due to inadequate medical intervention. Other diseases that kill millions of Africans each year include very treatable ones such as dysentery, cholera, typhoid, and yellow fever, among others.

It is estimated that malaria is responsible for nearly 4 million clinical cases and 50,000 deaths per year, including up to 20 percent of maternal mortality... HIV prevalence in the general population was estimated at 16 percent of the population aged 15 to 49... other diseases contribute significantly to the disease burden in Zambia. These diseases include acute respiratory infections, diarrhea, worm infestations and bilharzias (schistosomiasis) and non-communicable diseases (NCDs) (FNDP, 2005:162-164).

It raises some vital questions: what is the utility of ICT in medical research? How has it been used in developed and developing countries? How has it affected the medical research in Zambia with the current division between those people who do or do not have access to information and communication technologies (ICTs)?

Norris (2001) provides an interesting analysis of this division, describing a multi-dimensional digital divide that exists globally, socially and democratically. The global digital divide is the difference in access to ICTs between countries; the social digital divide is the difference in access to ICTs between the citizens of a country; the democratic digital divide is the difference between those who are or are not able to use ICTs to participate in public life.

The multi-dimensional digital divide that Norris describes has a clear impact on the provision of electronic healthcare information in the developing world, both between countries and within them. Electronic healthcare information resources emerging from the developed world may not necessarily be relevant or appropriate to the needs of those living in developing countries. It may be that knowledge no longer functions accurately when disconnected from its environment (Jimba, 2000), that information is perceived as having little local relevance (Carter, 2005), or there is a lack of evidence-based research that is applicable for healthcare practitioners in developing countries. (Chinnock et al, 2005) Although there is

continuing access to suitable ICTs and reliable connections to the Internet, it remains challenging and costly for many.

As this was an exploratory study, no direct literature was found that correlates or studies the effects of ICTs on the accessibility of medical research information by medical research personnel in Zambia. However the literature review was innovatively done by the use of literature discussing the independent and dependant variables separately or discussions of ICTs in correlation to the field of medicine. By and large, the study was intended to generate the much needed literature for future research.

CHAPTER THREE

METHODOLOGY

3.1 Research Design

This is an exploratory study aimed at getting primary information that can be used in subsequent researches. This study combined both qualitative and quantitative approaches; this was based on the researcher's recognition of the fact that when either of the approaches is used in exclusion of the other, it would have grave limitations and biases which would have been mitigated by a combination of the two approaches. The quantitative aspect would give an exposition of statistically meaningful data of ICT use by medical research personnel. This is because the quantitative approach would enable the use of standard data collection and analysis tools such as questionnaires, interview guides and software packages that are accepted and widely used with standard procedures and rules (Gay, 2003). In addition, maintenance and control over contextual factors in the quantitative approach would lead to successful deduction of findings from a sample to the general population.

The qualitative aspect of the research created insight in the utility and choice of ICTs. The qualitative approach made use of the non-numeric data and contextual factors that can not be controlled (Gay, 2003). Thus it will be possible to make an induction based on the participants perspectives and understanding.

The quantitative data was in form of ordinal and nominal data collected from close ended questions, where as the qualitative data was from explanations and reasoning collected from open ended questions.

3.2 Population and Sample Size Determination

Based on the estimated population, P, the total number of medical institutions in Zambia, is 19. Assuming all medical research institutions are actively involved in medical research, 1/3 will still have 95 % confidence limit and assuming a design effect of 1. The sample size is estimated using the formula indicated below.

$$\text{Sample size } (n) = \lceil \text{DEFF} * Np(1-p) \rceil / \lceil (d^2 / Z_{1-\alpha/2}^2 * (N-1) + p * (1-p)) \rceil$$

The formula helps to overcome the problems associated with the vastness of the study population (Dean et-al 2009). Therefore a sample has to be taken from the populations and estimates made about the total population based on information derived from the sample. It was helpful for the researcher to make his/her sample large enough so as to give a good representation of the population and small enough to be manageable.

Using Openepi software version 2.2.1, a medical and public health statistical and descriptive software, which has a sample size calculation function based on the above formula; the estimated minimum sample size required is 6 medical research institutions. Additions to this minimal statistical sample size requirement would yield no significant changes in terms of findings. However, factoring in non-response rate and possible hard-to-reach medical research institutions, the target sample size of medical research institutions is 9. The proposed sample size was sufficient enough to generalize the findings, conclusions and recommendations for all the targeted medical research institutions in Zambia.

3.3 Study Sample

The purposive sampling method was used to select the provinces from where the sample was drawn. The provinces that were selected are Copperbelt, Southern and Lusaka because they are the most accessible provinces using road or railway network with medical research institutions in Zambia. This selection was based on Ministry of Health Listing of Health Facilities According to Levels and Location for 2008. Lusaka province has more medical research institutions in Zambia, therefore seven were sampled from Lusaka where as one was sampled from Copperbelt and one from Southern Provinces respectively. According to Cook and Campbell (1979), in Wimmer and Dominick (1997; 34), “one way to ensure external validity is to select a sample that is representative of the group to which the results will be generalised”. Thus this research sample adequately passes this test.

3.4 Sampled Institutions

The landscape of medical research in Zambia is characterised by numerous medical research institutions and projects running. One of the Institutions in Zambia is the Tropical Diseases Research Centre (TDRC).

3.4.1 Tropical Diseases Research Centre (TDRC) - a biomedical research Centre established by the World Health Assembly in 1977. It is located in Ndola, Zambia.

The Tropical Diseases Research Centre (TDRC - formerly National Council for Scientific Research (NCSR)) was initiated by the World Health Organisation (WHO) in collaboration with the Zambian Government. The Zambian Government in January 1981 at Ndola Central Hospital established TDRC with a view to undertake Science and Technology related research (FNDP, 2006:140. As a result TDRC became a National Institution for research, training, and service in diseases of public health importance in Zambia. TDRC, a parastatal under the Ministry of Health with the mandate to conduct epidemiological and clinical research was in response to a resolution of the World Health Assembly of 1974 which called for the intensification of research into tropical diseases and stipulated that, as far as possible, the work should be done in developing countries where these diseases are endemic.

Activities of the institute include epidemiological and clinical re- search in malaria, schistosomiasis African trypanosomiasis, HIV/AIDS, micronutrient deficiencies, health systems research, health impact and evaluation, training and service.

The Centre works closely with the Ministry of Health in various areas such as disease outbreak investigation and control, National AIDS Prevention and Control Programme, Health Systems Research, Disease Surveillance and Malaria Prevention and Control Programme. The TDRC has 3 scientific departments namely: Public Health, Clinical Sciences and Biomedical Sciences.

The Public Health Department has personnel qualified in Epidemiology, Social Science, Demography, Public Health, Information Technology and Statistics. The department's mission is to understand the health problems of communities in urban and rural Zambia, and to define means of controlling them given limited resources devoted to preventive disease control programmes in developing countries in general. To achieve this goal, the department engages in both field and clinical research with multi-

disciplinary approach, drawing on the techniques and perspectives of epidemiology, health systems research, clinical medicine, medical sociology, medical anthropology, nutrition, and health economics.

The Clinical Sciences Department has well trained Physicians and Nursing Staff. The department's mission is to conduct clinical trials of new chemotherapeutic agents against malaria, schistosomiasis, HIV/AIDS and other diseases of public health significance to Zambia and the region. In its expanded role, the department will, in future, develop and test local herbs for treatment of endemic diseases.

The Biomedical Sciences Department has 7 units, namely: Parasitology, Immunology, and Vector biology, Haematology, Microbiology, Nutrition and Clinical Chemistry.

Other than giving support to the epidemiology and clinical pharmacology programmes, the department has started conducting independent basic research to understand further the biology of disease causing organisms. The department provides support to and is a reference Centre for the National AIDS Control and Prevention Programme. It also evaluates all new diagnostic tools for tropical diseases (Sukwa, 1998).

Major achievements of the TDRC over the years include the training of Zambian Scientists in research; the design and implementation of a functional Primary Health Care Programme to control malaria morbidity and mortality in Isoka District; the design and implementation of a surveillance system to control African trypanosomiasis in Isoka District, evaluation of new drugs for treatment of malaria, schistosomiasis and HIV infection and defining the role of Vitamin A deficiency in childhood blindness in the Luapula Valley.

In spite of the budgetary constraints, the Government of Zambia continues to recognise the value of applied research to support disease control programmes. In 1996, annual allocation to the TDRC was about Kwacha 605 million compared to Kwacha 5 million in 1981. Most of the research at the Centre is supported by competitive grants from external donor agencies such as WHO, UNICEF, Wellcome Research Laboratory, (UK), the Irish Government, USAID, WAF, etc. which in 1996 amounted to about Kwacha 558 million (Sukwa, 1998).

The staff complement comprises about 65 indigenous professional and technical staff supported by approximately 130 support and field personnel. There is a deliberate policy of recruiting nationals and priority is given to the training and retention of indigenous personnel. In 1982, of the 12 Scientists

working at Centre, only 4 were Zambians. In contrast, the Centre now has 28 Scientists all of whom are Zambians

Lastly, the future of the TDRC lies in its Staff Development Programme. There is need for capacity building in the area of Health Systems Research so that the role of the Centre in capacity building in the area of Health Systems supporting the on-going health sector reforms and disease control programmes in Zambia is recognised. The TDRC remains one of Africa's finest institutions with internationally acclaimed reputation and capacity mainly to conduct clinical trials in diseases of public health importance in Zambia and the Region. (Sukwa, 1998)

3.4.2 Malaria Research Centre at MACHA - Macha Mission Hospital is the health care provider for the greater Macha area, in the rural area of Choma District in Zambia's Southern Province. It is a grant aided hospital, administered by Brethren in Christ Church. Originally the research centre at Macha was established to undertake research in malaria. However, it has evolved to incorporate more medical fields including HIV/AIDS, Tropical diseases and medicine, and TB.

Recently the Hospital has had installed a VSAT and network to enable access to medical information. The effects of new 300 b/s internet connectivity at Macha, which is an IConnect Initiative, on the accessibility of medical research information to medical researchers is not well known. Zulu (2009), sites the project implementer, Mr. Stam, noting remote access to medical and research information as a benefit of the Internet connection.

The project at Macha Mission Hospital and the Malaria Institute at Macha (MIAM) that started in 2004 is not a simple project. It has:

Two VSAT connections, diverse routing, LAN and distributed WLAN with 75 users. The project has 100 computers and is growing rapidly, with two network servers, content filtering (spam), proxy, firewall, virus scanning, FTP, file sharing, network printing, web server (10 websites and growing), content management (Blogging), network and system management, traffic prioritisation, and a SQL database Zulu (2009).

Other institutions that are engaged in medical research include the following:

3.4.3 University Teaching Hospital (UTH) – The University Teaching Hospital (UTH) in Lusaka is the biggest hospital in Zambia. It is located in the capital city Lusaka approximately 4Km east of the city centre. UTH is the principle medical training institution in the country for Medical Students, Interns, and Postgraduate Doctors. It also trains Nurses through the Nursing school located within the hospital grounds as well as Clinical Officers through their college located at Chainama Hills College Hospital. UTH has approximately 1655 beds and 250 Baby cots. It provides a full range of primary, secondary, and tertiary health and medical services on both an inpatient and outpatient basis.

In addition it serves as the country's specialist centre receiving referrals from all over the country.

The departments include:

- Department of Anaesthesia
- Department of Internal Medicine
- Department of Obsetrics and Gynaecology
- Department of Paediatrics
- Department of Surgery
- Department of Community Medicine
- Department of Pathology
- Radiology Department
- Physiotherapy Department
- Pharmacy Department
- Blood Bank

3.4.4 Central Veterinary Research Institute (CVRI) – situated in Balmoral, Lusaka and conducts research in Livestock Research and animal-human communicable diseases.

3.4.5 Chainama Hills College Hospital of Health Sciences (CHCHS) – situated in Chainama Hills in Lusaka. It undertakes different types of Research which include Clinical, Public Health, Health Care Provision and Health Information System. Its primary research interests are IMCI, Diarrhoeal Diseases, Roll Back Malaria and Nutrition in Children.

3.4.6 National Malaria Control Centre, Ministry of Health, Lusaka, Zambia (NMCC) – The National Malaria Control Centre (NMCC), located on the grounds of the Chainama Hills College of Health Sciences in Lusaka, assumed responsibility for coordinating Zambia malaria control activities in December 1997. The NMCC, which is a department under the directorate of Public Health and Research of the Ministry of Health, provides technical support and coordination for a wide range of partners including research and training institutes and Provincial and District Health Offices.

It coordinates malaria control activities in the country; the NMCC is involved in the day-to-day implementation of malaria prevention and control interventions in an effort to significantly reduce morbidity and mortality due to malaria in line with the global Roll Back Malaria goal of reducing the malaria burden by half by the year 2010.

It aims at improving access to prompt and effective treatment through disease recognition, treatment with appropriate drug (Fansidar and Coartem), and compliance with multi-dose therapies. It also targets reducing the burden of malaria in pregnancy through provision of intermittent preventive therapy (IPT), use of insecticide treated mosquito nets (ITNs) and providing services to reduce anaemia. NMCC further aims at increasing access to and use of ITNs and insecticide tablets to retreat the nets, conducting indoor residual spraying in areas where nets are not being distributed and increasing awareness through information, education and communication (IEC) strategies. It undertakes Monitoring and evaluation, operational research and provides overall strategic management of national malaria control activities and partner coordination.

3.4.6 Zambia Emory HIV/AIDS Research Project (ZEHRP) - began working in Zambia in 2003, has its headquarters in Emasdale, Lusaka and runs research centers in Ndola and Kitwe, where epidemiological studies and clinical research are conducted.

3.4.7 Centre for Infectious Diseases Research in Zambia (CIDRZ) – Began working in Zambia in 2000 and has its headquarters in Northmead, Lusaka, with epidemiological and clinical research running with clinics in Lusaka, Copperbelt and Southern Provinces.

3.4.8 National Institute for Scientific and Industrial Research (NISIR) –

The National Institute for Scientific and Industrial Research (NISIR) is a Zambian Government-funded statutory research organisation. It undertakes research and development activities in various areas, including agriculture, natural resources and products, environment and water resources, minerals and industrial raw materials, peaceful application of nuclear science and technology, electrical and electronic power conditioning and protection, textile testing and services, information and communications technology, the information system and their affect on humans.

3.5 Respondents

There were two categories of respondents. These were key informants and medical research personnel in selected institutions. The key informants were selected due to the role they play in ICT and medical research. Therefore coordinators, Monitoring & Evaluation officers and ICT specialists of the 9 medical research institutions were sampled. This formed a minimum of 30 key informants. The other category of respondents was selected purposively and constituted a minimum number of 80 respondents in total.

A combination of probability sampling and non-probability sampling procedures were used in the study. Multi-stage sampling, a form of cluster sampling procedure was used to select the sample. This form of sampling procedure is usually used in nationwide studies to ensure representativeness in the data obtained (Leed: 1974; 13) in (Wimmer and Dominick: 1997; 69).

3.6 Research Instruments

The study used structured questionnaires for the medical research personnel and key informants in collecting data. The questionnaires were used in collecting both quantitative and qualitative data. Open ended questions in the questionnaires facilitated the collection of qualitative data while closed ended questions in the questionnaire solicited more of quantitative data.

3.7 Data Collection

The questionnaires for this study were pre-tested before conducting the actual interview. The pre-testing exercise was conducted using 10 questionnaires which were distributed to some medical research

personnel in Lusaka. The exercise provided the researcher with some insight on the validity and reliability of the research instruments as well as further improvement of the research instruments.

Primary data was collected using a self administered questionnaire, while secondary data was collected from written and online documents.

3.8 Ethical Consideration

Throughout the research, the researcher made consented efforts to maintain all research ethics. The issues included the respondents' rights to confidentiality and the right to withhold their consent to participate in the research undertaking. The researcher fully indicated to all the key informant respondents that prior permission would be sought from them before quoting them. Furthermore, all the respondents were notified in no uncertain terms that they reserved the right to decline to participate in the research. The questionnaires also had a covering introductory letter which asked the respondents to supply information that will be used for academic purposes only.

3.9 Coding Sheet

After the data gathering exercise, a coding sheet was designed for coding the data so that it could be analysed by computer. The coding was conducted by assigning numbers to the various responses. In this research, nominal, ordinal and interval levels of measurements were used for coding the data.

3.10 Data Processing and Analysis

Both quantitative and qualitative techniques were used to analyse the data. To enhance quick completion of data processing a data entry screen in EPI-DATA was created. This programme facilitates creation of a data entry dictionary or programme with a screen that guides the data entry. This programme is capable of handling filter questions through skip patterns as well as detecting out-of-range and invalid entries(Dean et-al 2009).

After data was entered, a thorough data cleaning and validation was undertaken. Thereafter, data was analysed using SPSS. Cross tabulations and frequency tables were generated. The qualitative data

collected were analyzed in a number of conventionally established approaches. Data analysis in the qualitative model according to Miles and Huberman, (1994) comprises three levels of activity

- Data reduction
- Data display;
- Conclusion drawing/ verification

Data reduction is essentially attaching meaningful labels to data chunks (Miles and Huberman, 1994). Meanwhile Strauss and Corbin, (1990) described a process of data analysis in which questions are asked about the data and comparisons are made in order to identify similarities. Categories and themes are developed according to their properties (characteristics) or dimensions (high or low on a continuum). Through this analysis of the data the researcher was able to make a rational and fairly well-informed assessment of the effects of ICTs on the accessibility of medical research information by medical research personnel in Zambia.

3.11 Limitations of the Study

As earlier indicated, although the study used the purposive sampling was also used at the level of choosing the respondents and key informants, probability sampling approach was used to select provinces and sample of medical research institutions, However, the constraints may be negligible because the three selected provinces are among the prominent ones with medical research institutions in the country.

The study is the first of its kind in this field in Zambia; hence it posed some challenges on the theoretical framework. No theory that directly explains the research questions was found as basis of the study. However, a tentative explanation about how ICTs affects the accessibility of medical research information was given in order to provide a theoretical base to the study.

