ASSOCIATION BETWEEN INFRASTRUCTURE, STAFFING AND TRAINING, VALIDITY OF DATA, MANAGEMENT SUPPORT AND QUALITY OF HEALTH MANAGEMENT INFORMATION SYSTEM (HMIS) IN MALINDI SUB-COUNTY, KENYA

BY

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DECLARATIONS

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DEDICATION

To my dear wife, Patience Mkanyika and my children Mwaringa, Neema and Rehema for their consistent support and encouragement during the time of my studies. Their moral support was overwhelming and stood with me all the way. May God Bless them abundantly.
ABSTRACT

Health Management Information System (HMIS) is a core component of a functioning Health System. Its role is to make available reliable, complete and timely health service data which is useful for the informed decision-making process in health services management. HMIS is also vital for assessing the health needs of populations and groups, and for planning, implementation, monitoring, and evaluation of healthcare interventions. Such management support capability is crucial especially within the context of severe limitations on finance and other resources. Despite this crucial role, HMIS especially in the developing world are weak and unable to provide the expected health systems support. In Kenya, the HMIS data shows imperfections, as timely and comprehensive data are not always available and even if available, not output-oriented. In Malindi Sub-County of Kenya, data quality and timeliness is not optimal and there is a great deal of overlaps in data collection, often making it not helpful for management decisions and local health programs. These imperfections are an impediment to quality health service delivery. In a cross-sectional study, the association between availability of HMIS infrastructure, levels of staffing and training in HMIS, completeness, accuracy and timeliness, management support for HMIS work and quality of HMIS in Malindi Sub-County, Kenya was determined. Saturated sampling method was used to sample 127 HMIS health workers from 81 health facilities in the district. Data collection used a pre-tested semi-structured questionnaire. Data was analyzed using SPSS (version 19). Chi-square tests was used for proportionality and \( P \leq 0.05 \) was the cut-off for testing significance. The study found out that the health information infrastructure is poor with inadequate working space, lack of proper Standard Operating Procedures and reporting tools, and inadequate equipment to support HMIS in Malindi Sub-County. As much as the staff were trained in HMIS, they were not directly involved in HMIS work. Perception on quality and in regards to completeness, accuracy and timeliness varied across the trained staff. There was poor supervision and feedback as ways of management support in the Sub-County. Additional regression analyses showed that out of all the HMIS Infrastructure, adequate space for HMIS \( (P < 0.0001) \), SOP and reporting tools \( (P = 0.004) \), and data processing equipment \( (P = 0.02) \) were significantly associated with higher odds of quality in HMIS at Malindi Sub-County. However, budget support was not associated with quality of HMIS. On Staffing and Training, staff who indicated that they had undergone training were 1.43 more likely to lead to quality in HMIS \( (P = 0.045) \) while those demonstrating competencies and better remuneration were 2.30 more likely to lead to quality in HMIS \( (P = 0.006) \). However, deployment had no association with quality of HMIS in Malindi Sub-County. On validity of HMIS data, completeness \( (P = 0.044) \), accuracy \( (P = 0.034) \) and timeliness \( (P = 0.029) \) had a higher odds of increasing quality in HMIS at Malindi Sub-County. All the management support variables i.e. supervision of the health workers \( (P = 0.540) \) and provision of feedback \( (P = 0.650) \) were not associated with HMIS quality in Malindi Sub-County. The study recommends for requisite investment in health management information infrastructure to enable effectiveness and efficiency in the management of health systems. This should include making available working space, equipment, reporting tool, internet connectivity, standard operating procedures among other tools. Functional Health information systems will only be possible with adequate and skilled human resource. There is also need to strengthen management and budgetary support for health information systems. These are critical if effective HMIS is to be implemented in healthcare in Malindi Sub-County and beyond. Information generated will form critical background for support systems not only in Malindi Sub-County but also in other devolved systems.
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OPERATIONAL DEFINITIONS

Data: Are facts, events, transactions, which have been recorded. They are the input raw materials from which information is produced.

Health Information System: A system that integrates data collection, processing, reporting, and use of the information necessary for improving health service effectiveness and efficiency through better management at all levels of health services.

Health Management Information System: An information system specially designed to assist in the management and planning of health programmes, as opposed to delivery of care. HMIS is commonly used synonymously with HIS.

Health Systems Management: The management of the interrelated component parts, both sectoral and intersect oral as well as the community itself, which produce a combined effect on the health of the population.

Information: Is data that has been processed in such a way as to be useful to the recipient.

Management Information System: A system that provides specific information support to the decision-making process at each level of an organization.

Monitoring: The process of observing whether an activity or service is occurring as planned.

Quality of Data: The degree to which the data or statistics measure what was intended to be measured when the data collection system was designed.

System: A collection of components that work together to achieve a common objective.

Quality of HMIS: This is defined as measure of intended purpose on HMIS Infrastructure (adequate space for HMIS, SOP and reporting tools, data processing equipment, and budget support), Staffing and Training (Deployment, training in HMIS, competencies and remuneration), validity of HMIS data (completeness, accuracy and timeliness) and management support (supervision and feedback).
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CHAPTER ONE
INTRODUCTION

1.1 Background Information

Health Management Information System (HMIS) can be defined as a set of components and procedures organized with the objective of generating information, which will improve healthcare management decisions at all levels of the health system. It is a system that integrates data collection, processing, reporting, and use of the information necessary for improving health service effectiveness and efficiency through better management at all levels of health services (WHO, 2000).

There is universal acceptance that health information is essential for modern health care services. This is indicated by the long history of data collection, health statistics sections, medical records keeping and special surveys worldwide. The World Health Organization (WHO) has long identified Health Information Systems (HIS) as critical for achieving optimum health for populations in the world (WHO, 2000). It links improved management to improved health information systems and notes that, of the major obstacles to effective management, information support is the one most frequently cited (Finau, 1994).

Just as good management is a pre-requisite for increasing the effectiveness of health services, a well-designed and quality HMIS enable the delivery of services according to standards and monitoring and evaluation of health interventions. Effectiveness and efficacy in the management of health services and programmes can be achieved where managers and planners use accurate and timely data to make their decisions. A good health information system is hence a necessity for sound planning in health service management (Kimaro et al., 2008).
A good health management information system should therefore produce information that is accurate, reliable and up to date. The data produced by the system should also be easy to collect, interpret and most critically, the information produced should be relevant to the needs of the health system. Public health decision-makers require accurate and timely information on disease-specific treatment burdens within a health system to monitor and plan resource needs. Reliable data is a basic requirement, which is addressed by a HMIS that coordinates the routine acquisition of treatment records from health facilities and the transfer, compilation, and analysis of these data through district, regional, and national levels (Gething et al., 2006).

For information to influence management in an optimal way, it has to be used by decision makers at each level of the management spiral. This means that not only policy makers and managers need to make use of information in decision-making but also the care providers. The ultimate objective of health information system is therefore not to gain information but to improve action (WHO, 2008).

The Millennium Development Goals (MDGs) adopted by the United Nations General Assembly in 2000, set ambitious, quantifiable targets against which to measure progress in health and other dimensions of development. This has been captured extensively in the post-millennial Sustainable Development Goals (SDGs). The focus on tracking progress has drawn attention to the underlying weaknesses of countries' health information systems. Though reliable and timely health information is an essential foundation of public health action, few information systems in developing countries are effective. Despite increases in knowledge during the 1990s, there remains a gap between what public health policy-makers know and what the knowledge they need to gain in order to improve health and reach international development goals. Data are
often not available in those countries that have the greatest need, owing to under-investment in the systems for their collection, analysis, dissemination and use (WHO, 2007). Decision-makers do not have information to identify problems and needs, formulate evidence-based policies and programmes, and allocate scarce resources optimally. When data are available, they are often out-of-date, rendering trend assessment particularly difficult. Indeed, countries can least afford to be without good health information systems, lack of sufficient resources notwithstanding (UN, 2007).

