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USE OF AGGREGATE DATA FOR HEALTH DECISION MAKING AT DISTRICT LEVEL: CASE STUDY OF GA WEST MUNICIPALITY OF THE GREATER ACCRA REGION

BY

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DECLARATION

I, Rabiatu Alawiye hereby declare that this work is the result of my own original research under the supervision of Dr. Samuel Dery, and the inclusions of other peoples' research by way of literature review which has been duly acknowledged. This dissertation, either in whole or in part has not been presented elsewhere for another degree.

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Dr. Samuel Dery

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DEDICATION

This work is dedicated to my parents who have made me who I am today, and have encouraged and supported me to pursue this Masters Programme.

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ABSTRACT

Background: There is growing interest in the usage of reliable evidence for decision making in the health sector. Quality data from an aggregated system can provide the platform for improving health system performance. The extent of usage of Routine Health Information System (RHIS) data at the lower levels of the health system remain largely unknown. This study examined the level of usage of routine aggregate data for decision making and the extent to which information culture exists at the district and facility levels in the Ga West Municipality of the Greater Accra region.

Methods: The study adopted descriptive cross-sectional design and used a quantitative data collection approach. The Organisational, Behavioural Assessment Tool (OBAT) was adapted to measure the level of promotion of information culture which is a key component to the use of routine data for decision making. The tool also contained information on organisational mechanisms, commitment and support for RHIS data use, and self-perception of competence in RHIS data use. A total of 214 healthcare workers (13 upper level managers, 201 other staff) were sampled for the study. Simple random sampling was used to identify the upper level mangers while systematic sampling was used to recruit the other staff in all the seven sub districts. Responses were mainly collected using Likert scale and analysed through composite scoring and Cronbach alpha, which was used to assess the reliability of the tool. Frequencies and relative frequencies were computed in Stata version 15 and Microsoft Excel and presented in tables. The study was approved by the Ethics Review Committee of the Ghana Health Service.

Results: A total of 214 healthcare workers participated in the study [Female: 62.1% (133)]. The majority of the respondents (69.6%) had never received formal training in RHIS data use. Fifty percent had worked with RHIS data for 1 – 5 years. As regards to information culture, 69.6% agreed that the basis of healthcare decisions is superior's directives. Over

50% agreed health care decisions are based on evidence/facts, history and funding directives from higher levels. Fifty-nine of respondents agreed that managers seek input from relevant staff, 56.1% agreed that managers emphasise that data quality be followed at all times. Most staff have positive attitude in promoting information culture by completing RHIS tasks (43.0%), using data for day-to-day decision making (65.0%) and preparing and showing data visuals to monitor progress (51.4%). Forty-two percent of staff agreed that they feel discouraged when information is not used for decision making but 45.3% agreed data collection is tedious. Sixty-seven of health facilities visited had written guidelines on RHIS information display. All the 18 heath facilities had strategic and annual plans, data visuals on their notice boards. Over 80% of the facilities received regular feedback on data quality and service performance. Eighty-three percent of the facilities hold monthly management meetings. Over 50% of the staff had high self-perceived competence in the RHIS tasks.

Conclusion: A good culture of information supported by positive staff and management attitude exists in the district. The district has adequate organisational support and commitment which enhances RHIS data use. The level of aggregate data use and the self-perceived competence for RHIS data use are relatively high in the district. However, formal training for staff on RHIS data use is low. The upper level management should train staff on RHIS data analysis and use.

Keywords: Health Information, Data, information culture, Ga West, Ghana

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LIST OF ABBREVIATIONS

CHPS	-	Community-based Health Planning Services
DHIMS2	-	District Health Information Management System
DHIS2	-	District Health Information Software
DHMT	-	District Health Management Team
GHS	-	Ghana Health Service
GHS-ERC	-	Ghana Health Service Ethics Review Committee
GWMA	-	Ga West Municipal Assembly
HIS	-	Health Information System(s)
HISP	-	Health Information Systems Programme
HMIS	-	Health Management Information System
ICT	-	Information Communication Technology
LMIC	-	Low- and Middle-Income Countries
MOH	-	Ministry of Health
MSc. PH. M&E Evaluation	-	Master of Science Public Health Monitoring and
OBAT	-	Organisational, Behavioural Assessment Tool
QIP	-	Quality Improvement Process
RHIS	-	Routine Health Information Systems
TBA	-	Traditional Birth Attendant

CHAPTER ONE

INTRODUCTION

1.1 Introduction

This study investigated the use of aggregate data for health decision making at district level in the Ga West Municipality of the Greater Accra Region. Within this chapter, the study was introduced through the research background, problem statement, the research questions and objectives. Also included were the conceptual framework and justification for the study.