The financial and time constraints meant that the researcher was not able to reach all sources and exhaustively conduct the research. As it turned out that many other sources were recommended for interviews, more time and finances were required.

The use of research questions rather than hypotheses limited the robustness of the conclusions. It leaves the study in the realm on 'exploratory' research which invites further study.

In spite of these limitations, however, it is the strong belief of the researcher that this study presents fresh and useful insights about the effects of ICTs on the accessibility of medical research information.

In conclusion, the study used social scientific methodology for sampling and data analysis in order to have representative results. It also used synthesised analytical approaches thereby strengthening the explanatory and predictive value of the results

CHAPTER FOUR

PRESENTATION OF FINDINGS

This chapter presents the findings of this study. This is based on what the study set out to do: To assess the effects of ICTs on the accessibility of medical research information by medical research personnel in Zambia.

It has been clearly stated in chapter four that the study was conducted using both qualitative and quantitative data analysis methods.

Quantitative analysis involves using the Statistical Package for Social Sciences (SPSS), a computer software programme. Among the statistical methods used were frequencies and cross tabulations. SPSS frequencies and cross tabulations of the different independent and dependent variables were run. The results are presented in detail in various tables in this chapter. The details are also reflected in the descriptive discussion.

Qualitative analysis involves sorting out qualitative data in categories of responses collected from the field through questionnaires. This is followed by a discussion.

4.1 Characteristics of Respondents

For key informants four respondents were sampled from each of the nine (9) medical research institutions. Whereas for medical research staff a total of 80 respondents were sampled from the nine (9) medical research institutions. An average of 8 – 9 respondents was sampled from each institution. In some institutions more than 9 were sampled where as in other institutions less than 9 were sampled. This was based on the availability of medical research staff and size of institutional establishment.

The sample of key respondents was characterised by certain key features. In terms of sex for the key respondents, 19 (52.8%) of respondents were male while 17 (47.2%) were female. The sample of medical research staff was characterised by medical research staff who actively participate in the different levels

of medical research. In terms of sex for medical research staff, 43 (53.8%) were male while 37 (46.3%) were female

In terms of age distribution, the sample of key informants was characterised by 20 (55.6%) of respondents being between 31-40 years of age. 6 (16.7%) of respondents were between 26-30 and 41-45 years of age respectively. Only four (11.1%) were 46 years of age and above. Where as the sample of medical research staff was characterised by 27 (33.8%) of respondents being between 26-30 years of age, while 25 (31.3%) of respondents were between 31-35, 10 (12.5%) of respondents were 36-40 years of age, seven (8.7%) of respondents were from 41-45 years of age, six (7.5%) of respondents were from 21-25 years of age and five (6.3%) were 46 years of age and above.

The study also revealed that 17 (47.2%) of key informant respondents had a Bachelors Degree as their qualification, followed by percent 10 (27.8%) with a Masters Degree, 6 (16.7%) with a PhD and three (8.3%) with a Diploma. While for medical research staff it was observed that 34 (42.5%) of respondents had a Bachelors Degree as their qualification, followed by 24 (30%) with a Diploma, 14 (17.5%) with a Masters Degree, five (6.3%) with a Certificate and three (3.8%) with a PhD.

4.2 Type of Organisation

From the key informants it was found that six (66%) of the medical research institutions in the study were publicly owned whereas one (11.1%) was owned by the church and two (22.2%) was owned by the NGOs. It was further established that 51 (63.8%) of medical research staff respondents in the study were from publicly owned institutions whereas nine (11.3%) were from church owned institutions and 20 (25%) were from NGOs owned institutions. The highest sampled institution was UTH/UNZA with 16 (20%) of the sample size followed by TDRC with 13 (16.2%), CIDRZ with 11 (13.8%) and MACHA and EMORY with nine (11.2%) respectively. NMCC followed with 7 (8.7%), CVRI with 7.5%, CCHS with 5 (6.3%) and NISIR with 4 (5%). As shown in figure 2 below.

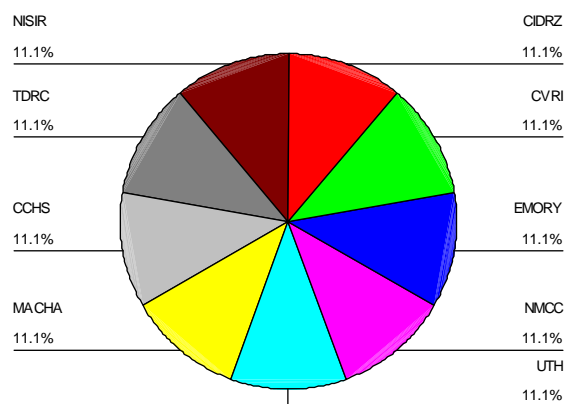


Fig. 2: Type of Organisation

4.3 Type of Medical Research Undertaken

As key informants, respondents from all nine medical research institutions were asked what types of medical research their organisations undertake. It was established that 18 (50%) of the respondents said they undertake Basic Medical Research while 18 (50%) indicated that their institutions do not undertake Basic Medical Research as shown in table 1 below.

Table 1: Type of Medical Research undertaken

	Yes		No	
	Percentage	Count	Percentage	Count
Basic Medicine	50.0%	18	50.0%	18
Clinical Medicine	75.0%	27	25.0%	9
Health Sciences	88.9%	32	11.1%	4
Medical Biotechnology	38.9%	14	61.1%	22
Forensic science	16.7%	6	83.3%	30
Biological and Chemical Sciences	61.1%	22	38.9%	14
Social Sciences	47.2%	17	52.8%	19
Veterinary Sciences	22.2%	8	77.8%	28
Molecular Epidemiology	22.2%	8	77.8%	28
HIV/AIDS Prevention	44.4%	16	55.6%	20

It was observed that 27 (75%) of respondents indicated that their organisations undertake Clinical Medical Research where as nine (25%) stated that they do not undertake Clinical Medical Research (shown in table 1 above).

From the data obtained it was observed that 32 (88.9%) of respondents stated that their organisation undertake Health Sciences Research as opposed to four (11%) of the respondents who indicated that their institution do not embark on Health Sciences Research as shown in table 1 above.

It was established that 14 (38.9%) of respondents indicated that their organisations undertake Medical Biotechnology Research where as 22 (61.1%) of the respondents stated that their organisations do not carry out Medical Biotechnology Research (Shown in table 1 above).

It was observed that six (16.7%) of respondents stated that their institutions undertake Forensic Science Research while 30 (83.3%) of the respondents stated do not embark on Forensic Science Research (Shown in table 1 above).

From the data obtained it was also observed that 22 (61.1%) of respondents indicated that their organisations undertake Biological and Chemical Sciences Research where as 14 (38.9%) of the respondents indicated that their organisation do not carry out Biological and Chemical Sciences Research (Shown in table 1 above).

It was established that 17 (47.2%) of respondents stated that their organisation undertakes Social Sciences Research, while 19 (52.8%) of the respondents stated that their institutions do not undertake Social Sciences Research as shown above in table 1.

It was observed that eight (22.2%) of respondents stated that their organisation undertakes Veterinary Sciences Research and Molecular Epidemiology Research as opposed to 28 (77.8%) of the respondents who indicated that their institutions do not embark Veterinary Science Research and Molecular Epidemiology Research as Shown in table 1 above.

It was found that 16 (44.4%) of respondents indicated that their organisations undertake HIV and AIDS Prevention Research where as 20 (56.2%) of the respondents stated that their organisations do not undertake HIV and AIDS Prevention Research (Shown in table 1 above).

4.4 Type of Medical Research Participated in and Organisational Ownership

Cross tabulations of Type of Ownership of organisation and Type of Medical Research were done. From key informants, it was found that 12 (33.3%) of Basic Medicine research is undertaken by public owned institutions followed by NGO Owned institutions at five (13.9%) and church owned institutions at one (2.8%). On the other hand 12 (33.3%) of respondents from public owned institutions stated that they do not undertake Basic Medical research followed by three (8.3%) for NGO owned institutions and three (8.3%) for church owned institutions, while for the medical research staff the study showed that 33 (41.3%) of those who participated in basic medicine research were from public owned institutions followed by church owned institution at eight (10%) and NGO owned institutions at six (7.5%), while 18(22.5%) of the respondents who indicated that they do not participate basic medicine were from public owned institutions followed by 14 (17.5%) of respondents coming from the NGO owned institutions and only one (1.2%) from the church owned institution as shown below in figures 3 and 4 below.

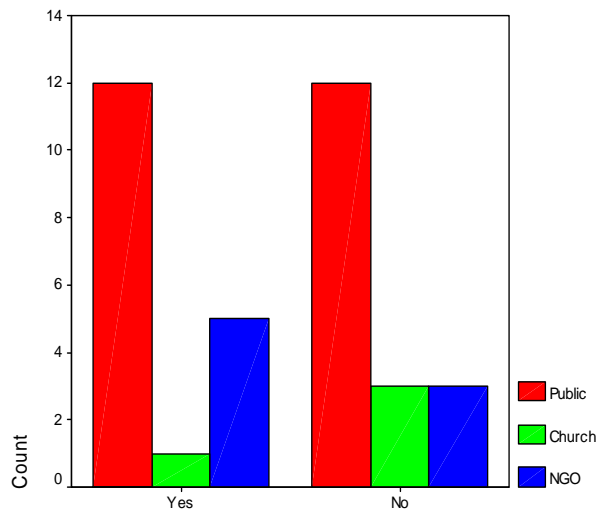


Fig. 3: Key Informant - Basic Medicine Research

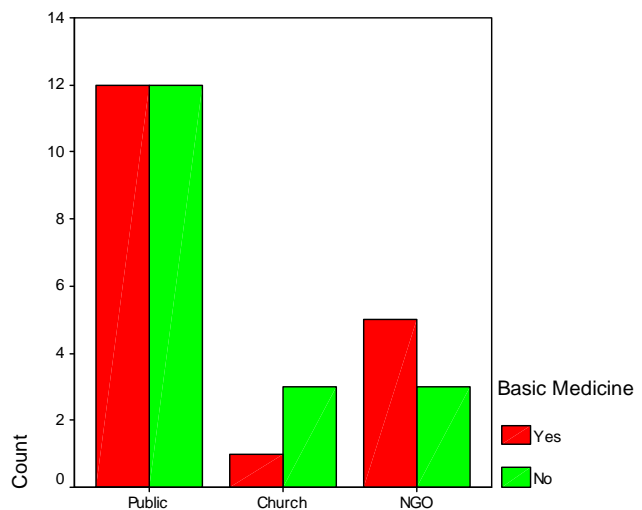


Fig. 4: Medical research Staff - Basic Medicine Research

16 (44.4%) of Clinical Medicine research is undertaken by public owned institutions followed by NGO owned institutions at eight (22.2%) and church owned institution at three (8.3%). On the contrary eight

(22.2%) of respondents from public owned institutions stated that they do not undertake Clinical Medical research followed by one (2.8%) for church owned institutions and none for NGO owned institutions. For the medical research staff respondents it was found that 33 (41.3%) of those who participated in basic medicine research were from public owned institutions followed by church owned institution at eight (10%) and NGO owned institutions at six (7.5%), while 18(22.5%) of the respondents who indicated that they do not participate basic medicine were from public owned institutions followed by 14 (17.5%) of respondents coming from the NGO owned institutions and only one (1.2%) from the church owned institution. See figures 5 and 6 respectively.

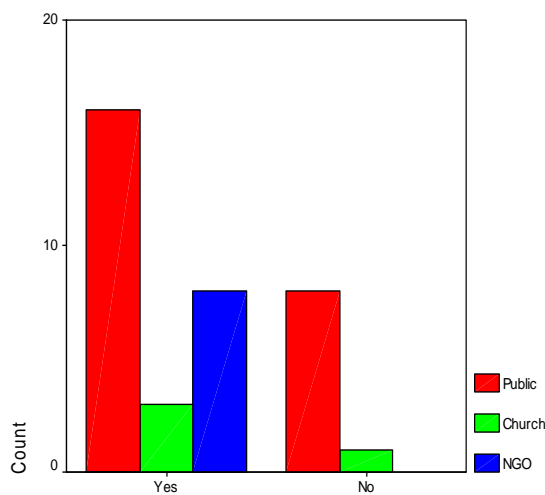


Fig. 5: Key Informant - Clinical Medicine Research

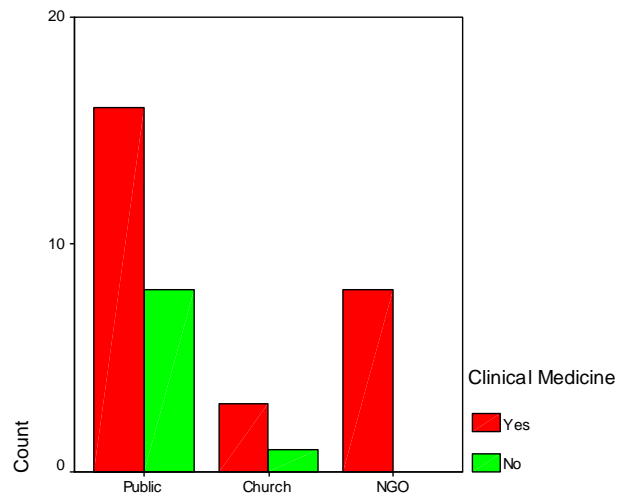


Fig.6: Medical research Staff - Clinical Medicine Research

From the key informants it was found that 22 (61.1%) of Health Sciences research is undertaken by public owned institutions followed by NGO Owned institutions at 6 (16.7%) and Church Owned institution at four (11.1%). On the other hand two (5.6%) of respondents from public owned institutions stated that they do not undertake Health Sciences research followed by two (5.6%) for NGO owned institutions and none for church owned institutions as shown below in figure 8 below. It was further observed that the majority medical research staff who participated in health science research were from public owned institutions 47 (58.8%) followed by 19 (23.8%) coming from NGO owned institution and only two (2.5%) representing church owned institution, whereas seven (8.8%) of the respondents who indicated that they do not participate in health science research from the church owned institution followed by five (5.0%) coming from public owned institutions and only one (1.2%) coming from the NGO owned institutions (Shown in figures 7 and 8 below).

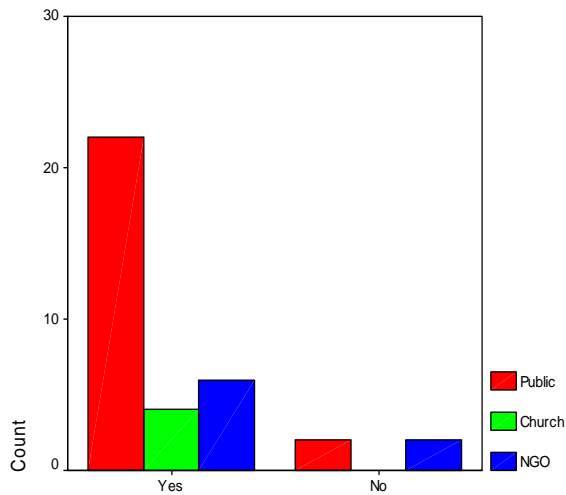


Fig. 7: Key Informant- Health Sciences Research

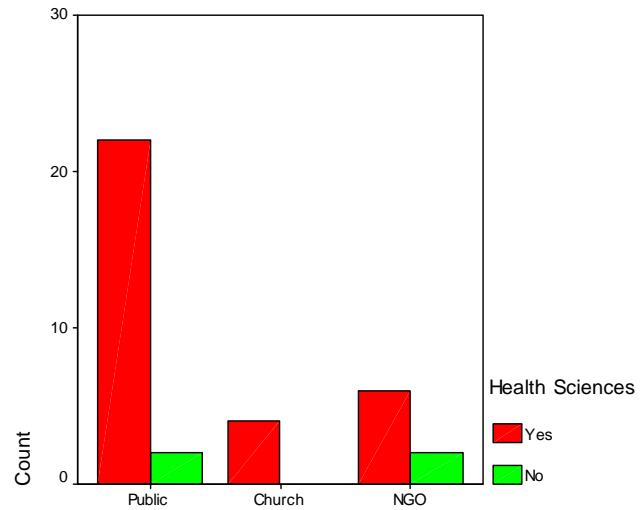


Fig. 8: Medical research Staff - Health Sciences Research

The key informants indicated that 10 (27.8%) of Medical Biotechnology research is undertaken by public owned institutions followed by NGO owned institutions at four (11.1%) and none for the church owned institution. On the other hand 14 (38.9%) of respondents from public owned institutions stated that they do not undertake Medical Biotechnology research followed by four (11.1%) for NGO owned institutions and four (11.1%) for church owned institutions. It was also established from the medical research staff that 32 (40%) of those who participated in medical biotechnology research represented public owned institutions, while 8 (10%) were from the church owned institution and only three (3.8%) representing the NGO owned institutions, whereas 19 (23.8%) of the respondents who stated that they do not participate in medical biotechnology research were from public owned institutions followed by 17(21.2%) from the NGO owned institutions and only three (1.2%) coming from the church owned institution as shown in figures 9 and 10 below.