The current Kenya National Health Sector Strategic Plan (2005 –2010) notes that HMIS forms the basis for monitoring and evaluation in the health sector. This notwithstanding, the HMIS is inadequate because timely and comprehensive data are not available and even in cases when it is available the information is not adequately used for management decision-making and data quality and timeliness is not assured (MoH, 2005).

Kenya was a signatory to the international declaration for achieving health for all by the year 2000 through a conference held at the Alma-Ata in the Soviet Union in 1977, which was later endorsed by the World Health Organization (WHO) in 1978. The efforts to achieve the goals of this declaration and that of the Bamako initiative of 1988 still remain to be realized (MoH, 2006). As health systems were re-structured, the demand for sound information and the skills to manage and use information are increasing significantly. Health Information Management Systems based on modern ICT technologies linking the various levels of the health system and addressing information needs cannot be ignored. In Kenya, the health information needs have changed over time due to health sector reforms and decentralization of health planning to districts (AMREF, 2005). Against this background, HMIS was reviewed and recommendations
used to improve and automate the information system. A pilot HMIS was developed and automated for Ministry of Health in the then Kwale District (currently Kwale County), Coast Province. The lesson learnt when developing an integrated HMIS, is that it is extremely important to use a finite number of indicators to monitor and evaluate the health system's performance. Information collected and the information flow must be streamlined and simplified. While negotiation and selection of a smaller set of indicators can be difficult, it encourages managers at different levels of the health system to determine their critical needs. It requires them to ask how much information they can legitimately require from already overburdened front-line health providers to collect (Gething et al., 2009).

The total population of Malindi Sub-County is 369,931. A total of 50.66% of the hospitals in the Sub-county are public and are government owned. The ratio of Doctor to population is 1:137,500 in the Sub-County (CRA, 2011). Every 30 people in 10,000 population in the region have TB lower than the national count of 39 ranked 25/47. An estimated 3.0% of the population are HIV + and the ante-natal care patients ranked 15/47 and 2.9% lower than the national population on care. The HIV prevalence in the county is 2.1% lower than the national HIV prevalence of 6.1% but is anticipated to be projected higher than the national figure. A total of 71.8% of children (0 – 60 months) are fully immunized, a figure which is below the average national fully immunized population of 83.0% (KIRA, 2014). Just as is the case nationally, the use of HMIS in decision-making in Malindi County is inadequate (MoH, 2005). Whether or not the quality of HMIS data that can guide these decision-making processes exist or not in Malindi County remains unknown. As such, the current study established the association between HMIS infrastructure, staffing and training, validity of HMIS data, management support and quality of health management information system (HMIS) in Malindi Sub-County, Kenya.
1.2 Problem Statement

Health Management Information System (HMIS) is a core component of a functioning health system and an essential foundation of public health (MoH, 2007). An adequate HMIS is vital for assessing the health needs of populations and groups in terms of planning, implementation, monitoring and evaluation of health interventions and programmes (Azubuike and Ehiri, 1999). The need for reliable and timely data is particularly acute where resources are limited and the cost of unwise allocation of funds and none evidence-based decisions can affect survival from any disease or mortality resulting from it.

HMIS in most developing countries are however, inadequate in providing the health systems management support since most of the data reported is irrelevant and its quality may be compromised due to lack of technical skills, training, standardized instructions on data collection, motivation, supervision and feedback (WHO, 1987).

In Kenya, despite the importance of monitoring and evaluation in the health sector, the HMIS is weak and characterized by inadequate infrastructure such as equipment and access to information and communication technologies to effectively deliver quality, relevant, effective and competitive data (HMN, 2008). This strategy faces the greatest challenges in collecting, analyzing, evaluating and interpreting indicators to guide evidence-based policy-making (HMN, 2008). Even when data is available, it is rarely used for decision-making, since the quality and timeliness of such data is not optimal and several gaps exist with a great deal of overlaps in data collection by various programmes. Furthermore, comprehensive data is not available, and whenever it is available, it is not performance-based and hardly serves decision-making processes. These facts impede the monitoring and evaluation of the health sector programmes and even the Millennium Development Goals (MoH, 2005).
In Coast Province, efforts to reform and strengthen the HMIS were started on a pilot basis courtesy of Aga Khan Health services, Danish International Development Agency (DANIDA) and the Provincial Medical Officers (PMOs) office. Despite these developments in Coast Province, HMIS infrastructure, reporting tools, data quality, timeliness, completeness, data analysis, staff capacity, reports transmission, and data utilization remain a challenge in Malindi Sub-County (MoH, 2008). It is on this background that the current study was designed to assess the association between HMIS infrastructure, staffing and training, validity of HMIS data, management support and quality of health management information system (HMIS) in Malindi Sub-County, Kenya.

1.3 Objectives

1.3.1 Broad Objective
Establish association between HMIS infrastructure, staffing and training, validity of HMIS data, management support and quality of health management information system (HMIS) in Malindi Sub-County, Kenya.

1.3.2 Specific Objectives
i. To identify association between availability of HMIS infrastructure and quality of HMIS in Malindi Sub-County, Kenya.

ii. To assess levels of staffing and training in HMIS and associations with quality of HMIS in Malindi Sub-County, Kenya.

iii. To assess the association between completeness, accuracy and timeliness of HMIS data and quality of HMIS in Malindi Sub-County, Kenya.
iv. To establish association between management support for HMIS work and quality in HMIS in Malindi Sub-County, Kenya.

1.3.3 Research Questions

i. What is the association between availability of HMIS infrastructure and quality of HMIS in Malindi Sub-County, Kenya?

ii. What are the levels of staffing and training in HMIS and associations with quality of HMIS in Malindi Sub-County, Kenya?

iii. What is the association between completeness, accuracy and timeliness of HMIS data and quality of HMIS in Malindi Sub-County, Kenya?

iv. What is the association between management support for HMIS work and quality in HMIS in Malindi Sub-County, Kenya?

1.4 Significance of the Study

Quality health information is critical in framing evidence-based health policy and decision-making. It is also fundamental for monitoring progress towards health-related development goals, including the Millennium Development Goals. Health information and research are complementary as foundations for strengthening health systems and health policy (WHO, 2007). An effective information system enables relevant decision-making and is accessible to beneficiaries at all levels promptly (Oranga and Nordberg, 1997).

In most developing countries, Kenya included, HMIS are weak, fragmented, under-staffed, and inadequately resourced. This compromises the quality of information hence affecting the whole health system (UN, 2006). Data is generally poorly collected without collation and proper analysis (UN, 2006). This has led to inappropriate system development, lack of resources, poor
manpower training, inadequate analysis, incomplete and poor recording (Campbell, 1997). There is also little indication for data utilization at the health systems various levels (Campbell, 1997).

Therefore, this study sought to establish the association between HMIS infrastructure, staffing and training, validity of HMIS data, management support and quality of health management information system (HMIS) in Malindi Sub-County, Kenya. The findings of the current study form the basis for intervention at the various levels of the health systems to improve on policy, practice, and research agenda in this region and beyond.
CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction
Health Management Information System has been recognized as an integral part of the health systems infrastructure. It is a combination of people, equipment and data collection and processing methods coordinated to produce information in support of planning and management of a health care system (Oranga and Nordberg, 1997). A health information system is therefore a functional entity of a comprehensive health system that offers integrated health services which include curative care, rehabilitative care, disease prevention, and health promotion services (WHO, 2004).

2.2 The Role of HMIS in the Health Systems
Sound and reliable information is the foundation of decision-making across all health system building blocks, and is essential for health system policy development and implementation, governance and regulation, health research, human resources development, health education and training, service delivery and financing (WHO, 2008). Health management information incorporates all the data needed by policy makers, clinicians and health service users to improve and protect population health. Few countries in the world today have effective and comprehensive systems in place to gather this data. Yet there has never been a greater need for robust health information. As the world community has turned its attention to meeting Millennium Development Goal targets, and ever increasing resources are going towards preventing and treating high burden diseases such as HIV and AIDS, tuberculosis and malaria, decision-makers need to be able to measure whether policies and programmes are working, and whether progress is being made towards the goals that have been set. Donors are
also placing more emphasis on performance, linking the release of funds to performance-based measures (Carlson, 2005). An effective HMIS ensures availability of reliable and timely data that supports the day-to-day management, long-term planning and policy development for the entire health system. It enables the sustainability of public health development and improved health outcomes, and strengthening of health systems (Stansfield et al., 2008).