1.2 Background

Health Information System (HIS) is an "integrated effort to gather, process, report and use health information and knowledge in order to influence policy making, program action and research" (Abouzahr & Boerma, 2005). It is an evidence-based system aimed specifically at helping to manage and forecast health programs as disparate in care delivery (Abajebel, Jira, & Beyene, 2011). The health information system centres on population morbidity and mortality patterns, causal investigation, and the selection and effectiveness of interventions in public health; this makes it different from data on health care intended for health experts and broader responsiveness related to health.

Sound and reliable evidence is the basis for decision-making across all building blocks of the health system and is critical for improving and operating health system policy, governance and regulation, health research, development of human resources, health education and training, service delivery and funding. In less well-off and underdeveloped populations, the usage of indigenous information intended for planning in health organisations and decision-making is often restricted towards very few decisions (Simba & Mwangu, 2004).

According to Hipgrave, Alderman, Anderson, and Soto (2014), the availability of evidence could allow for local policymaking and alignment of healthcare provision using accessible assets as well the health needs of the community, even though priority setting also rest on additional factors. The availability of well-timed, complete and accurate Health Information from Routine Health Information Systems, such as the District Health Information Management System (DHIMS2) designed by University of Oslo, through the Health Information Systems Programme (HISP) is critical for good policy, resource allocation and the day-to-day management decisions of a country's healthcare system. The HIS collects data from the health sector and other relevant sectors, analyse the data and ensures their overall quality, relevance and timeliness, and converts data into information for health-related decision-making (Lippeveld, 2017).

Ghana, as one of the Low- and Middle-Income Countries (LMIC) pushed for national health data repository reforms to improve data quality and reliability for evidence based health decision-making after realising the weakness in their routine health information systems (Abouzahr & Boerma, 2005; de Savingy & Taghreed, 2009). In 2010, Ghana adopted the open-source web-based District Health Information Software (DHIS2) to harmonize nation-wide data into a District Health Information Management System (DHIMS2) that serves as a bases for understanding health patterns, making informed decisions and forming actions to improve lives (Adaletey, Jolliffe, Braa, & Ofosu, 2015; Bakar, Sheikh, & Sultan, 2012; Kossi, Sæbø, Braa, Jalloh, & Manya, 2013), after abandoning their troubled national, non-web-based computerized health information system.

The use of reliable evidence in this current times for decision making in health is the benchmark for all service delivery in the health sector. Quality data from a system of Health Information can offer the platform for improving health performance (Abajebel et al., 2011). Such information aggregated over time becomes a valuable resource in providing reliable

evidence for health decision making (Mutale et al., 2013). Knowledge on its use also add up to the body of knowledge needed for improved evidence-based decision making, policy formulation, planning and implementation, and many more. This study therefore sought to probe the use of aggregate data for health decision making at district level in the Ga West Municipality of the Greater Accra Region.

1.3 Problem Statement

There has been a renewed global interest in health system performance. This has led to the development of performance indicators for monitoring, assessing, and managing health systems to achieve effectiveness, equity, efficiency and quality in healthcare delivery (Braithwaite et al., 2017).

The usage of evidence to support decision-making is the vital component of the facility-based information system (Hovenga & Grain, 2013). There is comprehensive acknowledgement of the role of data to underpin decision making. Information derived from health data are used to improve overall administration and delivery of the health sector (WHO, 2008). In Ghana, the Ministry of Health (MOH) and Ghana Health Service (GHS) have a formal performance agreement in which the GHS is to provide specific outputs and outcomes using the inputs provided by MOH. This performance agreement is established in monthly or quarterly reporting based on indicators in the performance contracts signed.

Usually, the agreement presumes that systems to provide dependable and timely data are in place. In reality however, this is not the case and the accessibility of high quality and reliable data does not usually result in utilisation of that data. Consequently, no direct relationship exists between data collection, sharing and utilisation (Hovenga & Grain, 2013) even though it must not be the case. This has led to in the constant shortfalls in the health system that has been linked to the inadequate utilisation of evidence for policy making by health managers

and decision makers, particularly at the district, sub-district and community levels despite improvements in health information systems in Ghana. Such practices lead to misallocation of health resources, misplaced prioritization and unmet healthcare demands. It is therefore important to actively engage with policy makers to ensure that data and evidence are properly adapted to guide decisions and interventions (PAHO/WHO, 2014) .

The problem in Ghana has to do with inadequate use of data to support decision-making at lower levels of implementation being Senior Managers, District, Sub districts and the facility level. The health administration and service delivery of health has seen little use of data at these levels due to its incompleteness, non-accuracy and the non-timeliness of deliverables. Scattered data in regards to the GHS Programme Based system of administration causing delays in merging aggregated data wit the high levels of bureaucracy in the case of accessibility of quality and reliable data for decision making. No direct relationship between data collection, sharing and utilization especially at the lower levels.