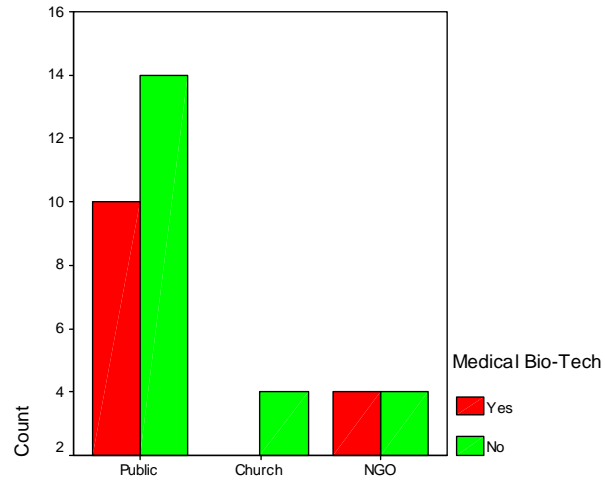
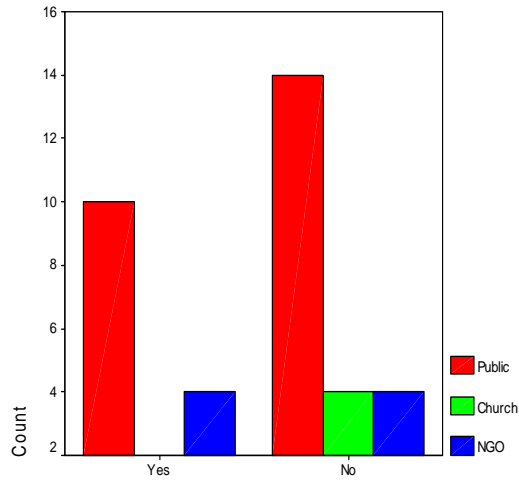


Fig. 9: Key Informant- Medical Biotechnology Research

Fig.10: Medical research Staff - Medical Biotechnology Research

The data obtained from the key informants showed that six (16.7%) of Forensic Science research is undertaken by public owned institutions and none is done by NGO owned institutions or church owned institution. On the contrary 18 (50.0%) of respondents from public owned institutions stated that they do not undertake Forensic Science research followed by eight (22.2%) for NGO owned institutions and four (11.1%) for church owned institutions. The observation from the medical research staff was that 10 (12.5%) of the respondents who participated in forensic science research were from public owned institutions, while one (1.3%) represented the church owned institution and on the other hand 41(51.2%) of the respondents who indicated that they do not participate in forensic science research were from public owned institutions followed by 20 (25.0%) coming from the NGO owned institutions and eight (10.0%). This is shown in figures 11 and 12 below.

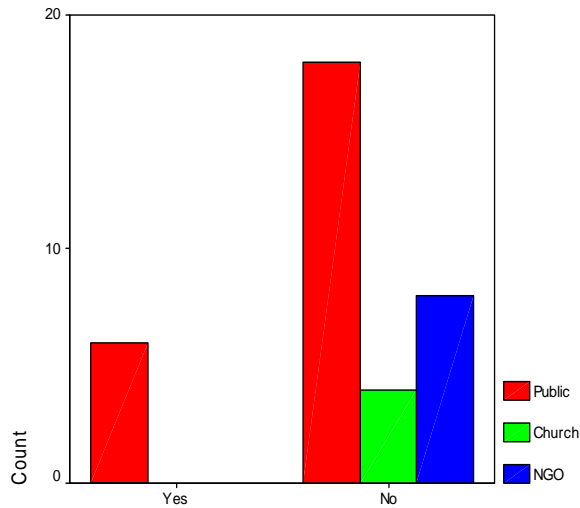


Fig. 11: Key Informant- Forensic Science Research

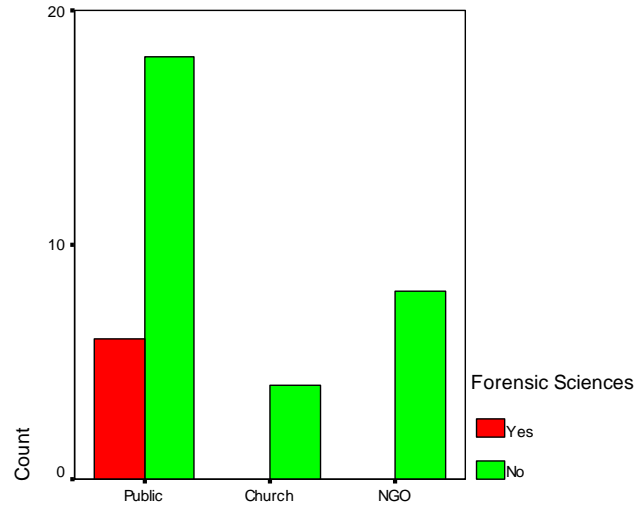


Fig. 12: Medical research Staff - Forensic Science Research

The study further reveals that from the key informants 19 (52.8%) of Biological and Chemical Sciences research is undertaken by public owned institutions followed by NGO owned institutions at two (5.6%) and church owned institution at one (2.8%). On the other hand six (16.7%) of respondents from NGO owned institutions stated that they do not undertake Biological and Chemical Science research followed by five (13.9%) public for owned institutions and three (8.3%) for church owned institutions. Whereas for the medical research staff the study showed that 16 (20%) of those who participated in biological and chemical science research were from public owned institutions followed by seven (8.8%) representing the church owned institution and only one (1.3%) coming from the NGO owned institutions, while 35 (43.8%) of the respondent who indicated that they do not participate in biological and chemical science research were from public owned institutions followed by 19 (23.8%) coming from the NGO world and two (2.5%) as shown in figures 13 and 14 below.

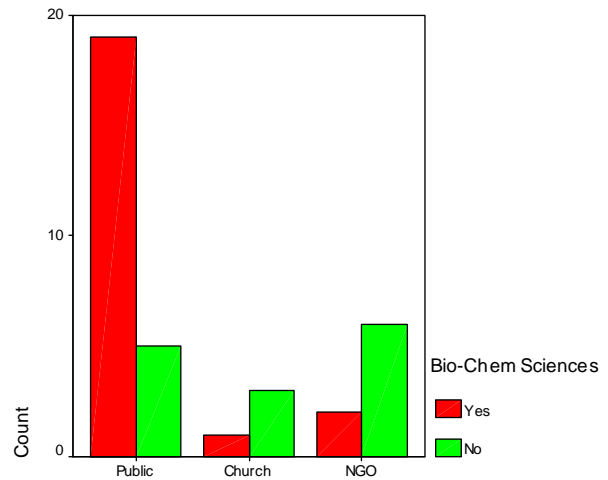
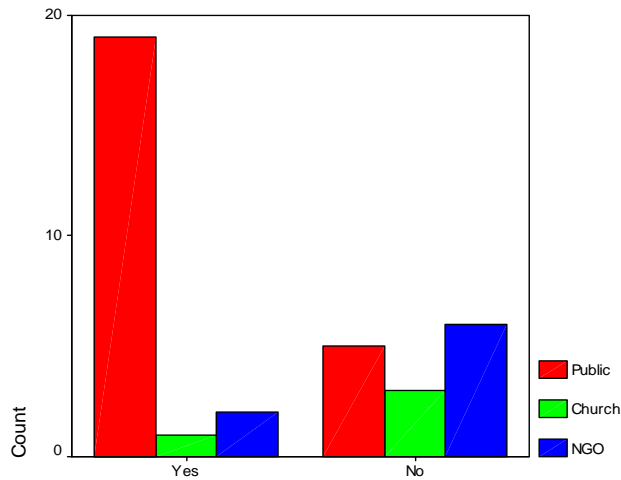


Fig. 13: Key Informant - Biological and Chemical Sciences Research **Fig. 14: Medical research Staff - Biological and Chemical Sciences Research**

Further analysis in the study indicated that from the key informants 12 (33.3%) of Social Sciences research is undertaken by public owned institutions followed by NGO owned institutions at 5 (13.9%) and none for the church owned institution. On the other hand 12 (33.3%) of respondents from public owned institutions stated that they do not undertake Social Science research followed by four (11.1%) for church owned institutions and three (8.3%) for NGO owned institutions. Whereas for the medical research staff it was found that majority of the respondents who participated in social science research were from the NGO owned institutions 18 (22.5%), while 13 (16.3%) represented public owned institutions on the contrary 38 (47.5%) of the respondents who stated that they do not participate in social science research were from public owned institutions followed by nine (11.2%) coming from the church owned institution and only two (2.5%) coming from the NGO owned institutions. This is shown in figures 15 and 16 below.

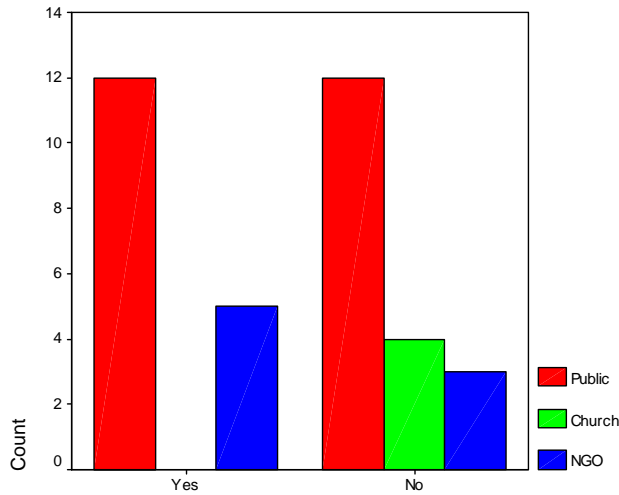


Fig. 15: Key Informant - Social Sciences Research

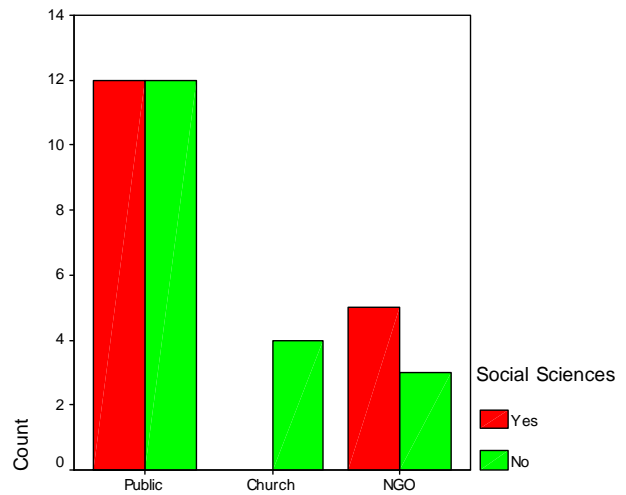


Fig. 16: Medical research Staff - Social Sciences Research

The data obtained from the key informants showed that eight (22.2%) of Veterinary Sciences research is undertaken by public owned institutions and none is done by NGO owned institutions or church owned institution. On the contrary 16 (44.4%) of respondents from public owned institutions stated that they do not undertake Veterinary Sciences research followed by eight (22.2%) for NGO owned institutions and four (11.1%) for church owned institutions. The medical research staff indicated that 10 (12.5%) of those who participated in veterinary science research were from public owned institutions, while respondents who indicated that they do not participate in veterinary science from public owned institutions were at 41 (51.2%) followed by those from the NGO owned institutions at 20 (25.0%) and none for the NGO and nine (11.2%) from the church owned institution as shown in figures 17 and 18 below.

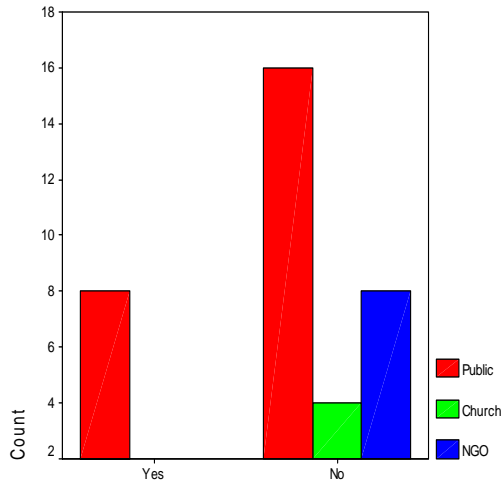


Fig. 17: Key Informant - Veterinary Sciences Research

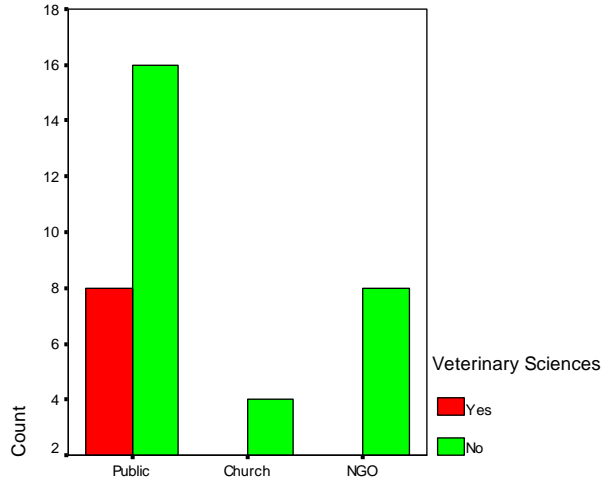


Fig. 18: Medical research Staff - Veterinary Sciences Research

The data obtained from the key informants showed that eight (22.2%) of Molecular Epidemiology research is undertaken by public owned institutions and none is done by NGO owned institutions or church owned institution. On the contrary 16 (44.4%) of respondents from public owned institutions stated that they do not undertake Molecular Epidemiology research followed by eight (22.2%) for NGO owned institutions and four (11.1%) for church owned institutions. The study further revealed that majority of the medical research staff that participated in molecular epidemiology research represented public owned institutions 28 (35%), while four (5%) were from the church owned institution and for respondents who stated that they do not participate in molecular epidemiology research 23 (28.8%) were from public owned institutions followed by 20 (25.0%) from the NGO owned institutions and five (6.2%) from the church owned institution as shown in figures 19 and 20 below.

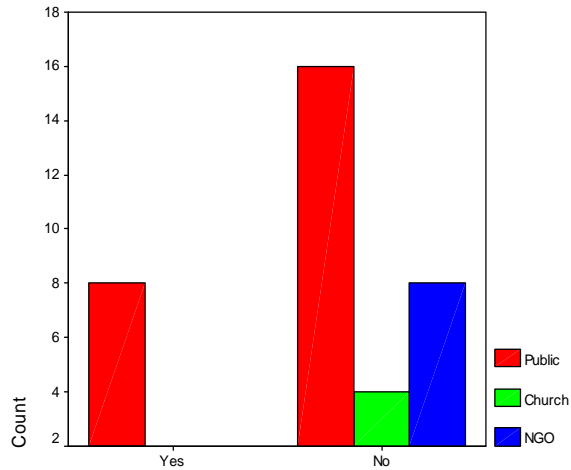


Fig. 19: Key Informant - Molecular Epidemiology Research

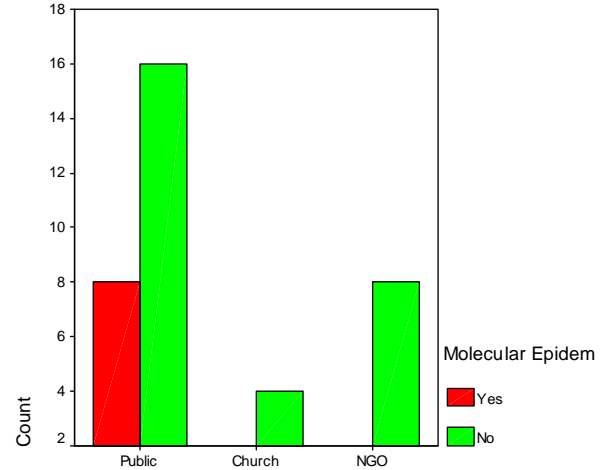


Fig. 20: Medical research Staff – Molecular Epidemiology Research

Furthermore the study found from the key informants that 11 (30.6%) of HIV and AIDS Prevention research is undertaken by public owned institutions followed by NGO owned institutions at five (13.9%) and none for the church owned institutions. On the contrary 13 (36.1%) of respondents from public owned institutions stated that they do not undertake HIV and AIDS Prevention research followed by four (11.1%) for church owned institutions and three (8.3%) for NGO owned institutions. Whereas it was also observed that 25 (31.3%) of medical research staff that participated in HIV and AIDS prevention research were from public owned institutions, while 19 (23.8%) as regards to those who do not participate in HIV and AIDS prevention research, 26 (32.5%) represented public owned institutions followed by nine (11.2%) representing the church owned institution and one (1.2%) representing the NGO owned institutions. This is shown in figures 21 and 22 below.

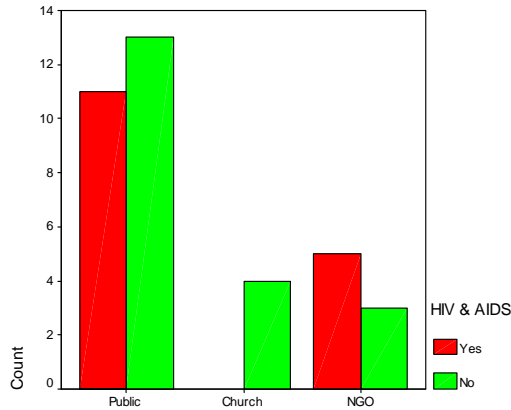
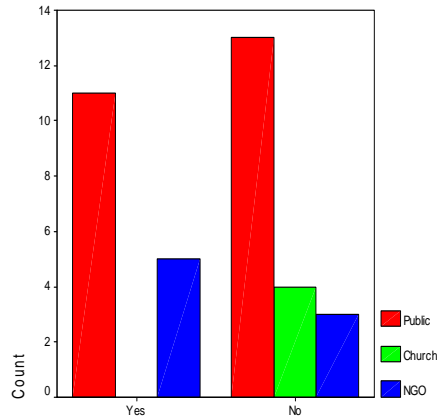


Fig. 21: Key Informant - HIV and AIDS Prevention Research Fig. 22: Medical research Staff – HIV and AIDS Prevention Research

4.5 Type of ICTS Used

In terms of organisations using ICTs in accessing medical research information, all 36 (100%) of respondents stated that they use ICTs in accessing medical research information for their research activities. In addition 36 (100%) of respondents stated that they use computers in accessing medical research information for their research activities, it was however observed that 32 (88.9%) of respondent stated that they use Electronic Databases in accessing medical research information as opposed to four (11.1%) of the respondents who indicated that they do not use Electronic Databases in accessing medical research information as shown in table 2 below.

Table 2: Type of ICTs used

	Yes		No	
	Percentage	Count	Percentage	Count
Electronic Databases	91.7%	32	11.1%	4
Computers	100.0%	36	0.0%	0
Electronic Mail	91.7%	33	8.3%	3
The Internet	91.7%	33	8.3%	3
Mobile Phones	33.3%	12	66.7%	24
Radio	25.0%	9	75.0%	27
Telephone Landline	75.0%	27	25.0%	9
Satellite Television	8.3%	3	91.7%	33
PDA's	13.9%	5	86.1%	31
ACASI	16.7%	6	83.3%	30
Fax	44.4%	16	55.6%	20
GPS	22.2%	8	77.8%	28

It was established that 33(91.7%) of respondents use Electronic Mail and the Internet in accessing medical research information while three (8.3%) of the respondents indicated that they do not use Electronic Mail and the Internet respectively in accessing medical research information as shown above in table 2. Conversely 33 (66.7%) of respondents stated that they do not use Mobile Phones in accessing medical research information where as 12 (33.3%) of the respondents stated that they utilize Mobile Phones in accessing medical research information as shown in table 2 above.