Health Information Systems are responsible for data generation, hence closely linked to; data collection, analysis and dissemination which will provide timely information to identify problems and needs, track progress, evaluate the impact of interventions, make evidence based decisions on health policy, programme design, strategic planning and resource allocation. It is crucial at all management levels of the health services, from the periphery to the centre, including client/patient management, health unit management, as well as health system planning and management. Health Information users hence include policy makers, managers, health service providers and community (PEPFAR, 2004; MoH, 2007). In Kenya, this mandate is vested on the HMIS division in the Ministry of Health whose establishment dates back to 1974 (HMN, 2008). A good HMIS should produce information with the following attributes; easy to collect, analyze and interpret, accurate, reliable and up to date (WHO, 2008). The system is designed to provide different levels of beneficiaries which include the community, service providers, managers, planners, policy-makers with timely and relevant information to formulate policy, plan, implement, monitor, supervise and evaluate health programmes (Oranga and Nordberg, 1997).
2.3 Structure of HMIS
The HMIS effectiveness and sustainability largely depends on the availability of both physical and human resources and their organization into a well-designed management structure. The management structure will need to be adapted to both the physical and organizational realities of the health system (WHO, 2008).

HMIS mainly consists of two major components:- the information process and Health Information System (HIS) management structure. The information process involves data collection, transmission, processing, analysis and presentation of information to various users. The management structure consists of HIS resources and organizational rules. HIS resources include personnel (planners, managers, and statisticians, epidemiologists, and data collectors), computer hardware and software, and financial resources. Other resources depending on the level of care include, service registers, reporting tools, tally sheets, data collection manuals, International Classification of diseases (ICDs), calculators, personal data assistants (PDAs), all of which are dependent on management support and the effectiveness of the existing supply system (HMN, 2008).

Office space, computer hardware and software, communication systems (for example telephone, fax, internet and documentation equipment) with all the other resources are together termed as the Information infrastructure. The data that are reported in the HMIS are collected by individual health workers in various health facilities, using various tools provided by the health authorities. Many a time, these tools for data collection are not available in the health facilities because they are not distributed on time from the Ministry of Health due to logistics problems or are not produced in time. In a previous study (Kimaro et al., 2008), it was noted that some facilities improvise some of the reporting tools.
Another study (Prybylski et al., 2004) also observed that decisions about any HMIS design must be adapted to the local context based on factors such as; the existing clinical care setting, existing staff capacity, space considerations, facility infrastructure including access to electricity and support services, existing reporting requirements and processes involved in patient flow. Lack of or inadequate HMIS infrastructure is a major impediment in making available quality data (Prybylski et al., 2004).

2.4 Investing for effective HMIS
For Health Information Systems to be effective there must be adequate management support. Data are often not available in most developing countries owing to under-investment in the systems. Resources related to human, financial and other materials are critical for effective functional Health Information Systems (WHO, 2007).

2.5 Weaknesses of Health Management Information Systems
The WHO notes that, despite this critical role in the overall health care delivery, HMIS in most countries are inadequate hence not able to provide the necessary health management support (WHO, 1987). This agrees with a previous study (Lippeveld et al., 1992) which also demonstrated that most of data generated from health facilities is not relevant for management decisions because it is incomplete, inaccurate, untimely or obsolete.

It has also been observed in another study (Smith et al., 1988) that a large part of the data collected passes to the national level without being analyzed. Current Health Information Systems are therefore widely seen as management obstacles rather than as support tool.

Reliable and timely information on disease-specific treatment burdens within a health system is critical for the planning and monitoring of service provision. HMIS exist to address this need at
national scales across Africa but are failing to deliver adequate data because of widespread underreporting by health facilities. Faced with this inadequacy, vital public health decisions often rely on crudely adjusted regional and national estimates of treatment burdens (Johns, 1997).

2.6 Irrelevance of Information
A WHO Expert Committee (1994) observes that in many countries a lot of the data recorded and reported by the health service staffs are not needed for the tasks they perform. Data collection tends to focus on the disease reporting and partially addresses management objectives. Data that are needed are frequently not collected, thus at times indicators to monitor important interventions are not included in Health Information Systems (WHO, 2004).

2.7 Inadequate HMIS Staffing and Training
An effective HMIS is highly dependent on the availability of local capacity of the people involved to understand and manage the system, to make sense of the information generated and to bring effectiveness and efficiency in the delivery of health services (Kimaro et al., 2008). It has equally been observed that, the effectiveness of HMIS in providing information support to health service managers depends upon well-trained staff. As such, the mechanics of data collection, high familiarity with case definitions and service standards are equally important and thus must be mastered. Carlson (2005) also observes that, one of the most difficult parts of improving HMIS is ensuring people filling in the forms at clinic level are skilled enough to report accurately, whether on diseases diagnosed or resource used (Carlson, 2005).

Thus, for HMIS to produce valid, reliable and useful information, staff skills must be built and maintained through initial training, regular refresher courses, regular-support and follow-ups with supervision. The district, regional or national level HMIS personnel need short or long-
term training in epidemiology, biostatistics and use of computer (Hotchkiss et al., 2010). HMIS staff must hence be well-trained and motivated at each level of service delivery to carry out their data collection, reporting and use responsibly (Hotchkiss et al., 2010).

2.8 HMIS Staff Remuneration
The WHO notes that improvements in HMIS cannot be achieved unless attention is given to the training, deployment, remuneration and career development of human resources at all levels (WHO, 2000). At national level, skilled epidemiologists, statisticians and demographers are needed to oversee data quality and standards for collection, and to ensure the appropriate analysis and utilization of information. At peripheral levels, health information staff should be accountable for data collection, reporting and analysis. Proper deploying of health information officers within large facilities and districts (as well as at higher levels of the health-care system) results in significant improvements in the quality of data reported and in the understanding of its importance by health-care workers.

Appropriate remuneration is essential to ensure the availability of high-quality staff and to limit attrition. Targeted capacity development is needed, and training and educational schemes should be used to address human resource development in areas such as health information management and use, design and application, and epidemiology. Such training should be for all levels of competency, ranging from the pre-service training of health staff and continuous education, to public health graduate education at the Master and Doctoral levels (WHO, 2004). This, however, is not the case as HMIS suffers chronic shortage of experienced staff and poor skills. Furthermore, data requirements are selected without taking into account the technical skills of health workers collecting the data, or the diagnostic equipment in peripheral health facilities as noted in a study by Health Metrics Network (2008). Health workers receive little if any training
in data collection methods and rarely have standardized instructions on how to collect the data (Murthy and Patel, 1988).

2.9 Lack of Supervision and Feedback
Lack of feedback and supervision on data reported at higher levels are other factors that lead to de-motivation of staff resulting in poor data quality. Health workers have little or no motivation to ensure the quality of collected data and to comply with reporting requirements. Most of them equate HMIS work with endless paper work and sending out reports with no feedback (Murthy and Patel, 1988).

In an assessment on HMIS by Ministry of Health in Kenya, it found out that HMIS was manned by inadequate staff, majority of whom are not trained in health information skills. Up to 46% of staff working on HMIS tasks had no professional training and thus lack of capacity of HMIS to generate reliable, up-to-date and timely information. Capacity building needs were identified both at the provincial and national level in the areas of computer skills and even higher skill development in epidemiology, statistics and demography. The division of HMIS also lacked computers and other equipment and no uniform system to manage and process data at all levels to facilitate efficiency of receiving and processing data (MoH, 2007).