Data use for decision making chronically has become an issue at all levels with persistent low commitment in using data for requesting commodities like vaccines, family planning devices, drugs leading to over and under stocking of health commodities in health facilities. In addition actions taken by managers are mostly based on personal intuition not data. On this basis it is assumed that;

- At the Regional levels there exist 55% - 68% data use during decision making.
- Similarly, at the district and sub district levels there exist 45% - 49% and 35% - 45% data use during decision making respectively.
- Facility level data use recorded below 35% data use during decision making.

The Problem is caused by inadequate resources/logistics, authorities at higher levels not showing interest, poor coverage's and incompleteness of service data, staff iteration and

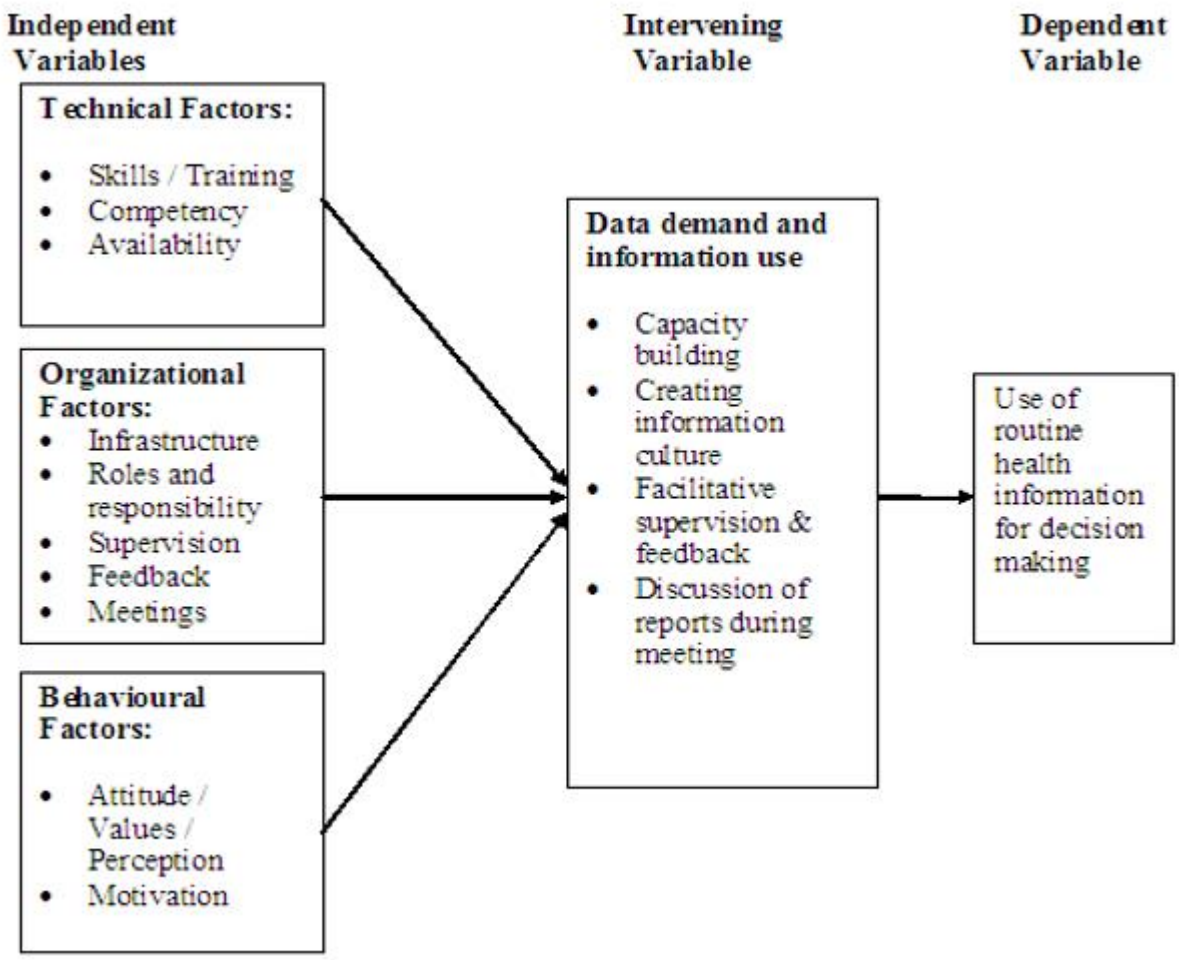
inadequate knowledge in data management and inadequate Management support among others. The consequences of the problem are under/over allocation of resources, poor planning and budgeting, poor response to health issues at lower levels, incomplete reporting and not meeting timelines. This problem affects allocation of resources and logistics, funding, service delivery, outputs and results.