On the other hand 27 (75%) of the respondents indicated that they do not use Radios in accessing medical research information whilst nine (25%) of the respondents indicated that they make the use of the Radio in accessing medical research information, this is shown in table 2 above. On the contrary 25 (75%) of the respondents stated that they use Telephone Landlines in accessing medical research information whereas nine (25%) of the respondents stated that they do not use Telephone Landlines in accessing medical research information as shown above in table 2.

It was found that 33 (91.7%) of the respondents indicated that they do not use Satellite Television in accessing medical research information while three (8.3%) of the respondents indicated that they do make use of Satellite Television in accessing medical research information as shown above in table 2.

On the other hand 31 (86.1%) of the respondents stated that they do not use Personal Digital Assistants (PDAs) in accessing medical research information whereas five (13.9%) of the respondents stated that they utilize PDAs in accessing medical research information as shown above in table 2. It was established that 30 (83.3%) of the respondents on the other hand indicated that they do not use Audio Computer Assisted Self Interview (ACASI) whilst six (16.7%) of the respondents indicated that they use ACASI in accessing medical research information as shown in table 2 above.

Conversely 20 (55.6%) of the respondents stated that they do not use fax machines in accessing medical research information as opposed to 16 (44.4%) of the respondents who stated that they use fax machines in accessing medical research information as shown above in table 2. On the other hand 28 (77.8%) of the respondents indicated that they do not use Global Positioning System (GPS) in accessing medical

research information whereas eight (22.2%) of the respondents indicated that they make use of GPS in accessing medical research information as shown above in table 2.

4. 6 Type of ICTS Used and Organisational Ownership

Cross tabulations of Type of Ownership and Type of ICTs used was done. It was found that 21 (58.3%) of the respondents who used electronic databases in accessing medical research information were from public owned institutions followed by NGO owned institutions at eight (22.2%) and church owned institution at three (8.3%) while three (8.3%) of the respondents who indicated that they do not use electronic databases were from public owned institutions followed by one (2.8%) of the respondents from church owned institution and none for the respondents from the NGO owned institutions as shown below in figure 23 below. Furthermore after doing a correlation and chi-square tests, a positive relationship between the type of ICTs (Electronic Database) used and organisational ownership was found as shown in tables 3 and 4 below.

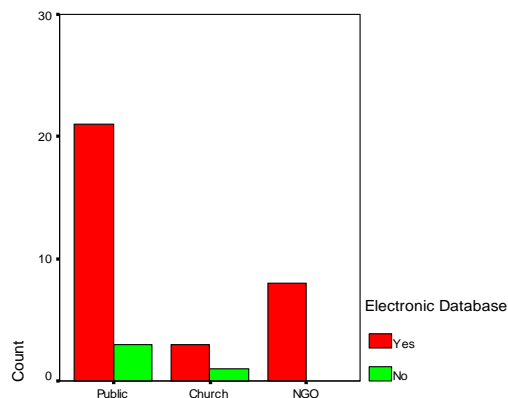


Fig. 23: Electronic Database Use

Table 3: Chi-Square Tests Type of Organisation ownership & Electronic Database use

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.828 ^a	2	.401
Likelihood Ratio	2.532	2	.282
Linear-by-Linear Association	.400	1	.527
N of Valid Cases	36		

a. 4 cells (66.7%) have expected count less than 5. The minimum expected count is .44.

Table 4: Symmetric Measures Type of Organisation ownership & Electronic Database use

		Value	Asymp. Std. Error ^a	Approx. T ^b	Approx. Sig.
Interval by Interval	Pearson's R	-.107	.120	-.627	.535 ^c
Ordinal by Ordinal	Spearman Correlation	-.102	.125	-.600	.553 ^c
N of Valid Cases		36			

a. Not assuming the null hypothesis.
b. Using the asymptotic standard error assuming the null hypothesis.
c. Based on normal approximation.

It was established that 24 (66.7%) of the respondents who used computers in accessing medical research information were from public owned institutions followed by NGO owned institutions at eight (22.2%) and church owned institution at four (11.1%), whereas none of the respondents indicated that they do not use computers in accessing medical research information as shown below in figure 24 below.

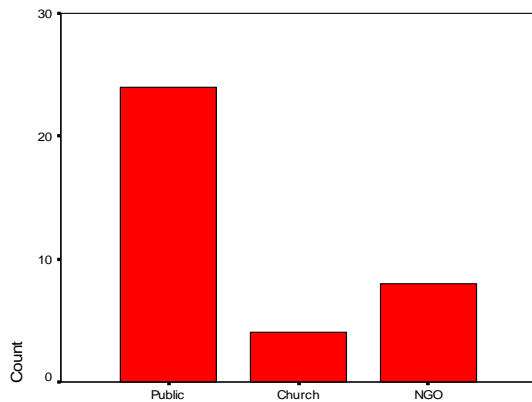


Fig. 24: Computer Use

It was found that 22 (61.1%) of the respondents who used electronic mail in accessing medical research information were from public owned institutions followed by NGO owned institutions at eight (22.2%) and church owned institution at three (8.3%), conversely two (5.6%) of the respondents who stated that they do not use electronic mail accessing medical research information were from public owned institutions followed by one (2.8%) of the respondents from church owned institution and none for the respondents from the NGO owned institutions as shown below in figure 25 below. Additionally a correlation and chi-square tests were done and a positive relationship was ascertained between the type of ICTs (Electronic mail) used and organisational ownership as shown in tables 5 and 6 below.

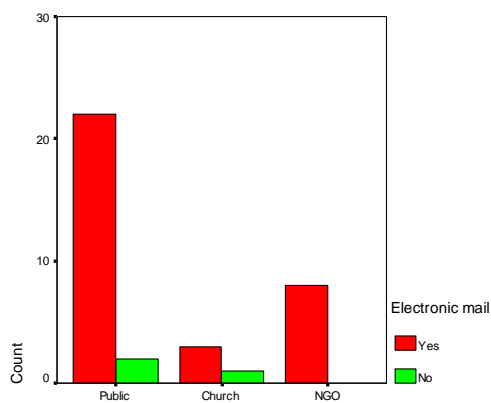


Fig. 25: Electronic Mail Use

Table 5: Chi-Square Tests Type of Organisation ownership & Electronic Mail Use			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.182 ^a	2	.336
Likelihood Ratio	2.385	2	.303
Linear-by-Linear Association	.095	1	.758
N of Valid Cases	36		

a. 4 cells (66.7%) have expected count less than 5. The minimum expected count is .33.

Table 6: Symmetric Measures Type of Organisation ownership & Electronic Mail Use					
		Value	Asymp. Std. Error ^a	Approx. T ^b	Approx. Sig.
Interval by Interval	Pearson's R	-.052	.126	-.304	.763 ^c
Ordinal by Ordinal	Spearman Correlation	-.047	.133	-.272	.788 ^c
N of Valid Cases		36			
a. Not assuming the null hypothesis.					
b. Using the asymptotic standard error assuming the null hypothesis.					
c. Based on normal approximation.					

It was observed that 21 (58.3%) of the respondents who used the internet in accessing medical research information were from public owned institutions followed by NGO owned institutions at eight (22.2%) and church owned institution at four (11.1%) on the other hand three (8.3%) of the respondents who indicated that they do not use the internet in accessing medical research information were from public owned institutions and none were from the NGO and church owned institutions respectively as shown below in figure 26 below. Furthermore after undertaking a correlation and chi-square tests, a positive relationship between the type of ICTs (Internet) used and organisational ownership was found as shown in tables 7 and 8 below.

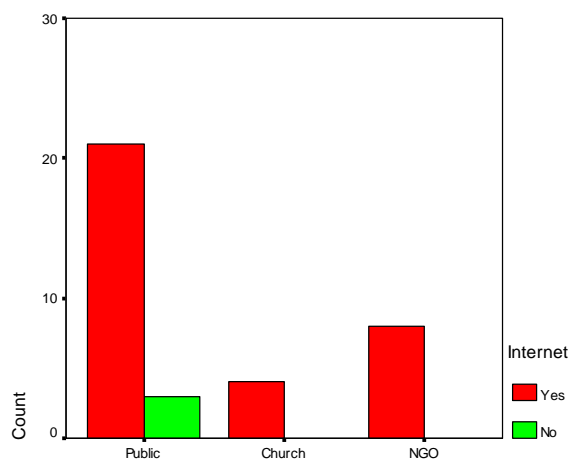


Fig. 26: Internet Use

Table 7: Chi-Square Tests Type of Organisation ownership & Internet Use

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.636 ^a	2	.441
Likelihood Ratio	2.567	2	.277
Linear-by-Linear Association	1.520	1	.218
N of Valid Cases	36		

a. 4 cells (66.7%) have expected count less than 5. The minimum expected count is .33.

Table 8: Symmetric Measures Type of Organisation ownership & Internet Use

		Value	Asymp. Std. Error ^a	Approx. T ^b	Approx. Sig.
Interval by Interval	Pearson's R	-.208	.066	-1.242	.223 ^c
Ordinal by Ordinal	Spearman Correlation	-.209	.065	-1.248	.220 ^c
N of Valid Cases		36			
a. Not assuming the null hypothesis.					
b. Using the asymptotic standard error assuming the null hypothesis.					
c. Based on normal approximation.					

It was further established that six (16.7%) of the respondents who used mobile phones in accessing medical research information were from public owned institutions followed by NGO Owned institutions at four (11.1%) and church owned institution at two (5.6%), whilst 18 (50.0%) of the respondents who indicated that they do not use mobile phones in accessing medical research were from public owned institutions followed by respondents from NGO owned institutions at four (11.1%) and church owned institution at two (5.6%), as shown below in figure 20 below. In addition a correlation and chi-square tests were undertaken and a positive relationship between the type of ICTs (Mobile Phones) used and organisational ownership was established as shown in tables 9 and 10 below.

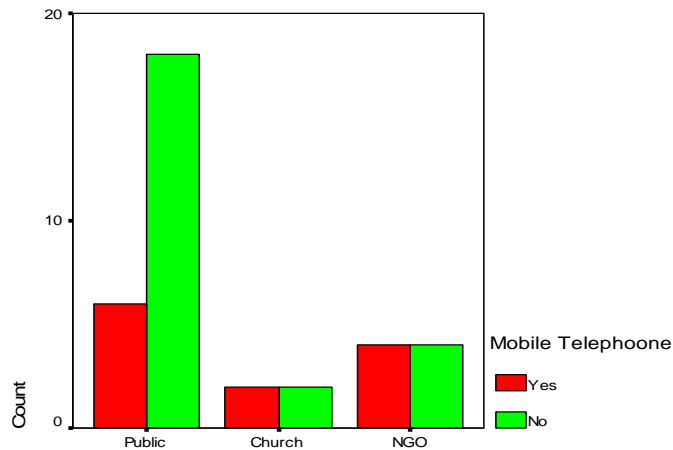


Fig. 27: Mobile Phones Use

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.250 ^a	2	.325
Likelihood Ratio	2.201	2	.333
Linear-by-Linear Association	2.090	1	.148
N of Valid Cases	36		

a. 3 cells (50.0%) have expected count less than 5. The minimum expected count is 1.33.

		Value	Asymp. Std. Error ^a	Approx. T ^b	Approx. Sig.
Interval by Interval	Pearson's R	-.244	.169	-1.469	.151 ^c
Ordinal by Ordinal	Spearman Correlation	-.245	.168	-1.477	.149 ^c
N of Valid Cases		36			

a. Not assuming the null hypothesis.
b. Using the asymptotic standard error assuming the null hypothesis.
c. Based on normal approximation.

From the data obtained it was established that six (16.7%) of the respondents who used the radio in accessing medical research information were public owned institutions followed by NGO Owned institutions at three (8.3%), however majority 18 (50.0%) of the respondents who indicated that they do

not use the radio in accessing medical research information were from public owned institutions followed by five (13.9%) coming from the NGO owned institution and four (11.1%) from the church owned institution as shown below in figure 21 below. Furthermore after undertaking a correlation and chi-square tests, a positive relationship between the type of ICTs (Radio) used and organisational ownership was ascertained as shown in tables 11 and 12 below.

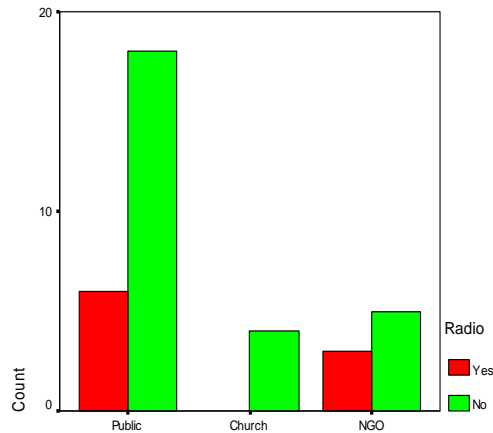


Fig. 28: Radio Use

Table 11: Chi-Square Tests Type of Organisation ownership & Radio Use			
	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.000 ^a	2	.368
Likelihood Ratio	2.911	2	.233
Linear-by-Linear Association	.087	1	.768
N of Valid Cases	36		

a. 3 cells (50.0%) have expected count less than 5. The minimum expected count is 1.00.

Table 12: Symmetric Measures Type of Organisation ownership & Radio Use					
		Value	Asymp. Std. Error ^a	Approx. T ^b	Approx. Sig.
Interval by Interval	Pearson's R	-.050	.177	-.291	.773 ^c
Ordinal by Ordinal	Spearman Correlation	-.045	.178	-.260	.796 ^c
N of Valid Cases		36			
a. Not assuming the null hypothesis.					
b. Using the asymptotic standard error assuming the null hypothesis.					
c. Based on normal approximation.					

It was found that 20 (55.6%) of the respondents who used the telephone landline in accessing medical research information were from public owned institutions followed by seven (19.4%) NGO from owned institutions, whereas four (11.1%) of the respondents who stated that they do not use telephone landlines in accessing medical research information came from public and church owned institutions respectively and only one (2.8%) came from the NGO owned institutions as shown below in figure 22 below. Furthermore after undertaking a correlation and chi-square tests, a positive relationship between the type of ICTs (Telephone Landline) used and organisational ownership was found as shown in tables 13 and 14 below.

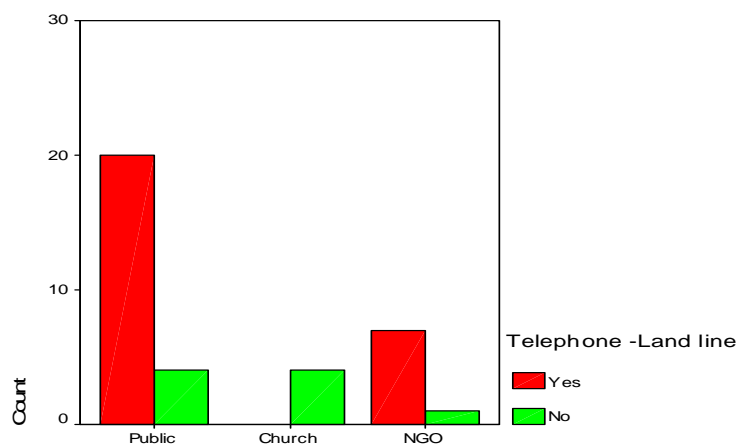


Fig. 29: Telephone Landline Use

Table 13: Chi-Square Tests Type of Organisation ownership & Telephone Landline Use

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.556 ^a	2	.001
Likelihood Ratio	12.833	2	.002
Linear-by-Linear Association	.784	1	.376
N of Valid Cases	36		

a. 3 cells (50.0%) have expected count less than 5. The minimum expected count is 1.00.

Table 14: Symmetric Measures Type of Organisation ownership & Telephone Landline Use

		Value	Asymp. Std. Error ^a	Approx. T ^b	Approx. Sig.
Interval by Interval	Pearson's R	.150	.158	.882	.384 ^c
Ordinal by Ordinal	Spearman Correlation	.163	.166	.965	.341 ^c
N of Valid Cases		36			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

It was also observed that two (5.6%) of the respondents who used the satellite television in accessing medical research information were from public owned institutions followed by respondents from NGO owned institutions at one (2.8%), on the other hand 22 (61.1%) of the respondents who stated that they do not use satellite television were from public owned institutions followed by seven (19.4%) coming from the NGO owned institutions and four (11.1%) of the respondents coming from the Church Owned institution as shown below in figure 23 below. Furthermore after undertaking a correlation and chi-square tests, a positive relationship between the type of ICTs (Satellite Television) used and organisational ownership was established as shown in tables 15 and 16 below.

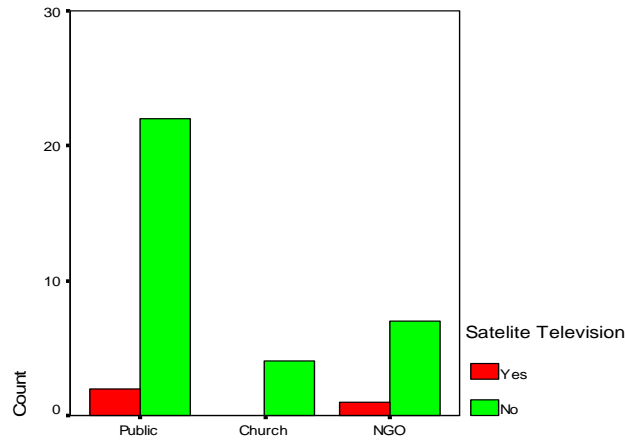


Fig. 30: Satellite Television Use

Table 15: Chi-Square Tests Type of Organisation ownership & Satellite Television Use

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.545 ^a	2	.761
Likelihood Ratio	.856	2	.652
Linear-by-Linear Association	.024	1	.878
N of Valid Cases	36		

a. 4 cells (66.7%) have expected count less than 5. The minimum expected count is .33.