2.10 Duplication and Parallel Health Information System
The HMIS in the developed countries are rarely a result of co-ordinated efforts to address information needs of health planners and managers. Often, donor agencies or national programmes within the Ministry of Health develop their own specialized health information systems, mostly under pressure and with financial assistance from external donor agencies. While these separate information systems could indeed provide real information support for
programmatic decisions and the quality of information better than from the routine information system, the net result is that the latter becomes more chaotic and bothersome (WHO, 1994).

In a previous study (Stansfield et al., 2008), it was also noted that in typical low resource settings, vertical programs often implement their own information systems to meet their specific needs without consideration of how this information is integrated with the overall health information system.

2.11 Relevance of HMIS Data

Relevance of data is the over-riding quality. Information must be relevant to the problem or decision being considered. Data that is accurate, complete and timely delivered to users is an important aspect in health planning, management and decision-making. Evidence-based plans and decisions must be of necessity and be based on accurate, complete and timely data (WHO, 2000). Quality or accuracy of data refers to the degree to which data or statistics measure what was intended when the data collection system was designed, the HMIS therefore is expected to guarantee that decision – makers have access to both unbiased and complete information (Simba and Mwangu, 2006).

According to (Lucey, 1997), quality information is that which is used and which creates value. Any good information should be, relevant, sufficiently accurate, timely and complete for its purpose.

The level of quality of data from routine information systems in many developing countries is however questionable and preferably should be weighed against other methods of data collection where possible (WHO, 2008). Data produced are often incomplete, inaccurate, un-timely, obsolete and un-related to priority tasks and functions of local health personnel. This
phenomenon has been summed as “data-driven” instead of “action-driven”. Many of the data recorded and reported by the health service are not needed for the task the staff performs (WHO, 1994).

2.12 Utilization of Data and Management Support
For information to influence management in an optimal way, it has to be used by decision-makers at each point of the management spiral thus from the periphery to the centre. Policy makers, managers, doctors, health technicians, community health workers need information as much as the service providers.

It has been noted that information has no value in itself thus; its value is derived from the value of the change in decision behavior caused by the information being available.

This implies that, information is not an end in itself, but a means to better decisions in policy design, health planning, management, monitoring and evaluation of programmes and services. Information can only influence decisions if it is relevant, reliable and available for the decision maker in timely fashion. Unfortunately, the availability of such high quality data does not guarantee its appropriate use in the decision-making process. Research findings abound with anecdotal accounts of underutilized data. It has been noted that in the developing world, there are low incidences of information based decision-making in the health sector than in other sectors (WHO, 2008). When the incentive to perform and to monitor quality is low, the use of information can be expected to be low (Opit, 1987; Lucey, 1997).

As stated in the previous sections, in Coast Province, efforts to reform and strengthen the HMIS were started on a pilot basis courtesy of Aga Khan Health services, Danish International Development Agency (DANIDA) and the Provincial Medical Officers (PMOs) office. Despite
these developments in Coast Province, HMIS infrastructure, reporting tools, data quality, timeliness, completeness, data analysis, staff capacity, reports transmission, and data utilization remain a challenge in Malindi Sub-County (MoH, 2008). It is on this background that the current study was designed to establish the association between HMIS infrastructure, staffing and training, validity of HMIS data, management support and quality of health management information system (HMIS) in Malindi Sub-County, Kenya.
2.13 Conceptual Framework of Study

This framework presents identified concepts based on the literature review and the problem statement of this study.

INDEPENDENT VARIABLES

HMIS INFRASTRUCTURE
- Adequate space for HMIS
- HMIS SOP & reporting tools
- Data Processing Equipment
- Budget support

STAFFING & TRAINING
- Deployment
- Training in HMIS
- Perception on competencies
- Remuneration

VALIDITY OF HMIS DATA
- Completeness
- Accuracy
- Timeliness/Deadline of reporting

DEPENDENT VARIABLE

QUALITY OF HMIS DATA

Figure 2.1. Conceptual Framework
CHAPTER THREE
METHODOLOGY

3.1 Study Area
This study was carried out in Malindi Sub-County, Kenya (Appendix I). Malindi Sub-County with a population of 400,414 (KNBS, 2010), which is one of the 13 Districts in Coast Province, it borders Kilifi County to the South, Taita Taveta to the West, Tana-River County and the Indian Ocean to the North West and East, respectively. It lies between latitude 0º.12´ South and longitude 40º05´East. The District covers a geographical area of 7605 km², which is 1.3% of Kenya’s total area, with a coastline of 155 km. Malindi town with an estimated population of 100,000 is the major urban centre in the district, and is located about 615km from Nairobi, Kenya’s capital city (MoH, 2010).

3.2 Study Population
The study population consisted of 127 health workers directly carrying out HMIS in the 81 health facilities in the district.

3.3 Study Design
This was a cross-sectional study to determine the association between correlates of quality of HMIS data and the quality of HMIS in Malindi Sub-County, Kenya.

3.4 Study Variables
3.4.1 Independent variables
- Availability of HMIS infrastructure
- Staffing and Training of staff
- Validity of HMIS data
- Management support
3.4.2 Dependent variables

Quality of HMIS data

In order to establish the quality of HMIS, a Question-Answer (QA) based Approach was used to calculate a Quality Index (QI). The process for each characteristic were and allowed a rating each one on a scale of 1 to 3 as follows: - Bad = 1, Fair /Acceptable = 2, Good = 3.

Once rating is completed, calculate rating of each Characteristics using following formulae:

QI of product using formulae:

\[
QI = \frac{\sum C(j)}{n} \times 100
\]

Where,

QI = Quality Index
n = number of Quality Characteristics

The number 2 (Fair /Acceptable = 2) and 3 (Good) were then collapsed into one group of ‘Good’=1 and all the ‘Bad’ =0 for purposes of logistic regression analyses.

3.5 Sample Size Determination

The sample size was based on the actual number of health workers working with HMIS at the health facilities within Malindi Sub-County, Kenya. Table 3.1 shows the actual number of these health workers stratified by category of facility. A total of 127 respondents from 81 health facilities and using the HMIS in Malindi Sub-County, Kenya were interviewed. The study adopted a saturated sampling method since all the respondents available in the study site who were using the HMIS were interviewed.
Table 3.1: Health Facilities involved in study Malindi Sub-County (N = 127)

<table>
<thead>
<tr>
<th>Health Facility Category</th>
<th>Health Facility Ownership</th>
<th>Total No. of Health Facilities</th>
<th>No. of health workers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GoK</td>
<td>Private</td>
<td></td>
</tr>
<tr>
<td>Hospitals</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Health Centres</td>
<td>4</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Dispensaries</td>
<td>25</td>
<td>2</td>
<td>27</td>
</tr>
<tr>
<td>Clinics</td>
<td>0</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>TOTAL</td>
<td><strong>30</strong></td>
<td><strong>51</strong></td>
<td><strong>81</strong></td>
</tr>
</tbody>
</table>

The table above shows the number of health facilities by category and manning agency which were involved in the study along with the number of health workers interviewed. There were 81 health facilities and 127 health workers.

3.5.1 Selection of Study Area
Malindi Sub-County was purposely selected because it is one of the Sub-counties in Kilifi County with a large population and also has a large number of health facilities owned by both government and private. As such, there has been critical need to develop an effective HMIS to support decision-making in health services for population resident in the Sub-County.

3.5.2 Inclusion Criteria
Consenting health workers involved in HMIS working in the health facilities.

3.5.3 Exclusion Criteria
Health workers not involved in HMIS but working in the health facilities.
3.6 Data Collection Tools
The researcher developed semi–structured questionnaires to collect quantitative data (see Appendix II). Informed consent was obtained from the respondents prior to administration of the questionnaires (Appendix III). An observation checklist was used to assess the availability of HMIS infrastructure in the visited health facilities (Appendix IV). For data collection, interviews were carried out using the questionnaire. Observation method was also used to check on availability of HMIS infrastructure.

3.7 Recruitment and Training of Research Assistants
Four Research Assistants were recruited and trained for two days on data collection and interviewing techniques. The training was both theoretical and practical.