Table 16: Symmetric Measures Type of Organisation ownership & Satellite Television Use

		Value	Asymp. Std. Error ^a	Approx. T ^b	Approx. Sig. ^c
Interval by Interval	Pearson's R	-.026	.182	-.152	.880 ^c
Ordinal by Ordinal	Spearman Correlation	-.023	.181	-.136	.893 ^c
N of Valid Cases		36			

a. Not assuming the null hypothesis.
b. Using the asymptotic standard error assuming the null hypothesis.
c. Based on normal approximation.

It was found that five (13.9%) of the respondents who used PDAs were NGO owned institutions, while 24 (66.7%) of the respondents who indicated that they do not use PDAs were from public owned institutions followed by four (11.1%) respondents from the church owned institution and only three

(8.3%) came from the NGO owned institutions as shown below in figure 24 below. Furthermore after undertaking a correlation and chi-square tests, a positive relationship between the type of ICTs (PDAs) used and organisational ownership was ascertained as shown in tables 17 and 18 below.

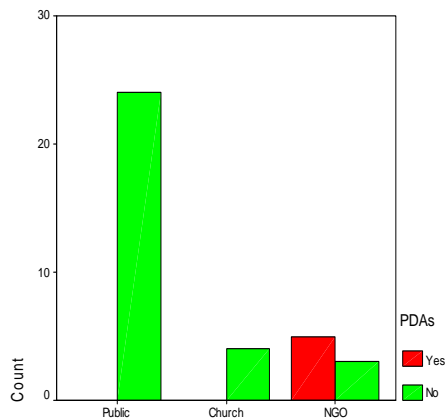


Fig. 31: PDAs Use

Table 17: Chi-Square Tests Type of Organisation ownership & PDAs Use			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	20.323 ^a	2	.000
Likelihood Ratio	18.427	2	.000
Linear-by-Linear Association	15.208	1	.000
N of Valid Cases	36		
a. 4 cells (66.7%) have expected count less than 5. The minimum expected count is .56.			

Table 18: Symmetric Measures Type of Organisation ownership & PDAs Use					
		Value	Asymp. Std. Error ^a	Approx. T ^b	Approx. Sig.
Interval by Interval	Pearson's R	-.659	.112	-5.111	.000 ^c
Ordinal by Ordinal	Spearman Correlation	-.651	.111	-4.997	.000 ^c
N of Valid Cases		36			
a. Not assuming the null hypothesis.					
b. Using the asymptotic standard error assuming the null hypothesis.					
c. Based on normal approximation.					

It was also established that six (16.7%) of the respondents who used ACASI were from NGO owned institutions, while 24 (66.7%) of the respondents who indicated that they do not use ACASI were from public owned institutions followed by four (11.1%) of the respondents came from church owned institution and only two (5.6%) coming from the NGO owned institutions as shown below in figure 25 below. Furthermore after undertaking a correlation and chi-square tests, a positive relationship between the type of ICTs (ACASI) used and organisational ownership was found as shown in tables 19 and 20 below.

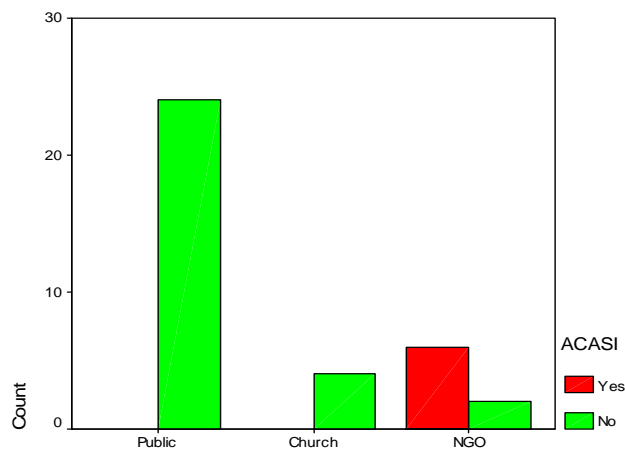


Fig. 32: ACASI Use

Table 19: Chi-Square Tests Type of Organisation ownership & ACASI Use			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	25.200 ^a	2	.000
Likelihood Ratio	23.443	2	.000
Linear-by-Linear Association	18.858	1	.000
N of Valid Cases	36		

a. 4 cells (66.7%) have expected count less than 5. The minimum expected count is .67.

Table 20: Symmetric Measures Type of Organisation ownership & ACASI Use					
		Value	Asymp. Std. Error ^a	Approx. T ^b	Approx. Sig.
Interval by Interval	Pearson's R	-.734	.100	-6.303	.000 ^c
Ordinal by Ordinal	Spearman Correlation	-.725	.101	-6.130	.000 ^c
N of Valid Cases		36			
a. Not assuming the null hypothesis.					
b. Using the asymptotic standard error assuming the null hypothesis.					
c. Based on normal approximation.					

It was found that 12 (33.3%) of the respondents who used fax machines in accessing medical research information were from public owned institutions followed by NGO Owned institutions at four (11.1%), on the other hand there also 12 (33.3%) of the respondents coming from public owned institutions indicating that they do not use fax machines in accessing medical research information followed by four (11.1%) coming from the NGO and church owned institutions respectively as shown below in figure 26 below. Additionally a correlation and chi-square tests were undertaken and a positive relationship between the type of ICTs (Fax) used and organisational ownership was established as shown in tables 21 and 22 below.

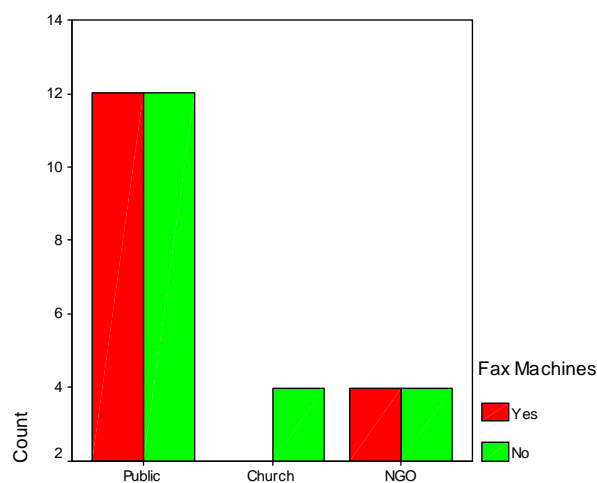


Fig. 33: Fax Use

Table 21: Chi-Square Tests Type of Organisation ownership & Fax Use

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.600 ^a	2	.165
Likelihood Ratio	5.100	2	.078
Linear-by-Linear Association	.326	1	.568
N of Valid Cases	36		

a. 4 cells (66.7%) have expected count less than 5. The minimum expected count is 1.78.

Table 22: Symmetric Measures Type of Organisation ownership & Fax Use

		Value	Asymp. Std. Error ^a	Approx. T ^b	Approx. Sig.
Interval by Interval	Pearson's R	.097	.167	.566	.575 ^c
Ordinal by Ordinal	Spearman Correlation	.104	.168	.607	.548 ^c
N of Valid Cases		36			

a. Not assuming the null hypothesis.
b. Using the asymptotic standard error assuming the null hypothesis.
c. Based on normal approximation.

It was found that four (11.1%) of the respondents who used GPSs in accessing medical research information were from public owned institutions and NGO Owned institutions respectively, conversely 20 (55.6%) of the respondents who stated that they do not use GPSs in accessing medical research were coming from public owned institution and only four (11.1%) were coming from the NGO and church owned institutions respectively as shown below in figure 27 below. Furthermore after undertaking a correlation and chi-square tests, a positive relationship between the type of ICTs (GPS) used and organisational ownership was found as shown in tables 23 and 24 below.

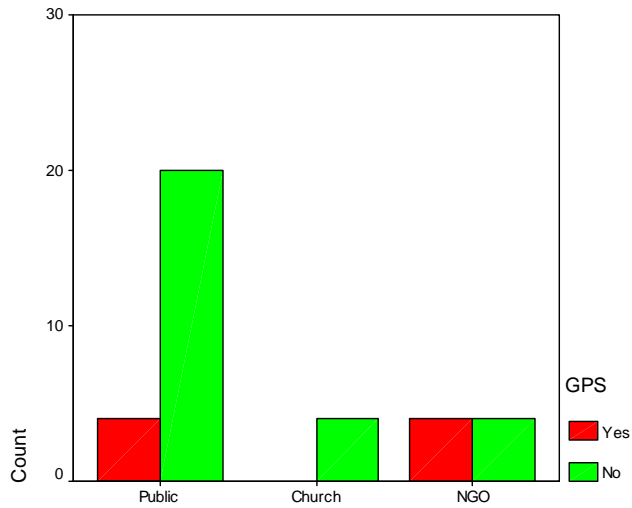


Fig. 34: GPS Use

Table 23: Chi-Square Tests Type of Organisation ownership & GPS Use

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.143 ^a	2	.076
Likelihood Ratio	5.422	2	.066
Linear-by-Linear Association	2.257	1	.133
N of Valid Cases	36		

a. 3 cells (50.0%) have expected count less than 5. The minimum expected count is .89.

Table 24: Symmetric Measures Type of Organisation ownership & GPS Use

		Value	Asymp. Std. Error ^a	Approx. T ^b	Approx. Sig.
Interval by Interval	Pearson's R	-.254	.182	-1.531	.135 ^c
Ordinal by Ordinal	Spearman Correlation	-.247	.184	-1.489	.146 ^c
N of Valid Cases		36			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

4.7 ICT Policy Framework and Training

All the 36 (100%) respondents indicated that their institutions have a policy that governs the acquisition and use of ICTs. However, only 14 (38.9%) of the respondents stated that their institutions have an ICT training policy for their medical research staff, with 22 (61.1%) stating that their organisations do not have an ICT training policy for their medical research staff (Shown below in figure 28).

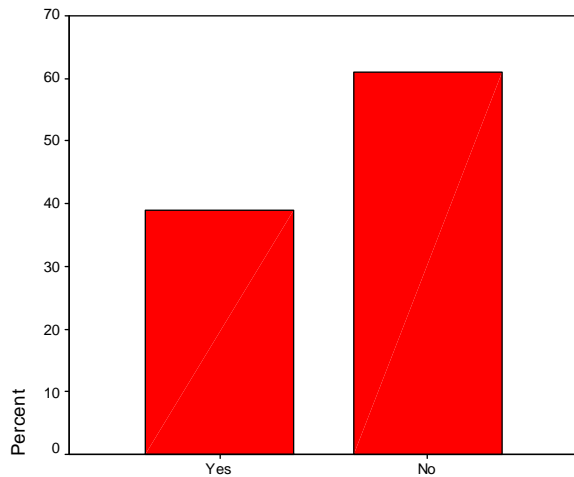


Fig. 35: Policy Framework governing ICT Acquisition

Given that 22 (61.1%) do not have an ICT training policy, four (11.1%) of the respondents indicated that they send their medical research staff for training every one to two years. Three (8.3%) of the respondents stated that they send their medical research staff for ICT training every four to six months while three (5.6%) of the respondents only send their staff every two to three months, and three (11.1%) of the respondents indicated that their medical research staff are not consistently sent for training, whereas one (2.8%) of the respondents stated that they would commence ICT training for their staff in the year to come (2010). This is shown in figure 29 below.

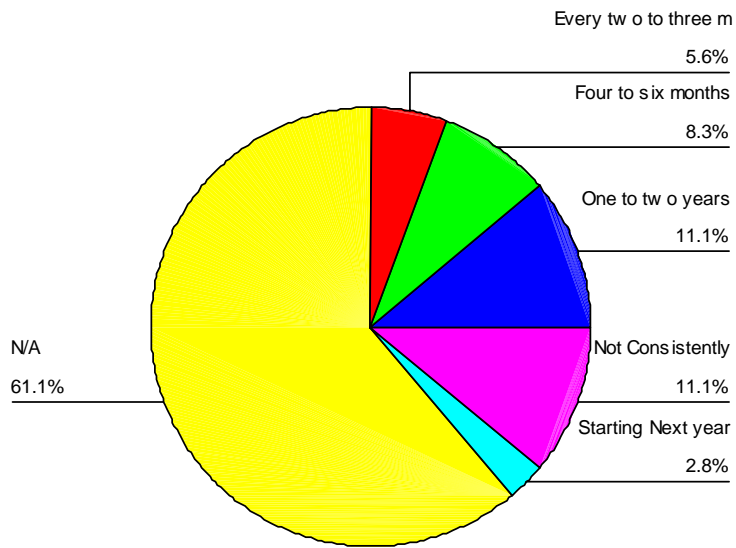


Fig. 36: Frequency of ICT Training

When asked on the adequacy of the ICT training for their medical research staff, 12 (33.3%) of the respondents stated that it was good, while 14 (38.9%) of the respondents indicated that it was fair, and 10 (27.8%) of the respondents indicated that it was poor (as shown in figure 30 below).

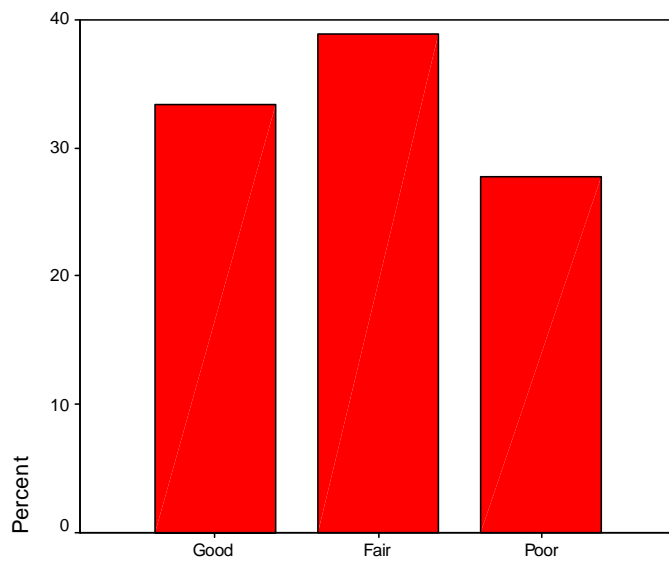


Fig. 37: Adequacy of ICT Training

In probing further, respondents were asked to explain their ranking of adequacy in ICT training.

Respondents that ranked the adequacy of ICT training as Poor cited the following reasons;

- Poor ICT infrastructure and development/training policies
- Lack of resources or institutional capacity
- Lack of interest among medical research staff
- Lack of appreciation by the organisation as a whole to integrate ICTs in all operations of the institution
- Poor or no collaboration between ICT training institutions and medical research institutions
- Lack of awareness, importance and use of ICTs in medical research
- Lack of development, promotion and coordination of ICT related activities among medical research institutions.
- Lack of medical transcript centres
- Lack of IT specialists within medical research institutions to advocate and supplement training

Respondents that ranked the adequacy if ICT training as Fair cited the following reasons;

- ICT training institutions met the basic training requirement that the medical research institutions required
- Medical research staff has appreciated the ICT training and keep requesting for more training.
- The training meets the minimum requirements for medical research staff to use ICT.
- The training has improved the ease of communication amongst medical researchers when conducting research.
- Training has improved the easy of access to literature and information
- The ICT training has enabled medical research staff to have knowledge of research undertaken by other researchers thus reduction in duplication of studies

Respondents that ranked the adequacy if ICT training as Good cited the following reasons;

- The curriculum is modern and is updated frequently
- The training has enhance efficiency amongst medical research staff in conducting research

- The training has further exposed them to new ways and means of accessing the much needed information for their research activities.
- The training has made it possible for medical research staff to hold meetings via internet, review manuscripts and publish online.
- The training has made it enabled medical research staff to transmit data easily to other places for analysis and interpretation in their research.

When asked to explain what could be done to improve the training, respondents cited the following;

- The ICT training curriculum should be tailored in such a way that it should enhance the quality of information specific to different fields of medicine and clinical treatment in the health sector through content development, databases, and meta search engines in order to reduce inconsistencies in data sharing and medical terminologies
- The training should provide skills to utilize web-based portals for dissemination of existing clinical and medical information and epidemiological information on the prevention of diseases such as sexually transmitted infections (STIs)/HIV/AIDS, TB and malaria.
- The training should improve and promote closer health sector collaboration with private entrepreneurs and regional initiatives in ICTs.
- Run online training modules that are regularly and frequently updated.
- Staff training on computer utilization would be helpful if it is done frequently, especially for staff who are not specialized in ICTs.
- Establish a strong relationship with ICT centres and provide standardized training and references to inspire proficiency.
- Need for strong training policy from health policy stakeholders and training institutions such as schools of medicine, physiotherapy, pharmacy and nursing.
- Training should be provided to medical scientists both on a one to one basis when available and in groups.
- Need to reinforce that training policy that already exists so that the training can be accessed by all medical research staff.

4.8 ICTs used and Type of Medical Research Participated In

Tables were made to show the trend of the ICTs used for each type of medical research the medical researchers participated in. The tables below shows the percentages and counts of each type of medical research with the ICTs that are used to access medical research information as the researchers participate in the various types of medical research (as shown below in tables25, 26 & 27)

Table 25: ICTs used and Type of Medical Research participated in

Medical research undertaken	Electronic Database				Computers				Email				
	Yes %	Count	No %	Count	Yes %	Count	No %	Count	Yes %	Count	No %	Count	
Basic medicine	Yes	51.3%	41	7.50%	6	58.6%	47	0%	0	57.5%	46	1.3%	1
	No	33.75%	27	7.50%	6	38.8%	31	2.50%	2	37.5%	30	3.8%	3
Clinical medicine	Yes	76.3%	61	13.8%	11	88.8%	71	1.25%	1	86.3%	69	3.8%	3
	No	8.75%	7	1.25%	1	8.8%	7	1.25%	1	8.8%	7	1.3%	1
Health sciences	Yes	76.3%	61	8.75%	7	83.6%	67	1.25%	1	81.3%	65	3.8%	3
	No	8.75%	7	6.25%	5	13.8%	11	1.25%	1	13.8%	11	1.3%	1
Medical biotechnology	Yes	46.3%	37	7.50%	6	53.8%	43	0.0%	0	53.8%	43	0.0%	0
	No	38.8%	31	7.50%	6	43.8%	35	2.5%	2	41.3%	33	5%	4
Forensic science	Yes	12.5%	10	1.3%	1	13.8%	11	0.0%	0	13.8%	11	0.0%	0
	No	72.5%	58	13.8%	11	83.8%	67	2.5%	2	81.3%	65	5.0%	4
Biological and Chemical sciences	Yes	26.3%	21	3.8%	3	30.0%	24	0.0%	0	30.0%	24	0.0%	0
	No	58.8%	47	11.3%	9	67.5%	54	2.5%	2	65.0%	52	5.0%	4
Social science	Yes	37.5%	30	1.30%	1	38.8%	31	0.0%	0	38.8%	31	0.0%	0
	No	47.5%	38	13.8%	11	58.8%	47	2.5%	2	56.3%	45	5.0%	4
Veterinary Sciences	Yes	8.6%	7	3.80%	3	12.5%	10	0.0%	0	12.5%	10	0.0%	0
	No	76.3%	61	11.3%	9	85.0%	68	2.5%	2	82.5%	66	5.0%	4
Molecular Epidemiology	Yes	36.3%	29	3.8%	3	40.0%	32	0.0%	0	40.0%	32	0.0%	0
	No	48.8%	39	11.3%	9	57.5%	46	2.5%	2	55.0%	44	5.0%	4
HIV and AIDS	Yes	50.0%	40	5.0%	4	55.0%	44	0.0%	0	52.5%	42	2.5%	2
	No	35.0%	28	10.0%	8	42.5%	34	2.5%	2	42.5%	34	2.5%	2

Table 26: ICTs used and Type of Medical Research participated in

Medical research undertaken	Internet				Mobile Tel				Radio				
	Yes %	Count	No %	Count	Yes %	Count	No %	Count	Yes %	Count	No %	Count	
Basic medicine	Yes	56.3%	45	2.5%	2	35.0%	28	23.8%	19	20.0%	16	38.8%	31
	No	38.8%	31	2.5%	2	15.0%	12	26.3%	21	5.0%	4	36.3%	29
Clinical medicine	Yes	87.5%	70	2.5%	2	45.0%	36	45.0%	36	22.5%	18	67.5%	54
	No	7.50%	6	70.0%	2	5%	4	5.0%	4	2.50%	2	7.5%	6
Health sciences	Yes	80.0%	64	5.0%	4	45.0%	36	5.0%	4	21.3%	17	63.8%	51
	No	15.0%	12	0.0%	0	40%	32	10.0%	8	3.75%	3	11.3%	9
Medical biotechnology	Yes	52.5%	42	1.3%	1	31.3%	25	22.5%	18	18.8%	15	35.0%	28
	No	42.5%	34	3.8%	3	18.75%	15	27.5%	22	6.3%	5	40.0%	32
Forensic science	Yes	12.5%	10	1.3%	1	10.0%	8	3.8%	3	6.3%	5	7.5%	6
	No	82.5%	66	3.8%	3	40.0%	32	46.3%	37	18.8%	15	67.5%	54
Biological and Chemical sciences	Yes	27.5%	22	2.5%	2	17.5%	14	12.5%	10	10.0%	8	20.0%	16
	No	67.5%	54	2.5%	2	32.5%	26	37.5%	30	15.0%	12	55.0%	44
Social science	Yes	37.5%	30	1.3%	1	20.0%	16	18.8%	15	10.0%	8	28.8%	23
	No	57.5%	46	3.8%	3	30.0%	24	31.3%	25	15.0%	12	46.3%	37
Veterinary Sciences	Yes	12.5%	10	0.0%	0	6.3%	5	6.3%	5	3.8%	3	8.8%	7
	No	82.5%	66	5.0%	4	43.8%	35	43.8%	35	21.3%	17	66.3%	53
Molecular Epidemiology	Yes	40.0%	32	0.0%	0	26.3%	21	13.8%	11	18.8%	15	21.3%	17
	No	55.0%	44	5.0%	4	23.8%	19	36.3%	29	6.3%	5	53.8%	43
HIV and AIDS	Yes	53.8%	43	1.3%	1	30.0%	24	25.0%	20	17.5%	14	37.5%	30
	No	41.3%	33	3.8%	3	20.0%	16	25.0%	20	7.5%	6	37.5%	30

Table 27: ICTs used and Type of Medical Research participated in

Medical research undertaken	Telephone (land line)				Satellite TV				PDAs				GPS				
	Yes %	No %	Count	Count	Yes %	No %	Count	Count	Yes %	No %	Count	Count	Yes %	No %	Count	Count	
Basic medicine	Yes	41.3%	33	17.5%	14	5.0%	4	53.8%	43	6.3%	5	52.5%	42	0.0%	0	58.8%	47
	No	23.75%	19	17.5%	14	1.25%	1	40.0%	32	13.8%	11	27.5%	22	3.8%	3	37.5%	30
Clinical medicine	Yes	58.8%	47	31.3%	25	6.3%	5	83.8%	67	17.5%	14	72.5%	58	0.0%	0	90.0%	72
	No	6.25%	5	3.8%	3	0.0%	0	10.0%	8	2.5%	2	7.5%	6	3.8%	3	6.3%	5
Health sciences	Yes	57.5%	46	7.5%	6	6.3%	5	78.8%	63	20.0%	16	65.0%	52	3.8%	3	81.3%	65
	No	27.5%	22	7.5%	6	0.0%	0	15.0%	12	0.0%	0	15.0%	12	0.0%	0	15.0%	12
Medical biotechnology	Yes	37.5%	30	16.3%	13	2.5%	2	51.3%	41	3.8%	3	50.0%	40	0.0%	0	53.8%	43
	No	27.5%	22	18.8%	15	3.75	3	42.5%	34	16.3%	13	30.0%	24	3.8%	3	42.5%	34
Forensic science	Yes	11.3%	9	2.5%	2	1.3%	1	12.5%	10	3.8%	3	10.0%	8	3.8%	3	10.0%	8
	No	53.8%	43	3.3%	26	5.00%	4	81.3%	65	16.3%	13	70.0%	56	0.0%	0	86.3%	69
Biological and Chemical sciences	Yes	21.3%	17	8.8%	7	2.5%	2	27.5%	22	2.5%	2	27.5%	22	0.0%	0	30.0%	24
	No	43.8%	35	26.3%	21	3.8%	3	66.3%	53	17.5%	14	52.5%	42	3.8%	3	66.3%	53
Social science	Yes	25.0%	20	13.8%	11	6.3%	5	32.5%	26	16.3%	13	22.5%	18	0.0%	0	38.8%	31
	No	40.0%	32	21.3%	17	0.0%	0	61.3%	49	3.8%	3	57.5%	46	3.8%	3	57.5%	46
Veterinary Sciences	Yes	12.5%	10	0.0%	0	0.0%	0	12.5%	10	2.5%	2	10.0%	8	3.8%	3	8.8%	7
	No	52.5%	42	35.0%	28	6.3%	5	81.3%	65	17.5%	14	70.0%	56	0.0%	0	87.5%	70
Molecular Epidemiology	Yes	35.0%	28	5.0%	4	0.0%	0	40.0%	32	2.5%	2	37.5%	30	3.8%	3	36.3%	29
	No	30.0%	24	30.0%	24	6.3%	5	53.8%	43	17.5%	14	42.5%	34	0.0%	0	60.0%	48
HIV and AIDS	Yes	35.0%	28	20.0%	16	5.0%	4	50.0%	40	17.5%	14	37.5%	30	0.0%	0	55.0%	44
	No	30.0%	24	15.0%	12	1.3%	1	43.8%	35	2.5%	2	42.5%	34	3.8%	3	41.3%	33

4.9 Information Accessibility

It was found that 74 (92.5%) of respondents indicated that the introduction of ICTs had made medical research information more accessible while four (5%) indicated that they did not know and only two (2.5%) of respondents stated that the introduction of ICTs had made medical research information less accessible, as shown in table 14 below.

Table 28: Information accessibility

	Frequency	Percent
More Accessible	74	92.5%
Less Accessible	2	2.5%
Don't know	4	5.0%
Total	80	100.0%

In probing further, respondents were asked to explain how the introduction of ICTs had made medical research information more or less accessible and below are their explanations. Respondents who stated that the introduction of ICTs had made medical research information become more accessible cited the following reasons:

- The introduction of ICTs have facilitated more access to the world's medical knowledge and locally-relevant content resources which has helped strengthen public health research and prevention programmes and promoting women's and men's health, such as content on sexual and reproductive health and sexually transmitted infections, and for diseases that attract full attention of the world including HIV/AIDS, malaria and tuberculosis.
- ICTs help us to become alert, monitor and control the spread of communicable diseases, through the improvement of common information systems. Furthermore ICTs promote the development of international standards for the exchange of health data, taking due account of privacy concerns.
- Introduction of ICTs has made medical research information more accessible and also exchange of information with other researchers has been made in a quick and timely manner. Additionally ICTs have made networking with other scientists around the world easier and this helps us to remain updated on current scientific work and as such avoid duplication of effort.

- The introduction of ICTs has further enhanced access to more accurate and timely information as opposed to the manual systems of storing and transferring information.
- Additionally the use of the internet has enabled advocacy coalition members to interact online, develop a shared identity and common agenda, exchange information, and mobilise collective action. Furthermore, offline activities can also be coordinated via SMS (mobile phone text messages).
- The use of ICTs has also facilitated for distance education which has helped to enhance the traditional face-to-face TOT (training of trainers) model, while fostering networks that trainees can rely on as a resource when they return to the field. Moreover integration of new ICTs (e.g., computers and the web) into programs utilising traditional ICTs (e.g., radio, telephones and print) has helped to increase the scale or scope of programmes. Furthermore ICTs have also enabled distance learning for health personnel and others interested in researching on several health issues. There are several sites available giving information on HIV/AIDS and other diseases like Malaria. Further information can be shared through radio and television or on CD ROMS, by email or teleconferencing.
- The introduction of ICTs has enabled doctors to do remote consultations and diagnosis, access medical information and coordinate research more effectively. In addition more traditional ICTs like radio and television have been beneficial in disease prevention and epidemic response. In Zambia, this has been evident in response to HIV/AIDS, Malaria and Cholera amongst other diseases. More recent ICTs like mobile phones, email and the internet could also be used to provide information on health alerts to the general public as well as medical consultations.
- Additionally the introduction of ICTs has made data collection and research to be conducted in a more cost effective form. For instance using the PDAs, email and going straight to the internet has helped us to cut initial costs spent on travel in the process of data collection.
- ICTs have helped in improving and extending health care and health information systems to remote and underserved areas and vulnerable populations, recognising women's roles as health providers in their families and communities.

Respondents who stated that the introduction of ICTs had made medical research less accessible cited the following reasons:

- With the introduction of ICTs information has become less accessible because confidentiality has been enhanced by as required by ethics and they have put in place passwords that restrict access to information, unless the organisation or the individual subscribes to the particular journal or database to have access to information.
- The introduction of ICTs has reduced access to medical research information in the sense that if the computer network goes down, information is unavailable. This becomes inconvenient or may even be life threatening. Additionally all staff will need training in the use of the software and part time staff may not be trained and therefore cannot access vital information. Some staff may be resistant or fearful of using ICTs moreover it is very expensive to set up.
- Limited infrastructure facilities have made ICTs reduce access to medical research information and this poses a great challenge especially so in disseminating and providing access to information for those working on disease like HIV/AIDS.

4. 10 Rank of ICTs Used in the Organisation

It was established that 40 (50%) of the respondents indicated that the ICTs used to access medical research information in their organisations were good, while 33 (41.2 %) of the respondents indicated that they were very good and five (6.2%) stated that the ICTs used to access medical research information were fair. On the contrary one (1.2%) of the respondents indicated that the ICTs used to access medical research information were very poor and poor respectively, shown in table 15 below.

Table 29: Rank of ICTs Used in the Organisation

	Frequency	Percent
Very good	33	41.2%
Good	40	50.0%
Fair	5	6.2%
Poor	1	1.2%
Very Poor	1	1.2%
Total	80	100.0%

4.1.11 Rank of ICTs Skills Necessary to Access Information

From the data obtained it was observed that 47 (58.8%) of the respondents stated that their ICT skills to access necessary medical research information were good, while 20 (25.0%) of the respondents indicated that their skills were very good and 12 (15.0%) ranked their ICT skills to access necessary information as fair. On the other hand one (1.2%) of the respondents stated that their ICT skills to access necessary information were very poor as shown in table 16 below.

Table 30: Rank of ICTs skills necessary to access information

	Frequency	Percent
Very good	20	25.0%
Good	47	58.8%
Fair	12	12%
Very Poor	1	1.2%
Total	80	100.0%

4. 1.12 ICT Training Undertaken

It was established from the data obtained that 34 (42.5%) of the respondents had undergone short ICT course training, while 22 (27.5%) indicated that they had received lessons from a friend or colleague and 20 (25.0%) stated that they only learn through self learning and trial and error whilst only four (5.0%) of the respondents had undergone formal ICT training as shown in table 17 below.

Table 31: ICT Training undertaken

	Frequency	Percent
Formal ICT Training	4	5.0%
Short ICT course	34	42.5%
Received lessons from a colleague or friend	22	27.5%
Self learning and trial & error	20	25.0%
Total	80	100.0%

CHAPTER FIVE

DISCUSSION OF THE FINDINGS

The study revealed a number of significant findings in relation to the objectives and the reviewed literature.

5.1 ICTs Utilization in Accessing Medical Research Information by Medical Research Personnel

ICTs being tools that facilitate the production, processing, transmission and storage of information, it was expected that a high proportion of medical research institutions would employ their use. It was therefore within the hypothesized result that all of the organisations sampled use ICTs in accessing medical research information. Not only did all the top officials (Key respondents) emphasize on their organisations use of ICTs but also all respondents (medical researchers) stated that they use ICTs in accessing medical research information for their research activities. From a broader perspective it is essential to note that Zambia which was the second country to embrace ICTs in Africa is sadly enough not even among the best 30 in Africa with countries like Mauritius, Kenya and Rwanda using ICTs for delivery of health services and national income generation at large. This is due to restrictive regulatory framework (Chinyama in Mutale Kapekele; Post Newspaper, 23rd, March 2010).

The study showed that in line with the research objective one, that all the sampled medical research institutions and personnel use ICTs to have access to medical research information. From this finding and with the support from the gathered and reviewed literature, we can induce that ICTs are used by medical research institutions and personnel to access medical research information. It is also within the scope of the study to deduce from the theoretical background and supported by the findings that the medical research institutions are embracing and using ICTs as a means of accessing medical research information.

5.2 ICTs Used

In the theoretical framework and study of reviewed literature, it is noted that for medical research to be undertaken successfully, it requires access to medical research information. Medical research information, being autonomous of the modes used to relay is an essential resource. Conversely, medical research cannot ignore the fundamental modes of information and knowledge exchange that are globally supported by the swift expansion of ICTs.

It is therefore in conformity to the theoretical framework and literature review that all the respondents sampled stated that they use computers in accessing medical research information for their research activities. According to McConnell et al (2006: 1) Information and communication technologies (ICTs) are increasingly being recognized as essential health technology, giving individuals at all levels of the health workforce and other stakeholders' access to information that helps them protect and improve health and save lives.

The use of Databases technology was one of the highest ICT currently in use. With more than 88% of key informants stating that they use Electronic Databases, it was the second most used ICT.

With the medical researchers, Electronic Databases, Electronic Mail and internet were the most used ICTs at more than 91%. These three ICTs are most frequently used to provide access to information resources over a network. ICTs are fundamentally used in medical research to gain access to medical research information through a virtual network, similar to the medical/health networks such as INARI and HealthNet that employ various ICTs including satellite, telephone and Internet technology to provide health information and communication among professionals. This by and large attempts to alleviate the problems of the shortage of current health/medical information and the isolation of health/medical and medical research professionals (SATELLIFE, 2001).

The use of the telephones by HealthNet in gaining access to medical research information through a virtual network also justifies the findings of our study showing the high use of Telephone Landlines at 75%. This study also reveals the use of Fax machines to be at 44.4%. A considerably lower percentage use of the fax machine may be justified as it is not only drawn from the 75% of respondents who use the

landline but also the fact that electronic formats are becoming more popular than paper (hard) copies offered by the fax.

Mobile Phones at 33.3% may not be as highly used in accessing medical research information due to the current cost structure and ICT infrastructure in Africa and Zambia. ICTs require “communication infrastructure” to operate successfully. Moreover the infrastructure refers not only to the hardware or software but to the practices, procedures and routines which make the infrastructure work. It describes the infrastructure required to support the operations and use of ICTs. Infrastructure (Monteiro and Hanseth, 1995) is viewed as part of the means of communication between all parts of the HIS. In addition, unreliable electricity supplies, poor network coverage and prohibitively high costs of setting up mobile phone transmission towers may reduce utilization in accessing medical research information.

Despite the fact that public broadcast media such as radio and television have a long history of effectively facilitating the dissemination of public health messages and disease prevention techniques in developing countries, it was found that 27 (75%) of the respondents indicated that they do not use Radios in accessing medical research information whilst 33 (91.7%) of the respondents indicated that they do not use Satellite Television in accessing medical research information. This is despite the fact that satellite television has been in use since 1980. However, at least nine (25%) of the respondents indicated that they make the use of the Radio in accessing medical research information where as three (8.3%) of the respondents indicated that they do make use of Satellite Television. Respondents who said they use radio and satellite television stated that information can be shared through radio and television or on CD ROMS, by email or teleconferencing. In addition more traditional ICTs like radio and television have been beneficial in disease prevention and epidemic study and response.