3.8 Pre-testing of Tools
After the training the research tools were pre-tested among health workers in the neighboring Kilifi Sub-County, Kenya to check for reliability and validity. The test-retest method was used to establish reliability and validity. The questionnaires recorded a reliability of 87% and validity of 95%.

3.9 Data Processing and Analysis
The data processing started with manual data cleaning on the filled questionnaires before data entry into the computer. Analysis of data was carried out using SPSS software (version 19). The quantitative data was presented as descriptive, graphs, tables and charts. Chi-test was used to determine proportionality. Binary regression analyses were used to establish association between the independent and dependent variables. Statistical significance was assessed at $P\leq0.05$. 

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3.10 Ethical Considerations
Authority to conduct this study was obtained from the School of Graduate Studies (SGS) of Maseno University. The local DMoH was informed and her authority sought (Appendix V). Informed consent was used from the respondents (health workers) after explaining the purpose and importance of the study. Confidentiality was maintained throughout the study.
CHAPTER FOUR

RESULTS

4.1 Category of Health Facilities Involved the Study

A total of 81 health facilities were targeted in the current study. Out of the 81, majority 45/81 (56%) were clinics, 27/81 (33%) were dispensaries, 6/81 (7%) were health centres while 3/81 (4%) were hospital (Figure 4.1).

![Figure 4.1: Category of the Health facilities and operating agency](image)

Of all the 81 health facilities visited, majority 49/81 (61%) were operated by private enterprises, 30/81 (37%) by GoK or public while 2/81 (3%) of them being mission or FBO (Figure 4.2).
4.2 Service offered as per category of the Health facilities

All the facilities were offering outpatient services (100%), 8/81 (10%) were offering inpatient, 36/81 (44.4%) were offering maternity services, 32/81 (39.5%) were offering laboratory services, 41/81 (50.6%) were offering MCH/FP services while 17/81(22%) were offering VCT/ART services (Table 4.1).

Table 4.1: Health Services offered in the Health Facilities (n=81)

<table>
<thead>
<tr>
<th>Services Offered in the Health Facilities</th>
<th>Hosp.</th>
<th>H/Centre</th>
<th>Disp.</th>
<th>Clinic</th>
<th>Total</th>
<th>% of Total Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outpatient</td>
<td>3</td>
<td>6</td>
<td>27</td>
<td>45</td>
<td>81</td>
<td>100%</td>
</tr>
<tr>
<td>Inpatient</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>8</td>
<td>10.0%</td>
</tr>
<tr>
<td>Maternity</td>
<td>3</td>
<td>5</td>
<td>27</td>
<td>1</td>
<td>36</td>
<td>44.4%</td>
</tr>
<tr>
<td>Laboratory</td>
<td>3</td>
<td>6</td>
<td>13</td>
<td>10</td>
<td>32</td>
<td>39.5%</td>
</tr>
<tr>
<td>MCH / FP</td>
<td>2</td>
<td>5</td>
<td>27</td>
<td>7</td>
<td>41</td>
<td>50.6%</td>
</tr>
<tr>
<td>VCT / ART</td>
<td>2</td>
<td>6</td>
<td>9</td>
<td>0</td>
<td>17</td>
<td>22.0%</td>
</tr>
</tbody>
</table>

Legend: The 81 facilities stratified as per health services being offered. % are n/81*100%.
4.3 Availability of HMIS Infrastructure

In order to establish the availability of HMIS infrastructure in Malindi Sub-County, availability of adequate HMIS space, SOP manual and reporting tools, equipment to facilitate processing of HMIS reports and availability of budget to support HMIS was assessed in all the health facilities.

4.3.1 Availability of Adequate HMIS Space

Majority, 80.2% (n=65/81) of the health faculties had no adequate space for HMIS work, while only 19.8% (n=16/81) had adequate space for HMIS work (Figure 4.3).

![Figure 4.3: Availability Space for HMIS work](image)

4.3.2 Availability of HMIS Standard Operating Procedure Manual and Reporting Tools

Majority, 92.6% (n=75/81) of the health facilities had no procedure manual or guideline for HMIS work. On availability of tools, 65.4% (n=53/81) had the necessary reporting tools required for HMIS. About 41/81 (50.6%) of facilities had no reliable HMIS tools supply system while 76/81 (93.8%) had systems that were not simplified in filling HMIS tools (Table 4.2).
Table 4.2: Availability of Standard Operating Manuals and reporting tools

<table>
<thead>
<tr>
<th>Variable</th>
<th>Yes</th>
<th>No</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Availability of HMIS SOP</td>
<td>6/81 (7.4%)</td>
<td>75/81 (92.6%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Availability of Reporting Tools</td>
<td>53/81 (65.4%)</td>
<td>28/81 (34.6%)</td>
<td></td>
</tr>
<tr>
<td>Reliable HMIS tools supply system</td>
<td>40/81 (49.4%)</td>
<td>41/81 (50.6%)</td>
<td></td>
</tr>
<tr>
<td>Simplicity in Filling HMIS tools</td>
<td>5/81 (6.2%)</td>
<td>76/81 (93.8%)</td>
<td></td>
</tr>
</tbody>
</table>

4.3.3 Equipment to Facilitate Processing of HMIS Reports

Majority, 44/81 (54.3%) of the health facilities had no machines or equipment to facilitate processing of HMIS reports (Figure 4.4). Furthermore, of all the 81 health facilities, 39/81 (48.1%) had computers, 12/81 (14.8%) had a printer, 2/81 (2.5%) had a photocopier, all (100%) of health facilities had telephone and calculators, none had a PDA and 5/81 (6%) of them had internet connectivity (Table 4.4).

Figure 4.4: Facilities with Equipment to facilitate processing of HMIS reports.
Table 4.3: Health Facilities with Data processing machines (n=81)

<table>
<thead>
<tr>
<th>Availability of Data processing Machine / Equipment</th>
<th>Hosp.</th>
<th>H/Centre</th>
<th>Disp.</th>
<th>Clinic</th>
<th>Total</th>
<th>% of Total Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>33</td>
<td>39</td>
<td>48.1%</td>
</tr>
<tr>
<td>Printer</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>7</td>
<td>12</td>
<td>14.8%</td>
</tr>
<tr>
<td>Photocopier / Duplicator</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2.5%</td>
</tr>
<tr>
<td>Telephone</td>
<td>3</td>
<td>6</td>
<td>27</td>
<td>45</td>
<td>81</td>
<td>100%</td>
</tr>
<tr>
<td>PDA</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Calculator</td>
<td>3</td>
<td>6</td>
<td>27</td>
<td>45</td>
<td>81</td>
<td>100%</td>
</tr>
<tr>
<td>Internet Connectivity</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>5</td>
<td>6%</td>
</tr>
</tbody>
</table>

**Legend:** All health facilities stratified as per availability of data processing machines. Hosp.=Hospital; H=Health; Disp.=Dispensary. % are n/81*100%.

4.3.4 Availability of Budget to Support HMIS Work
In terms of availability of budget to support HMIS work, 91% of the facilities indicated lack of while only 8% indicated they had budgetary support.

![Figure 4.5: Availability of Management Support](image_url)
4.4 Staffing and Training in HMIS

Nearly 90% (72/81) of the health facilities had no staff dedicated to HMIS work. HMIS work depended on other health workers assigned other duties in the facilities. On training in HMIS, majority 85.2% (69/81) indicated having had some form of training in HMIS (Table 4.4).

Table 4.4: Staff dedicated to HMIS work and training

<table>
<thead>
<tr>
<th>Variable</th>
<th>Result</th>
<th>No. of facilities</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff dedicated to HMIS work</td>
<td>Yes</td>
<td>9</td>
<td>11.1%</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>72</td>
<td>88.9%</td>
</tr>
<tr>
<td>Whether staff doing HMIS work had any training in HMIS</td>
<td>Yes</td>
<td>69</td>
<td>85.2%</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>12</td>
<td>14.8%</td>
</tr>
</tbody>
</table>

Proportions are n/81*100%.

4.5 Completeness, Accuracy and Timeliness of HMIS Data

In order to assess completeness, accuracy and timeliness of HMIS data in Malindi Sub-County, the awareness on timelines/deadlines, ability to submit reports in a timely manner and the health workers’ perception on accuracy and simplicity in filing the reports and on the quality of the reports were established.

4.5.1 Awareness on Reporting Deadlines/Timeline

A total of 85% of the respondents indicated that they are aware of the reporting deadlines when facilities are expected to submit their facilities monthly reports to the district level, while only 15% indicated that they are not aware of any reporting deadlines.
4.5.2 Ability to submit facility reports timely and the health workers perception on simplicity of reporting tools

On submission of their facility monthly reports, 65% of the health workers indicated that they normally submit their report timely, while the rest (35%) indicated that they are not able (P<0.0001). On whether the reporting tools are of quality or not, 66% of the respondents agreed that they were simple while 34% indicated they were not simple (Table 4.5).

Table 4.5: Submission of Reports

<table>
<thead>
<tr>
<th>Variable</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilities Submitting timely reports</td>
<td>65%</td>
<td>35%</td>
</tr>
<tr>
<td>Perception of Simplicity of Reporting Tools</td>
<td>66%</td>
<td>34%</td>
</tr>
</tbody>
</table>

Proportionality analyses using Chi-square analyses.

4.5.3 Perception on Quality of Reports

On the perception of quality of reports, 77% of respondents felt the reports they submitted were of good quality, while the rest (23%) felt they were not of good quality.
4.6 Management Support for HMIS Work in Malindi Sub-County

In order to establish whether there were any management support for HMIS work in the health facilities, the frequency of support supervision and feedback on the HMIS work was assessed in the 81 health facilities.

4.6.1 Frequency of Support Supervision

Majority (42%) of the respondents indicated that they get support supervision at least quarterly, 38.3% indicated half yearly, 9.9% indicated annually, 2.5% indicated monthly while 7.4% indicated never having any support supervision (Figure 4.8).

Figure 4. 7: Perception of whether Reports submitted are of good quality

Figure 4. 8: Frequency of support supervision visits to health facilities by DHMT
4.6.2 Feedback on HMIS

Majority of the respondents (60.5%) confirmed that they get feedback on HMIS reporting from the County while the rest (39.5%) indicated there was no feedback (Table 4.6).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whether facilities get feedback on their HMIS reports</td>
<td>60.5%</td>
<td>39.5%</td>
</tr>
</tbody>
</table>

4.6.3 Association between the Correlates of Quality and the Quality of HMIS in Malindi Sub-County

In order to establish the association between HMIS infrastructure, staffing and training, validity of HMIS data, management support and quality of health management information system (HMIS) in Malindi Sub-County, Kenya, a regression analysis was carried out in which presence of quality =1 and lack of it=0, based on the quality index calculated above in methods. The presence of the independent variables were coded as present=1, and absent=0.

Table 4.7. presents the association between HMIS Infrastructure (adequate space for HMIS, SOP and reporting tools, data processing equipment, and budget support), Staffing and Training (Deployment, training in HMIS, competencies and remuneration), validity of HMIS data (completeness, accuracy and timeliness) and management support (supervision and feedback) and the quality of HMIS in Malindi Sub-County.

Results demonstrate that out of the HMIS Infrastructure, adequate space for HMIS (OR=2.31, 95% CI=1.24-3.61, \( P<0.0001 \)), SOP and reporting tools (OR=4.20, 95% CI=3.11-5.01, \( P=0.004 \)), data processing equipment (OR=3.01, 95% CI=2.15-4.25, \( P=0.02 \)) were significantly associated with higher odds of quality in HMIS at Malindi Sub-County. However, budget support was not associated with quality of HMIS.
On Staffing and Training, staff who indicated that they had undergone training were 1.43 more likely to lead to quality in HMIS (OR=1.43, 95% CI=1.22-3.33, \( P=0.045 \)) while those demonstrating competencies and better remuneration were 2.30 more likely to lead to quality in HMIS (OR=2.30, 95% CI=1.34-3.44, \( P=0.006 \)). However, deployment had no association with quality of HMIS in Malindi Sub-County.

On validity of HMIS data, completeness (OR=1.20, 95% CI=1.01-2.01, \( P=0.044 \)), accuracy (OR=1.60, 95% CI=1.20-2.01, \( P=0.034 \)) and timeliness (OR=1.90, 95% CI=1.33-2.43, \( P=0.029 \)) had a higher odds of increasing quality in HMIS at Malindi Sub-County.

Further analyses demonstrated that supervision of the health workers (\( P=0.540 \)) and provision of feedback (\( P=0.650 \)) as part of Management Support were not associated with HMIS quality in Malindi Sub-County (Table 4.7).

**Table 4.7: Association between independent variables and the Quality of HMIS**

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>OR</th>
<th>95% CI</th>
<th>( P )-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HMIS Infrastructure</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adequate space for HMIS</td>
<td>2.31</td>
<td>1.24-3.61</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>SOP and reporting tools</td>
<td>4.20</td>
<td>3.11-5.01</td>
<td>0.004</td>
</tr>
<tr>
<td>Data processing equipment</td>
<td>3.01</td>
<td>2.15-4.25</td>
<td>0.02</td>
</tr>
<tr>
<td>Budget support</td>
<td>0.60</td>
<td>0.54-1.46</td>
<td>0.456</td>
</tr>
<tr>
<td><strong>Staffing and Training</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deployment</td>
<td>0.45</td>
<td>0.29-1.20</td>
<td>0.650</td>
</tr>
<tr>
<td>Training in HMIS</td>
<td>1.43</td>
<td>1.22-3.33</td>
<td>0.045</td>
</tr>
<tr>
<td>Competencies and remuneration</td>
<td>2.30</td>
<td>1.34-3.44</td>
<td>0.006</td>
</tr>
<tr>
<td><strong>Validity of HMIS Data</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Completeness</td>
<td>1.20</td>
<td>1.01-2.01</td>
<td>0.044</td>
</tr>
<tr>
<td>Accuracy</td>
<td>1.60</td>
<td>1.20-2.01</td>
<td>0.034</td>
</tr>
<tr>
<td>Timeliness</td>
<td>1.90</td>
<td>1.33-2.43</td>
<td>0.029</td>
</tr>
<tr>
<td><strong>Management Support</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supervision</td>
<td>0.75</td>
<td>0.45-1.23</td>
<td>0.540</td>
</tr>
<tr>
<td>Feedback</td>
<td>0.47</td>
<td>0.29-1.34</td>
<td>0.650</td>
</tr>
</tbody>
</table>

Analyses carried out using binary logistic regression analyses. OR=Odd Ratio, 95% CI= 95% Confidence Interval. Lack of the independent variables was used as reference group in each case.
CHATER FIVE

DISCUSSION

The current study was set out to assess the quality of Health Management Information System (HMIS) in Malindi Sub-County, Kenya by establishing availability of HMIS infrastructure, assessing levels of staffing and training in HMIS, evaluating the completeness, accuracy and timeliness of HMIS data and finally establishing the presence of any management support for HMIS work in Malindi Sub-County, Kenya. The discussion will be ordered as per the following specific objective areas:

5.1 Association between availability of HMIS infrastructure and HMIS Quality in Malindi Sub-County

The current study established that majority of the health facilities neither had adequate space for HMIS work [80.2% (n=65/81)] nor procedure manual or guideline for HMIS work [92.6% (n=75/81)]. There were no budget lines to support the HMIS in most health facilities. These poorly established HMIS infrastructure could be related to underdeveloped general public health systems, fragmented funding, inadequate training and technical expertise, inconsistent and sporadic technical assistance, limited information technology (IT) and data collection and inadequate financial resources in such hospital settings. Additional regression analyses demonstrated that adequate space for HMIS (OR=2.31, 95% CI=1.24-3.61, P<0.0001), SOP and reporting tools (OR=4.20, 95% CI=3.11-5.01, P=0.004), data processing equipment (OR=3.01, 95% CI=2.15-4.25, P=0.02) were significantly associated with higher odds of quality in HMIS at Malindi Sub-County. However, budget support was not associated with quality of HMIS. In previous studies, it has been demonstrated that high-performance health systems require a well-distributed workforce, information systems for data collection, quality improvement analysis, and clinical communication support, as well as the organizational capacity to support culturally
competent services and ongoing improvement efforts (Institute of Medicine, 2010). It is worth noting that a strong infrastructure as much as it depends on many organizations, the health departments are considered primary key players and there is an overemphasis on the presence of solid public health infrastructure at all levels to support the implementation of public health programs and policies and to respond to health threats (Institute of Medicine, 2003). Hence, it would be plausible to extend this reasoning and indicate that most of the health facilities in Malindi Sub-County are yet to acquire the level of infrastructure necessary to support effective high-performance health system in that region. As much as recent studies have noted challenges and barriers to implementation of effective HMIS and hence healthcare as related to devolution in the country (Langat and Mwanri, 2015), more energy should be vested in supporting HMIS at the Sub-County levels so that they can reap the outcome of evolved health system.

5.2 Association between Levels of Staffing and Training in HMIS and Quality in HMIS in Malindi Sub-County

In the current study, nearly 90% (72/81) of the health facilities had no staff dedicated to HMIS work and the HMIS work depended on other health workers assigned to other duties in the facilities. However, majority of the staff 85.2% (69/81) indicated having had some form of training in HMIS. Additional regression analyses demonstrated that staff who indicated that they had undergone training were 1.43 more likely to lead to quality in HMIS (OR=1.43, 95% CI=1.22-3.33, \( P=0.045 \)) while those demonstrating competencies and better remuneration were 2.30 more likely to lead to quality in HMIS (OR=2.30, 95% CI=1.34-3.44, \( P=0.006 \)). However, deployment had no association with quality of HMIS in Malindi Sub-County.

As part of the implementation process in HMIS, recruitment of staff with relevant training in HMIS and training are necessary requisite for effective strategies and implementation of HMIS
in any health system. Clearly, a lack of needed expertise among existing personnel can slow down the process of HMIS implementation, often leading to frustrations and pressure amongst the existing staff members leading to long-term failure in implementation. Numerous difficulties associated with the implementation of HMIS system in Malindi Sub-County can be mitigated through enhanced recruitment of staff with relevant training in HMIS and training of the existing staff to be able to support HMIS implantation. Furthermore, to gain maximum benefits from the implementation of the HMIS, all operations must be re-designed periodically to accommodate environmental changes and maximize operational benefits, while still maintaining the necessary controls in the systems (Tan and Payton, 2010).

5.3 Association between Completeness, Accuracy and Timeliness of HMIS Data and Quality in HMIS in Malindi Sub-County

In the current study, majority of the staff at the health facilities (85%) indicated that they are aware of the reporting deadlines when facilities are expected to submit their facilities monthly reports to the County level. Furthermore, 65% of the health workers indicated that they normally submit their report timely, while 66% of the respondents agreed that the format of the reports were simple. As much as quality could not be established directly, 77% of respondents felt the reports they submitted were of good quality. Even though the question of completeness was inadequately responded to by majority of the respondents, this came out as one of the most area that require awareness amongst the HMIS staff. Additional regression analyses demonstrated that completeness (OR=1.20, 95% CI=1.01-2.01, P=0.044), accuracy (OR=1.60, 95% CI=1.20-2.01, P=0.034) and timeliness (OR=1.90, 95% CI=1.33-2.43, P=0.029) had a higher odds of increasing quality in HMIS at Malindi Sub-County.
To be most useful for reporting, an HMIS should include the most current information on the clients served in their health unit. To ensure the most up to date data, information should be entered as soon as it is collected. The unit in-charges should specify concrete timelines for when data entry of information collected on paper should be completed. One of the key element to consider will be to adopt the standard recommendations of entering data within 24-hour period. Most established institutions ensure that complete and accurate data for the month are entered into HMIS by the fourth working day of the month following the reporting period (WHO, 2008). In Malindi Sub-County health facilities, a deliberate approach to upgrade the HMIS to allow the following approaches will ensure completeness and accuracy of data in the systems: software validation in which records are not saved unless all required fields are entered and a process of data quality reporting occurs after the fact where a system administrator produces reports of missing fields, and feeds that information back to the data entry staff. These approaches have been tested and proven to maintain an effective HMIS for healthcare (WHO, 2008).

5.4 Association between Management Support for HMIS work and Quality in HMIS in Malindi Sub-County

In the current study, it was established that majority (42%) of health facilities in Malindi Sub-County get support supervision at least quarterly, 38.3% indicated half yearly, 9.9% indicated annually, 2.5% indicated monthly while 7.4% indicated never having any support supervision. Furthermore, majority of the respondents (60.5%) confirmed that they get feedback on HMIS reporting from the County. As much as some of the respondents indicated that they get feedback from the County level whenever they release data, it was difficult to establish the chain of flow of information and the feedback. Further analyses demonstrated that supervision of the health workers ($P=0.540$) and provision of feedback ($P=0.650$) as part of Management Support were
not associated with HMIS quality in Malindi Sub-County. As much as there were no association between these variables and quality in HMIS, a proper channel of feedback need to be established as this process assures that the data released into the system is clear and provides the continuum for any ramifications of the findings. Generally, the problems of releasing data are minimal when data quality is high, but are potentially insurmountable when not enough attention has been paid to data quality throughout the collection process. While cleaning data and accurately representing limitations are valuable, engaging all parties—data entry staff, program directors, implementation-level staff, and the software itself—in a concerted effort to collect high quality data is much more important and ultimately the only way to truly achieve the long-term goals of HMIS.
CHAPTER SIX
SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

6.1 Summary of Findings
The current study has established that in Malindi Sub-County, the HMIS is poor, and most of
the health facilities have not dedicated enough space to support the quality of HMIS work. As
much as staff are trained on HMIS, they are not fully dedicated to HMIS due to competing
work-related interests. The level of completeness, timeliness in delivery and accuracy of HMIS
data are still wanting in Malindi Sub-County while the feedback mechanisms for improvement
of quality of data is still unclear in the Sub-County. These variables as established compromises
HMIS quality in such systems.

6.2 Conclusion
i. Out of all the HMIS infrastructure, adequate space for HMIS ($P<0.0001$), SOP and
reporting tools ($P=0.004$), and data processing equipment ($P=0.02$) were significantly
associated with higher odds of quality in HMIS at Malindi Sub-County. However,
budget support was not associated with quality of HMIS.

ii. On staffing and training, staff who indicated that they had undergone training were 1.43
more likely to lead to quality in HMIS ($P=0.045$) while those demonstrating
competencies and better remuneration were 2.30 more likely to lead to quality in HMIS
($P=0.006$). However, deployment had no association with quality of HMIS in Malindi
Sub-County.

iii. On validity of HMIS data, completeness ($P=0.044$), accuracy ($P=0.034$) and timeliness
($P=0.029$) had a higher odds of increasing quality in HMIS at Malindi Sub-County.
iv. All the management support variables i.e. supervision of the health workers \( (P=0.540) \) and provision of feedback \( (P=0.650) \) were not associated with HMIS quality in Malindi Sub-County.

6.3 Recommendations from Current Study

i. There is need to invest in health management information infrastructure to enable effectiveness and efficiency in the management of health systems. This should include working space, equipment, reporting tool, internet connectivity, standard operating procedures among other tools.

ii. Functional Health information systems will only be possible with adequate and skilled human resource in the Sub-County and beyond.

iii. There is need to strengthen management and budgetary support for Health information systems.

iv. A clear feedback mechanism at the Sub-County and County level need to be established in order to support flow of information and enhance quality of HMIS data.