As for the use of Global Positioning System (GPS), Audio Computer Assisted Self Interview (ACASI) and Personal Digital Assistants (PDAs), only eight (22.2%), six (16.7%) and five (13.9%) of the respondents indicated that they make use of them in accessing medical research information respectively. Despite the digital divide, Information and communication technologies (ICTs) in developing countries have been harnessed to bring an information age in which economic and social activity has been widened, deepened and transformed. However, only 28 (77.8%), 30 (83.3%) and 31 (86.1%) said they do not use GPS, ACASI and PDAs. This was found to be the case as these are emerging technologies in the

developing world and the existence of the Digital Divide that works as a barrier or hindrance to the universal use of ICTs and ultimately manifestation of a true Information Society's existence in the developing world, Zambia inclusive. A digital divide between underdeveloped and developed countries looms large and brings differential capabilities of entire social [or national] groups to access and utilize electronic forms of knowledge (Straub, 2003).

From the reviewed literature, conceptual and theoretical framework and the findings, the study revealed that there is a general underutilization of traditional ICTs (television, radios, fax and landline telephones) in all medical research institutions. It was however revealed that all medical research institution use computers to access medical research information. In line with the study objectives, the investigation of the extent to which ICTs are utilized in accessing medical research information, it was found that the scope to which ICTs are used are by and large computer based and networked. These computer based and networked ICTs are computers, database technologies (both local and online), electronic mail and internet. This implies that the ICTs include desktop computing, local area networking and wide area networking involving information processing, storage and retrieval. Emerging technologies such as PDAs and GPS are still "*Greek*" (new and eccentric) to most public and church medical research institutions. Therefore there is an evident need to explore the various utilities of these emerging technologies in order to realize the full benefits of the services they can render to the field of scientific and medical research.

5.3 Medical Research Type and ICTs Used

The study revealed that there was a general use in computer based technologies such as use of computers and databases including the use of internet and email services. In addition, there was also a general use in telecom technologies such as telephone landlines and Fax in accessing medical research information for all the types of medical research the respondents participated in.

However, GPS, mobile phones and PDAs were used more in health sciences research, while PDAs were also highly used in medical bio-technology, social science and HIV and AIDS research which are all mostly done in NGO medical research institutions. The study also revealed that radio and satellite television are used in basic medicine, clinical medicine, biological and chemical science, veterinary, molecular epidemiology research.

Consequently, the ICTs used in the different types of medical research are directly related to the ICTs used in the different types of medical research organizations. This was where basic medicine, clinical medicine and health sciences medical research was mostly done by all types of medical research institutions. Medical biotechnology, social science and HIV and AIDS medical research were mostly done by public and NGO medical research institutions, while Forensic, Biological and chemical sciences, veterinary medicine and molecular epidemiology medical research were done by public medical research institutions. From this analysis of the relation of types of medical research and types of medical research organizations, the study revealed that public medical research institutions participated in most types of medical research while church and NGO medical research institutions participated in a particular selection of the types of medical research. It was therefore of greater value to the study objectives to base the primary categories of ICT utilization on the types of organization rather than the types of medical research done.

5.4 Organisation Type and ICTs Used

The research data revealed a trend in the type of ICTs used according to different organisation types. The trend of the public sector medical research institutions was similar to that of NGO and church Institutions when it came to computer based technologies such as use of computers and databases including the use of internet and email services. Therefore there was a general use in computer based ICTs regardless of organisation type or Zambia being a developing country. This has come to show that despite the digital divide, Information and communication technologies (ICTs) in developing countries such as Zambia have been widely harnessed in the health sector. This falls in line with the more optimistic projections that were suggested by Vatsa (2000) that a computerised and networked world would not only ensure a more widespread and rapid growth of employment, productivity and output, but would also improve access to facilities that enhance the quality of life such as health care and related medical systems.

There were notable differences in the trends of emerging technologies use according to different organisational type. Portable information devices as part of the emerging technologies are changing the face of communication, entertainment and healthcare and are also influencing how business is conducted and information is managed. Technological innovation has allowed information devices to become

portable due to reduction in size and weight. Advances have also led to increased power in terms of processing speed and storage (IEEE, 2010). However, the study revealed that emerging technologies such as PDAs (13%) and ACASI (16.7%) are utilised only by NGO medical research institutions. GPS use were found to be at the same level between Public and NGO medical research institutions though the ratio between those who use and do not use them in the public medical research institutions tended to be on the lower use as compared to NGO medical research institutions, with public ratio at 1:5 while NGO was at 1:1. In addition, more respondents from public medical research institutions indicated that they do not use mobile phones in accessing medical research information as compared to their counterparts from church and NGO medical research institutions who indicated a 1:1 ratio in terms of use and none use.

In line with the disparity of use of emerging technologies among public, NGO and church medical research institutions, Norris (2001) provides an interesting analysis of this division, describing a multi-dimensional digital divide that exists globally, socially and democratically. However, the multi-dimensional digital divide can also exist at institutional level according to type. For instance the lower use of emerging technologies in the public medical research institutions can be attributed to a number of factors including poor funding and misappropriation of funds, poor attitude towards ICTs, poor ICT training policies and poor ICT implementation framework peculiar to the public sector.

Despite public broadcast media such as radio and television having a long history of effectively facilitating the dissemination of public health messages and disease prevention techniques in developing countries, the study revealed that radio and satellite television were among the lowest used ICTs. Radio and television are the oldest and most conventional ICT but are not usually used for accessing medical research information. The study revealed that all medical research institution were using computer based technologies. However public and church medical research institutions are lagging behind in embracing emerging technologies (PDAs and GPS). From the literature reviewed this could attributed to inadequate funding of these institutions and staff attitudes of resistance towards change, though more research needs to be done to investigate the causes of why public and church medical research institutions are lagging behind in embracing emerging technologies.

5.5 Acquisition and Use of ICTs

All the respondents indicated that their institutions have a policy that governs the acquisition and use of ICTs. However, “Lack of a clear implementation framework and strategy is seriously affecting the use of the Information and Communication Technology (ICT) sector as a tool for national development and income generation, Computer Society of Zambia has observed” (Mutale Kapekele; in Post Newspaper, 23rd, March 2010). In spite of all the organisations having indicated that they have an ICT policy that governs acquisition and use of ICTs, there still remains two main bottlenecks. The first exists in the form of none comprehensive and dynamic ICT policies. The second exists at the point of implementation.

The policies fail to clearly define the requirements of the communication infrastructure. In addition the policies are not comprehensive in outlining the practices, procedures and routines which make the infrastructure work. This causes a multiplicity of the types and standards of ICT equipment acquired and practices, procedures and routines used. Furthermore poor infrastructure leads to poor coordination and information sharing between sectors. The policies also barely manage to take into consideration the issues of rapidly evolving technologies. The policies do try to foster a system with harmonized technology in terms of compatibility and performance, but fall short resulting in the case where there are two parallel technology systems operating. One with old technology and the other with recent and latest technology. For example, Macha Mission Hospital may have a v-sat, state of the art server, computers and software but may fail to share electronic information with Central Veterinary Institute that has a dialup internet connection with limited bandwidth, older server, computers and software.

The ICT policies in the different sampled organisation may be comprehensive and dynamic but would still require highly trained and experienced staff with the technical capacity to implement the policy.

Software skills that help in the creation of information, processing of information, storage of information, analysis of the information and communication of the information have not been addressed. ICT skills required in industry for commerce, business innovations, business process outsourcing, e-Tourism, E-Health etc, have not been addressed (Chinyama in Mutale Kapekele; Post Newspaper, 23rd, March 2010).

This training, experience and technical capacity may not be readily available or identifiable in developing countries such as Zambia where the nation seriously lacks salient ICT skills and has depended on importing skills from outside the country

In addition, management commitment and recognition of ICT policy formulation and implementation as a key area is not highly pronounced. The implementation of ICT policy is crucial as Braa et al, (2000) states that implementation of infrastructure of communication is a key to support development and to make planning effective. However, health institution managers and directors may perceive other policies such as finding solutions to epidemics as higher priority than that of implementing a policy that is not the core function of the health/medical institution. Therefore successful implementation of ICTs needs to address six interlocking frameworks for change: the infrastructure, attitude, staff development, support (technical and administrative), legally mandated coordinating bodies and also sustainability and transferability of the ICTs used.

5.6 Training in ICTs

It was found that 38.9% of the sampled institutions have an ICT training policy for their medical research staff, with as many as 61.1% stating that their organisations do not have an ICT training policy for their medical research staff. This comes from a background where the penetration levels of ICTs in Zambia's education institutions remain low, with those schools that are equipped mostly utilising second-hand and refurbished computers. The integration of ICTs in learning and teaching practice has been limited, although the introduction of computer studies as a school subject has begun to change this. The adoption of a national ICT policy in 2007, as well as the development of a draft ICT policy for education and an associated implementation framework, provides an enabling policy environment to promote far greater access and use of ICTs across all sectors of Zambia's health education system, including a system for enhancing health education management, administration, and teaching and learning.

Given this background, Zulu (2009) asserts that educators and medical practitioners in public health have increasingly developed a view that information and communication technologies (ICTs) in general has the potential to revolutionize the way health-care professionals are trained and practice, and to boost their performance on the job. However, the demographics that relate to ICTs, such as tele-density, indicate that

Zambia has a high degree of ICT illiteracy and lack of ICT usage and access. The Least Developed Countries Report 2008 (UNCTAD, 2008) indicates that only 145 out of 1000 have access to radio services, 64 out of 1000 have access to Television, 8 out of 1000 have access to Telephone landlines, 140 out of 1000 have access to Mobile phones, 11 out of 1000 have access to personal computers and 42 out of 1000 have access to Internet. Therefore, delivery of services to the people is highly inefficient and in need of an urgent overhaul.

In addition, the few medical research institutions that have an ICT training policy would still experience low utilisation of ICTs due to the fast pace at which technology and more specifically ICTs are evolving and the fact that they do not train their medical research personnel frequently enough. For example, out of the institutions that have an ICT training policy, 44% indicated that they send their medical research staff for training every one to two years. This frequency allows for time lag and technology would have already evolved and created a digital divide with developed countries that have medical research information to offer to medical research staff in Zambia.

Furthermore, it was found that 38.9% of the respondents rated the adequacy of the ICT training to be fair. This group of respondents indicated that the ICT training institutions met the basic training requirements that the medical research institutions required. In addition the medical research staff had appreciated the ICT training and kept requesting for more training. They thought the training met the minimum requirements for medical research staff to use ICTs for accessing medical research information. The respondents said the training seemingly improved the ease of communication amongst medical researchers when conducting research and improved the easy of access to literature and information. It was also observed that the ICT training had enabled medical research staff to have knowledge of research undertaken by other researchers thus reduction in duplication of studies. This was in line with our conceptual framework and assumption that “ICTs are tools that facilitate the production, processing, transmission and storage of information” (Grace et al, 2004) and that in the field of medical research ICTs are as useful as they can improve medical research.

Respondents that ranked the adequacy if ICT training as Good (33.3%) cited different reasons including the curriculum being modern and updated frequently, and that the training had enhanced efficiency amongst medical research staff in conducting research. The training had further exposed them to new

ways and means of accessing the much needed information for their research activities. The training had also made it possible for medical research staff to hold meetings via internet, review manuscripts and publish online and had enabled medical research staff to transmit data easily to other places for analysis and interpretation in their research. According to WHO, the use of ICTs in health is not merely about technology (Dzenowagis, 2005), but a means to reach a series of desired outcomes, such as improved medical research, health workers making better treatment decisions, hospitals providing higher quality and safer care, people making informed choices about their own health, governments becoming more responsive to health needs, national and local information systems supporting the development of effective, efficient, and equitable health systems, policymakers and the public becoming more aware of health risks and people having better access to the information and knowledge they need for better health.

Respondents that ranked the adequacy of ICT training as poor (27.8%) bemoaned poor ICT infrastructure and development/training policies and lack of resources or institutional capacity. They also stated that lack of interest among medical research staff and lack of appreciation by the organisation as a whole to integrate ICTs in all operations of the institution. Additionally poor or no collaboration between ICT training institutions and medical research institutions had contributed to the inadequate training that medical research staff underwent. It was also found that there was a lack of awareness of the importance and use of ICTs in medical research including the lack of development, promotion and coordination of ICT related activities among medical research institutions. To aggravate the situation, there was also a lack in some information support services such as medical transcript centres and ICT specialists within medical research institutions to advocate and supplement training. It re-enforces the assertion that successful implementation of ICTs in medical institutions needs to address not just infrastructure but also staff attitudes, staff development, technical and administrative staff services and policy framework with legally mandated coordinating bodies and also sustainability and transferability of the ICTs used.

Due to the large extent of poor perception of ICT training in medical research institutions, it was identified that a number of interventions could be taken. Some respondents thought the ICT training curriculum should be tailored in such a way that it should enhance the quality of information specific to different fields of medicine and clinical treatment in the health sector through content development, databases, and meta search engines in order to reduce inconsistencies in data sharing and medical terminologies. In addition ICT training should provide skills to utilise web-based portals for

dissemination of existing clinical and medical information and epidemiological information on the prevention of diseases such as sexually transmitted infections (STIs)/HIV/AIDS, TB and malaria. Respondents also thought ICT training should aim to improve and promote closer health sector collaboration with private entrepreneurs and regional initiatives in ICTs. ICT training institutions and medical research institutions could also collaborate to run online training modules that are regularly and frequently updated.

It was discovered that Staff training on computer utilisation could be helpful if it was done frequently, especially for staff who are not specialized in ICTs. It was also noted that establishing a strong relationship between ICT centers and medical research institutions would help provide standardized training and references to inspire proficiency. A need for strong training policy for health policy stakeholders and training institutions such as schools of medicine, physiotherapy, pharmacy and nursing was identified coupled with training provided to medical scientists both on a one to one basis when available and in groups. Furthermore it was observed that there was a need to reinforce that training policy that already exists in the institutions with an ICT training policy and establish one in the institutions that do not have, so that the training can be accessed by all medical research staff and not just the privileged few.

5.7 Accessibility of Medical Research Information by Medical Research Personnel with the Introduction of ICTs.

The resultant effect of introducing ICTs in accessing medical research information may have a somewhat variegated view but remains generally positive. The study revealed that 92.5% of respondents indicated that the introduction of ICTs had made medical research information more accessible. This can be attributed to the introduction of ICTs that has facilitated more access to the world's medical knowledge and development of locally-relevant content resources which has helped strengthen public health research and prevention programmes. This is in conformity with the assertion of Unwin (2009) that ICTs have in recent times been developed, spread and used widely. This has resulted in a global swing in the creation, storage, exchange and ultimately the accessibility of information. The field of medical research is not an exception.

It is also important to note that ICTs happen to encourage alertness, monitoring and controlling the spread of communicable diseases, through the improvement of common information systems. Furthermore ICTs promote the development of international standards for the exchange of health data from medical research and health information systems, taking due account of privacy concerns. Ultimately ICTs tend to improve on the different aspects of quality of information.

Introduction of ICTs has made medical research information more accessible and also exchange of information with other researchers has been made in a quick and timely manner. Additionally ICTs have made networking with other scientists around the world easier and this helps to remain updated on current scientific work and as such avoid duplication of effort. This is because ICTs present a range of opportunities for the delivery of health information to the public, and for developing greater personal and collective communication. ICTs can be viewed as also representing a way for health workers to share information on changes in disease prevalence and to develop effective responses. They provide opportunities to encourage dialogue, debate, and social mobilization around a key public health concern. From the findings, it can be deduced that the introduction of ICTs has further enhanced access to more accurate and timely information. This is because the use of computer based and networked technologies such as the internet have enabled research advocacy coalition members to interact online, develop a shared identity and common agenda, exchange information, and mobilise collective action. Furthermore, offline activities can also be coordinated via SMS (mobile phone text messages).

The use of ICTs has also facilitated for distance education and E-learning which has helped to enhance the traditional face-to-face TOT (training of trainers) model, while fostering networks that trainees can rely on as a resource when they return to the field. During the past 10 years the Internet has radically altered the practice of distance education. Applying the benefits of information and communication technology (ICT) to higher education has improved the quality and cost- effectiveness of learning experiences that includes the area of public health.

...there is an increasing view among educators and medical practitioners that information and communication technology (ICT) in general has the potential to revolutionize the way health-care professionals are trained, and to boost their performance on the job (Health Millennium Development Goals; 2004)

Moreover integration of new ICTs (e.g., computers and the web) into programs utilising traditional ICTs (e.g., radio, telephones and print) has helped to increase the scale or scope of programmes. ICTs have also enabled distance learning and E-learning for health personnel and others interested in researching on several health issues. There are several sites available giving information on HIV/AIDS and other diseases like Malaria. Further information can be shared through radio and television or on CD ROMS, by email or teleconferencing.

The introduction of ICTs has enabled specialised doctors to undertake remote consultations and diagnosis, access medical information and coordinate research more effectively. For example, doctors undertaking the same research from different geographical locations can coordinate their research in terms of methodologies and standards to enable comparison and analysis of all their research findings. In addition more traditional ICTs like radio and television have been beneficial in disease prevention and epidemic response. In Zambia, this has been evident in response to HIV/AIDS, Malaria and Cholera amongst other diseases. More recent ICTs like mobile phones, email and the internet could also be used to provide information on health alerts to the general public as well as medical consultations.

The introduction of ICTs has made data collection and research to be conducted in a more cost effective form. For instance using the PDAs or ACASI, email and going straight to the internet has helped to cut initial costs spent on travel in the process of data collection. ICTs have also helped in improving and extending health care and health information systems to remote and underserved areas and vulnerable populations, recognising women's roles as health providers in their families and communities.

On the other hand, the study revealed that 5% of the respondents indicated that they did not know if the introduction of ICTs had made medical research information more or less accessible and only 2.5% of respondents indicated that the introduction of ICTs had made medical research information less accessible. The implication being that the introduction of ICTs in accessing medical research information has made it difficult for at least 2.5% of medical research personnel as compared to the 92.5% who have access to the required medical research information for undertaking medical research.

universal access to information for health professionals is a prerequisite for meeting the MDGs and achieving Health for All. However, despite the promises of the information revolution, and

some successful initiatives, there is little if any evidence that the majority of health professionals in the developing world are any better informed than they were 10 years ago. Lack of access to information remains a major barrier to knowledge-based health care in developing countries (as well as in many parts of the 'developed' world). (Godlee et al 2004).

Some respondents explained that the introduction of ICTs had made medical research information less accessible because confidentiality had been enhanced as required by ethics and they have put in place passwords that restrict access to information, unless the organisation or the individual subscribes to the particular journal or database to have access to information.

The introduction of ICTs has reduced access to medical research information in the sense that if the computer network goes down, information is unavailable. This becomes inconvenient or may even be life threatening. Additionally all staff will need training in the use of the software and part time staff may not be trained and therefore cannot access vital information. Some staff may be resistant or fearful of using ICTs moreover it is very expensive to set up. Limited infrastructure facilities have made ICTs reduce access to medical research information and this poses a great challenge especially so in disseminating and providing access to information for those working on disease like HIV/AIDS. Poor infrastructure leads to poor coordination and information sharing between sectors like health, education and contributes to an absence of coherent socio economic development initiatives with benefits to the people. Braa et al, (2000) states that implementation of infrastructure of communication is a key to support development and to make planning effective.

5.8 Satisfaction Levels of Medical Research Personnel in Zambia with their Use of ICTs in Accessing Medical Research Information.

5.8.1 Ranking ICTs

The general findings in the study indicated that the majority of respondents found the ICTs used to access medical research information in their organisations good or very good. This shows an above average satisfaction level with the use of ICTs possibly as a result of their increased access to medical research information. However the smaller proportion that found ICTs to be poor or very poor were in the bracket

of respondent both from public medical institutions and did not have an ICT policy or ICT training policy.

The study revealed that the majority (83.8%) of respondents indicated that their ICT skills used to access medical research information in their organisations were good or very good. This is in line with further findings that a large proportion (75%) had received some kind of lessons (formal or informal) in computers. However the smaller proportion(17%) of respondents who indicated that their ICT skills used to access medical research information in their organisations were fair, poor or very poor could fall in the bracket of respondents who indicated that they had learned how to use the computer through self learning and trial and error (25%).

The implication is that medical research institutions that had staff with poor or very poor ICT skills require both the establishment of an ICT and ICT training policy that will enhance and improve ICT skills through a formal and adequately frequent ICT training.

The overall analysis is that the satisfaction levels of medical research staff towards ICTs are high. This may be due to the increased access to medical research information that ICTs have brought. Conversely, the small pockets of dissatisfaction are not only prominent in public institutions but also in institutions that do not necessarily have an ICT training policy or ICT training program for staff. Therefore satisfaction levels of medical research staff towards their use of ICTs remains high as a large proportion of the small number of dissatisfied medical research staff is a policy or training issue.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

Medical research is a dynamic field that requires the assimilation of new technologies and skills in order to develop and contribute to the quality of human life. Medical research like any other field has succumbed to both the information society and the digital revolution. Medical research institutions in Zambia have developed an appreciation for the use of ICTs. Medical research institutions in Zambia do use ICTs in accessing medical research information. The study showed that there has been an effect of ICTs on the accessibility of medical research information by medical research personnel in Zambia. It was revealed that ICTs are utilized in accessing medical research information by medical research personnel and that medical research information is more accessible by medical research personnel with the introduction of ICTs. On further analysis of the research findings, the study revealed an above average satisfaction level of medical research personnel in Zambia with their use of ICTs in accessing medical research information.

Traditional ICTs (then known as ITs) including Television, radio, Fax and telephone landlines have always been used by medical research personnel to a limited extent. However the study has revealed that the more modern ICTs are being more utilized in accessing medical research information by medical research personnel to a greater extent, with the emerging ICTs being integrated and used at a slower rate possibly as a result of resource issues (both technical and financial resources). Therefore the rate of integration and use of emerging ICTs should be enhance in order for the field of medical research to benefit more from the potential increase in access, use, processing and storage of medical research information and cope with the ever escalating trends in the developed world.

Additionally the study has revealed that the introduction of ICTs has made medical research information more accessible because they have accorded medical research personnel with more sources from which information can be accessed from in an effective, efficient and timely manner. Even though there may be some bottlenecks to having access the study found that the introduction of ICTs had made medical

research much more accessible with the larger proportion indicating that they had been provided with numerous information sources and resources as a result of the introduction of ICTs. The previous manual or none ICT based medical research information sources and resources are still accessible and in use. Therefore the introduction of ICTs in accessing medical research information has effectively increased sources and resource access, thereby complimenting access and supporting the field to better enforce more uniform international standards in medical research.

In addition to the effective increase in access to medical research information by medical research personnel, the study has also shown an above average satisfaction level of medical research personnel in Zambia with their use of ICTs in accessing medical research information. Therefore the introduction of ICTs in accessing medical research information has not only brought about an improvement in the work processes of medical researchers but also augmented information sharing and networking among medical researchers and medical research institutions. Therefore the introduction of ICTs in accessing medical research information has made both medical research and medical research personnel more efficient and effective with a higher capacity of participating at national, regional, continental and international level.

The study therefore reveals that ICTs being tools that facilitate the production, processing, transmission and storage of information have the potential and have in effect brought about complimentary and wider access to information that covers a wide range of issues including copyright, open source, privacy and security. By this ICTs have made it more possible for the manifestation of an information society. An information society where there is the free flow of accurate and reliable information, equally available to all members of the society. ICTs have ushered in an information society and benefits that have affected all aspects of life and sectors of human endeavour that improve the overall quality of life and one such sector being the health and medical sector. This is a sector that deals with the treatment and management of illness and the preservation of health through services offered by the medical and health professionals.

This study has revealed some of the dynamics of how ICTs have affected the generation of knowledge for the development of new therapeutic strategies to prevent, cure or treat disease, infection and damage that deviates from the optimum function of the body. More specifically, the study has assessed the effects, both negative and positive, that the introduction of ICTs has brought to the scientists, who study biological systems to understand the causes of disease and other health problems in Zambia. The study

has revealed that access to medical research information using ICTs has increased although the country still has a lot to do when it comes to the acquisition of state of the art of ICTs being used to facilitate access to the so much required medical research information which is needed by medical research personnel. This was observed in most the public medical research institutions that had old computers mostly and accessing the internet and other databases almost takes forever. Furthermore the study has shown that all medical research institutions are trying to utilize ICTs to a greater extent so as to enhance their access to the much needed medical research information and thus be able to undertake research that will make them be able to offer quality services the Zambian people. The study also revealed that medical research information is more accessible by medical research personnel with the introduction of ICTs and that access could be enhanced further if medical research institutions could network with one another. The study further explored the satisfaction levels of medical research personnel in Zambia with their use of ICTs in accessing medical research information and it revealed an above average satisfaction level though medical research personnel called for more training and concerted effort between medical research institutions and ICT teaching institutions so as to enhance the skills of medical research personnel when it comes to the use of ICTs.

6.2 Recommendations

6.2.1 ICT Procurement and Acquisition Strategy

- There is need to formulate a health/medical sector ICT procurement and acquisition strategy from the national ICT policy. The government can lead an integrated hardware and software procurement strategy in the sector in order to facilitate and make possible inter-institutional networking of systems through a compatible platform. This strategy should be employed by all health/medical research institutions and could be monitored / regulated by the Ministry of Health in conjunction with Information Technology and Communication Authority (ITCA).

This would lead to a number of benefits including a general improvement in the functioning of health care systems by improving the management of information and access to that information, on management of logistics of patient care, administrative system, patient records and ordering and billing systems. This would also lead to an improvement in the delivery of health care through better diagnosis,

better mapping of public health threats, better training and sharing of knowledge among health workers, and supporting health workers in primary health care and particularly rural health care.

The synergy of the procurement and acquisition of ICTs in the health sector can facilitate telemedicine. According to the International Telecommunication Union (ITU, 2005), telemedicine is a powerful tool for improving health care delivery that has been successfully implemented in pilot projects in many countries, hence telemedicine is a growing field..

6.2.2 ICT Use and Application in Health/Medicine Policy

- There is a need for an integrated and expanded approach to the use and application of ICTs in the health sector and more specifically in medical research.

An integrated use and application of ICTs into existing health systems would help to improve the delivery of health care in numerous ways including the use of ICTs in telemedicine to improve diagnosis and enhance patient care, improved continued professional development of health workers and better sharing of research findings and an effective extension in the reach and coverage of health care.

- There is also a need to broaden the use and application of ICTs to exploit electronic resources for medical and health e.g. HINARI, PubMed/MEDLINE that are free access medical and health research databases for developing countries.

The use and application of ICTs to access electronic and online health and medical Resources would improve information sharing and communication about health and medical practice and research. There would evidently be an improved information flow among health workers, researchers and the general public resulting into better opportunities for health. Therefore a broadened use and application of ICTs would enhance interactive communication.

The use and application of ICTs would provide medical research staff with access to E-Journals. This would become an efficient and effective source of information covering biomedical literature search and retrieval, continuing professional development of health workers, telemedicine and remote diagnostic

support, diagnostic imaging, critical decision support systems, quality assurance systems and disease surveillance and epidemiology research.

6.2.3 ICT Training Policy and Medical Training

- ICT training should be enhanced at both input and output levels. This is to say medical research personnel should be trained firstly as part of their medical training as well as within their working institutions. Therefore medical research training institutions and medical research practicing institutions should coordinate to formulate a curriculum and integrate ICT education into the medical research training as well as amalgamate ICT training in the medical researchers' human resource training and development programmes.

Evidently, medical research personnel should be trained in exploiting Internet Resources, Evaluating Health Information on the Internet and other Sources of Health Information.

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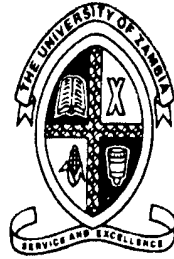
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List of Appendixes

Appendix I Key Informant Questionnaire

Appendix II Medical Research Staff Questionnaire

Appendix I: Questionnaire for Key Informants



The University of Zambia
Directorate of Research and Graduate Studies

Dear Respondent,

I am a post-graduate student at the University of Zambia. I am conducting a research to assess the effects of ICTs on the accessibility of medical research information by medical research personnel in Zambia. You have been randomly selected to participate in this study by way of this questionnaire. The questionnaire has a number of questions to which you are requested to supply a wide range of responses.

You may only supply a foster name. You reserve the right to refuse or accept to participate in the study. You may terminate your participation in the study at any time and without prior notice. The responses that you will supply in this questionnaire will be used for entirely academic purposes and your anonymity is hereby fully guaranteed. Please indicate your willingness to participate in the study by signing below.

I thank you very much for taking time off your academic activities.

Yours sincerely

Edward C. Mwalimu

***Respondent to Sign**

I _____ do here by declare that I have freely allowed the said Edward C. Mwalimu to administer this questionnaire on me. I understand that the responses I am going to give in this questionnaire will be used for purely academic purposes. I do also understand that I have the right to refuse to participate in this undertaking and to terminate it at any time without prior notice.

Key Informant Questionnaire #: { }

SECTION A: BACKGROUND

1. Sex
- | | | |
|-----------|-----|--------------------------|
| 1. Male | { } | <input type="checkbox"/> |
| 2. Female | { } | |

2. Age
- | | | |
|-----------------------|-----|--------------------------|
| 1. 15 – 20 years | { } | <input type="checkbox"/> |
| 2. 21 – 25 years | { } | |
| 3. 26 - 30 years | { } | |
| 4. 31 – 55 years | { } | |
| 5. 36 – 40 years | { } | |
| 6. 41– 45 years | { } | |
| 7. 46 years and above | { } | |

3. Educational level
- | | | |
|----------------|-----|--------------------------|
| 1. Certificate | { } | <input type="checkbox"/> |
| 2. Diploma | { } | |
| 3. Degree | { } | |
| 4. Masters | { } | |
| 5. PHD | { } | |

4. What is the name of the organisation you work for?

.....

5. State the type of ownership for your organisation
- | | | |
|-----------------------|-----|--------------------------|
| 1. Public | { } | <input type="checkbox"/> |
| 2. Private | { } | |
| 3. Church | { } | |
| 4. Other specify..... | { } | |

6. What type of medical research does your organisation undertake?

(Please tick the ones applicable)

- 1. Basic medicine { }
- 2. Clinical medicine { }
- 3. Health sciences { }
- 4. Medical biotechnology { }
- 5. Forensic science { }
- 6. Biological and Chemical sciences { }
- 7. Social science { }
- 8. Veterinary Sciences { }
- 9. Others specify.....{ }

7. How long have you been working for this organisation?

- 1. Less than five years { }
- 2. 6 – 10 years { }
- 3. 11 – 15 years { }
- 4. 16 – 20 years { }
- 5. 21 – 25 years { }
- 6. More than 26 years { }

8. What is your job title?

.....

SECTION B.

9. Does your organization use ICTs in accessing medical research information for research activities?

- 1. Yes { }
- 2. No { }

For official use only

10. What ICTs does your organisation use in accessing medical research information for research activities? [Tick applicable options]

- 1. Electronic Database { }
- 2. Computers { }
- 3. Electronic Mail { }
- 4. The Internet { }
- 5. Mobile Telephone { }
- 6. Radio { }
- 7. Telephone (land line) { }
- 8. Satellite Television { }
- 9. Others Specify..... { }

11. Is there an ICT Policy in your organisation that governs the acquisition and use of ICTs?

- 1. Yes { }
- 2. No { }

12. Do you have an ICT training policy for medical research staff in your organisation?

- 1. Yes { }
- 2. No { }

13. If yes to the question above (13), how often do you send your medical research staff for ICT training and retraining?

- 1. Monthly { }
- 2. Every two to three months { }
- 3. Four to Six months { }
- 4. Seven to twelve months { }

- 5. One to two years { }
- 6. Others, please specify.

14. In your assessment, how would you generally rank the adequacy of ICT training of medical research staff?

- 1. Very good { }
- 2. Good { }
- 3. Fair { }
- 4. Poor { }
- 5. Very poor { }



15. Please explain your response in question 14 above.

.....

.....

16. Please explain what you think can be done to further improve the training?

.....

.....

.....

Thank you very much

Appendix II: Questionnaire for Medical Research Staff



The University of Zambia
Directorate of Research and Graduate Studies

Dear Respondent,

I am a post-graduate student at the University of Zambia. I am conducting a research to assess the effects of ICTs on the accessibility of medical research information by medical research personnel in Zambia. You have been randomly selected to participate in this study by way of this questionnaire. The questionnaire has a number of questions to which you are requested to supply a wide range of responses.

You may only supply a foster name. You reserve the right to refuse or accept to participate in the study. You may terminate your participation in the study at any time and without prior notice. The responses that you will supply in this questionnaire will be used for entirely academic purposes and your anonymity is hereby fully guaranteed. Please indicate your willingness to participate in the study by signing below.

I thank you very much for taking time off your academic activities.

Yours sincerely

Edward C. Mwalimu

***Respondent to Sign**

I _____ do here by declare that I have freely allowed the said Edward C. Mwalimu to administer this questionnaire on me. I understand that the responses I am going to give in this questionnaire will be used for purely academic purposes. I do also understand that I have the right to refuse to participate in this undertaking and to terminate it at any time without prior notice.

Questionnaire #: { }

SECTION A: BACKGROUND

- | | | | |
|--------|-----------|-----|--------------------------|
| 1. Sex | 1. Male | { } | <input type="checkbox"/> |
| | 2. Female | { } | |

- | | | | |
|--------|-----------------------|-----|--------------------------|
| 2. Age | 1. 15 – 20 years | { } | <input type="checkbox"/> |
| | 2. 21 – 25 years | { } | |
| | 3. 26 - 30 years | { } | |
| | 4. 31 – 55 years | { } | |
| | 5. 36 – 40 years | { } | |
| | 6. 41– 45 years | { } | |
| | 7. 46 years and above | { } | |

- | | | | |
|----------------------|----------------|-----|--------------------------|
| 3. Educational level | 1. Certificate | { } | <input type="checkbox"/> |
| | 2. Diploma | { } | |
| | 3. Degree | { } | |
| | 4. Masters | { } | |
| | 5. PHD | { } | |

4. What is the name of the organisation you work for?
.....

- | | | | |
|--|-----------------------|-----|--------------------------|
| 5. State the type of ownership for your organisation | 5. Public | { } | <input type="checkbox"/> |
| | 6. Private | { } | |
| | 7. Church | { } | |
| | 8. Other specify..... | { } | |

6. What type of medical research do you participate in your organisation?
(Please tick the ones applicable)

- 10. Basic medicine { }
- 11. Clinical medicine { }
- 12. Health sciences { }
- 13. Medical biotechnology { }
- 14. Forensic science { }
- 15. Biological and Chemical sciences { }
- 16. Social science { }
- 17. Veterinary Sciences { }
- 18. Others specify.....{ }

7. How long have you been working for this organisation?

- 1. Less than five years { }
- 2. 6 – 10 years { }
- 3. 11 – 15 years { }
- 4. 16 – 20 years { }
- 5. 21 – 25 years { }
- 6. More than 26 years { }

8. What is your job title?

.....

SECTION B.

9. Does your organization use ICTs in accessing medical research information for research activities?

- 1. Yes { }
- 2. No { }

10. What ICTs does your organisation use in accessing medical research information for research activities? [Tick applicable options]

- 1. Electronic Database { }
- 2. Computers { }
- 3. Electronic Mail { }
- 4. The Internet { }
- 5. Mobile Telephone { }
- 6. Radio { }
- 7. Telephone (land line) { }
- 8. Satellite Television { }
- 9. Others Specify.....{ }

11. Has the introduction and use of ICTs made medical research information become more or less accessible than before in your organization?

- 1. More accessible { }
- 2. Less accessible { }
- 3. Do not know { }

12. Please explain your response in question 11 above.

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13. How would you rank the ICTs you use in your organization in adequately assisting in accessing medical research information?

- 1. Very good { }
- 2. Good { }
- 3. Fair { }
- 4. Poor { }
- 5. Very poor { }

14. How would you rank your ICT skills necessary for accessing medical research information?

- 1. Very good { }
- 2. Good { }
- 3. Fair { }
- 4. Poor { }
- 5. Very poor { }

15. Please indicate the type of ICT training you have undergone?

- 1. Formal ICT training { }
- 2. Short ICT Course { }
- 3. Received Lessons from a colleague or friend { }
- 4. Self learning and trial & error { }
- 5. Others specify..... { }

Thank you very much