6.4 Recommendations for Future Studies

i. There is need to carry out a comprehensive study on how HMIS has been implemented in the devolved systems in Kenya as a way to learn from the Counties and Sub-Counties.

ii. There is need for comparison of HMIS in developing countries viz-a-viz in developed countries to offer strategies for support, maintenance and upholding of quality HMIS for effective healthcare.
REFERENCES


McDonald, M.D. (2000) Health Information Infrastructure in Developing Countries, Global Health Initiative


APPENDICES

Appendix 1: Map of the Study Site
## Appendix II: Questionnaire

**HMIS infrastructure, staffing and training, validity of HMIS data, management support and quality of health management information system (HMIS)**

<table>
<thead>
<tr>
<th>Questionnaire No_______________________________</th>
<th>Date:<em><strong><strong>/</strong></strong></em>/ 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of Interviewer_______________________________________________________</td>
<td></td>
</tr>
</tbody>
</table>

### Instructions for filling in the questionnaire

1. The Respondent is kindly requested to read carefully and answer every question appropriately in the box provided for by selecting 1,2,3,e.t.c

2. The respondent is assured that the information obtained will be handled in confidence.

### Socio-Demographic and Profile of Health Facility

<table>
<thead>
<tr>
<th>1. Name of Health Facility___________________________</th>
<th>Division____________________________</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Category of Health facility</td>
<td>1. Hospital</td>
</tr>
<tr>
<td></td>
<td>2. Health Centre / Nursing Home</td>
</tr>
<tr>
<td></td>
<td>3. Dispensary</td>
</tr>
<tr>
<td></td>
<td>4. Clinic</td>
</tr>
<tr>
<td>3. Operating agency of facility</td>
<td>1. GoK</td>
</tr>
<tr>
<td></td>
<td>2. Mission</td>
</tr>
<tr>
<td></td>
<td>3. NGO</td>
</tr>
<tr>
<td></td>
<td>4. Private</td>
</tr>
<tr>
<td>4. Services offered at the facility [Tick [✓] as appropriate]</td>
<td>1. Outpatients treatment</td>
</tr>
<tr>
<td></td>
<td>2. Inpatient</td>
</tr>
<tr>
<td></td>
<td>3. Maternity</td>
</tr>
<tr>
<td></td>
<td>4. Laboratory</td>
</tr>
<tr>
<td></td>
<td>5. MCH/FP/PMCTC</td>
</tr>
</tbody>
</table>
### AVAILABILITY OF HMIS INFRASTRUCTURE

<table>
<thead>
<tr>
<th></th>
<th>Question</th>
<th>1. Yes</th>
<th>2. No</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Does your facility have adequate space for HMIS work / operations?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Does the facility have a guideline/manual on how to fill in the various reporting tools?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Do you have necessary reporting tools including registers [Stationery] you require for HMIS work?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>What are the sources of your reporting tools, HMIS stationery and materials?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>How would rate the supply system for the HMIS tools and other stationery.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Do you have any equipment /machines which facilitates in the processing of your reports?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>If yes, mention the machines or equipment you have. Tick [√] as appropriate.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### BUDGET AND SUPPORT FOR HMIS

<table>
<thead>
<tr>
<th></th>
<th>Question</th>
<th>1. Yes</th>
<th>2. No</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>Do you have any budget for reporting tools, materials and HMIS work in general?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>How often does your HMIS work get</td>
<td>1. Monthly</td>
<td></td>
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</tbody>
</table>
supportive supervision from the District Health Management team [DHMT].

<p>| | | |</p>
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<thead>
<tr>
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<tbody>
<tr>
<td>2.</td>
<td>Every three months</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Every six months</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Yearly</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Never</td>
<td></td>
</tr>
</tbody>
</table>

14. Do you ever receive any feedback on HMIS from the District/Higher level?

<p>| | |</p>
<table>
<thead>
<tr>
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<th></th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Yes</td>
</tr>
<tr>
<td>2.</td>
<td>No</td>
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</tbody>
</table>

**STAFFING AND TRAINING IN HMIS**

15. Do you have staff dedicated to HMIS work in this facility?

<p>| | |</p>
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<tbody>
<tr>
<td>1.</td>
<td>Yes</td>
</tr>
<tr>
<td>2.</td>
<td>No</td>
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</table>

16. Have the staffs doing HMIS work had any training/Orientation in HMIS?

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<tbody>
<tr>
<td>1.</td>
<td>Yes</td>
</tr>
<tr>
<td>2.</td>
<td>No</td>
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</tbody>
</table>

**QUALITY OF HMIS**

17. Are you aware of any deadlines to submit your reports to the District or next higher level?

<p>| | |</p>
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<tbody>
<tr>
<td>1.</td>
<td>Yes</td>
</tr>
<tr>
<td>2.</td>
<td>No</td>
</tr>
<tr>
<td>3.</td>
<td>Don’t know</td>
</tr>
</tbody>
</table>

18. Are you able to transmit your reports within the required time schedule?

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Yes</td>
</tr>
<tr>
<td>2.</td>
<td>No</td>
</tr>
</tbody>
</table>

19. In your perception, are the HMIS reporting tools simple to fill or not?

<p>| | |</p>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Yes</td>
</tr>
<tr>
<td>2.</td>
<td>No</td>
</tr>
</tbody>
</table>

20. In your opinion does your facility produce relevant /quality reports data?

<p>| | |</p>
<table>
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<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Yes</td>
</tr>
<tr>
<td>2.</td>
<td>No</td>
</tr>
</tbody>
</table>
Appendix III: Informed Consent form for respondents

The Researcher’s name is Christopher K. Ziroh, a student at Maseno University studying for Masters’ Degree in Public Health. I am currently carrying out this study to: - Establish association between HMIS infrastructure, staffing and training, validity of HMIS data, management support and quality of health management information system (HMIS) in Malindi Sub-County, Kenya. The purpose of this study is to collect data that will enable establish strengths and weaknesses in our HMIS, whose findings will help policy makers and health services managers at the various levels of the health system to design appropriate interventions.

You have been identified to participate in this study and are kindly requested to consent and spare a few minutes to take this interview with the Researcher / Research assistant.

I wish to assure you that the data being collected in this study will be used for the purpose intended.

Name of Respondent:_________________________________________________

Health Facility:_______________________________________________________

Signature:____________________________________________________________

Date:_______________________________________________________________
Appendix IV: Observation Checklist

1. Facility having adequate space to allow HMIS infrastructural development to support HMIS Quality.

2. Availability of SOPs and reporting tools for HMIS Quality.

3. Presence of data processing equipment and how many of the types.

4. Presence of budget support.

5. Rate of staff deployment.

6. Evidence of training in HMIS by the staff.

7. Year of experience/competencies of the HMIS staff.

8. Remuneration of the HMIS staff.

9. Completeness of the data in the HMIS.

10. Accuracy of data in the HMIS.

11. Timelines in reporting in the HMIS.

12. Levels and hierarchy in supervision of the HMIS.

13. Evidence of feedback to the HMIS staff whenever they raise issues.
Appendix V: DMOH Approval

Telegram: "MEDICAL" MALINDI
Telephone: 042-20491/30661
Fax 042-30661
E-mail: dmo@malindi@yahoo.com

Ref: Mal./C.7/Vol. II/(109)

Mr. Christopher K. Ziroh
c/o Office of the Provincial Director of Public Health
MOMBASA

REF: AUTHORITY TO CARRY OUT RESEARCH IN MALINDI DISTRICT
CHRISTOPHER K. ZIROH – STUDENT NO. MPH/099/2005

Following your request to carry out an academic research entitled “Assessment of Quality of HMIS in Malindi”, you are hereby authorized to visit our health facility in the district for data collection for a period of one month from the date of this letter. By copy of this letter the health workers in the health facilities are asked to support the bearer of this letter accordingly.

Yours Faithfully

Dr. Elwyn Chondo
District Medical Officer of Health
Malindi District

c.c: The In-charges – Health Facilities – Malindi District