Although a study has been conducted to evaluate the quality of data in the DHIMS2 in Ghana, very little was done to assess how information was used to make decisions (Amoakoh-Coleman et al., 2015). It is for these reasons that this study sought to evaluate how the data from DHIMS 2 is being utilized for decision-making at the district level and how this can be improved.

1.4 Conceptual Framework

This research adopted a framework from Aqil, Lippeveld, & Hozumi, (2009) to expand routine information systems for health. The Performance of Routine Information System Management (PRISM) categorizes three interconnected sections that are essential to advance routine information systems and the utilization of the information they produce. They are the technical, organizational, and individual/behavioural elements that influence the use of information. The technical section consists of systems such as processes, systems and methods for data collection. The behavioural/individual section refers to data users and collectors' behaviours and how data is used to solve problems and improve programs. The last part of the organizational component focuses on the processes and composition of the establishments using the data from these systems.

Opportunities were identified using the framework components as well as constraints for effective data use, and information use improvement policies were built along the same parameters.



Source: Adapted from Aqil et al., (2009)

Figure 1: Conceptual framework on use of routine health information for decision-making

1.5 Research Questions

This study sought to explore the following research questions;

1. What are the organizational mechanisms in place for producing the results in RHIS performance?
2. To what extent does culture of information exist in the organization?
3. What is the commitment and support of upper management in enhancing an information system?

1.6 Objectives

1.6.1 General Objective

To determine whether aggregate data is used for decision making and the extent to which information culture exist at the district level in the Ga West Municipal of the Greater Accra Region.

1.6.2 Specific Objectives

1. To examine the extent of existence of information culture in the Ga West municipal health directorate
2. To assess the commitment and support of upper management for enhancing an information system.
3. To assess the proportion of self-perception of competence to perform RHIS tasks among health staff in the municipality
4. To determine the use of aggregate data for health decision-making at the district level

1.7 Justification

Demand for data and use in response to altering health partner finance mechanisms has become highly significant in relation to program and funding agencies. Particularly based on donor funding in the health sector, it has become necessary to show the corresponding achievements and merits to vulnerable groups. The Ministry of Health, Ghana, is also under great pressure to demonstrate evidence for the achievement of their goal and to ensure that both donors and civil societies can demonstrate to what extent their contributions to the health sector have contributed to the development of health. Information from this research will be useful in improving how unit heads at the district level use aggregate data to inform decisions to improve the overall performance in terms of service delivery in their areas. Information from this research will also be useful to regional and national heads, the

administrators of the system and the sector as a whole. They can use this information for further training and intensify supervision and surveillance. The information will also be relevant to the government of Ghana and health partners who are investing in health and in the system and want to make evidence-based decision making in the health sector. The study results can also serve as a guide to other countries that use a routine system to collect health service data, particularly in low- and middle-income countries.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter is reviewed all extant literature significant to the study. It is comprised of the conceptual review, the theoretical review and the empirical review. The conceptual review discusses the definitions and concepts while the empirical review focuses on existing literatures and studies on routine health information system performance and use, and the determinants affecting utilization of routine health information.

2.2 Background Review

2.2.1 Use of Aggregate Data for Decision-Making

Usage of aggregated information for decision-making is defined as employing data from a routine heath information system to identify priority areas of focus in the sector; to identify gaps in equity, to guide planning and monitoring of health service delivery; and also, to guide equitable health resource allocation (Sector & Policy, 2007).

2.2.2 Health Management Information System

The Health Information Management System (HIMS) is a system designed to support the health sector to plan, manage and make decisions in health facilities and organisations (USAID & MEASURE Evaluation, 2010). It is one of the six building blocks for strengthening health systems through the use of data for evidenced based decision-making. Effective use of data from HIMS has the potential for improving other agencies and sectors through data sharing (Bhattacharyya et al., 2016).

2.2.3 Health Information System

Health Information System (HIS) can be defined as the mechanisms and procedures for obtaining and scrutinizing data, providing information for the management of a health program or system, and for monitoring health activities (Dewey, Lwanga, & Tye, 2006).

The health data repository system offers the foundations for policy-making and has four key functions: data collection, compilation, analysis and synthesis, and communication and use (Das, 2017). It gathers data from the health sector and other relevant sectors, scrutinises the data and guarantees their overall quality, significance and timeliness, and transforms data into information for health-related decision-making (Islam, Hasan, Wang, Germack, & Noor-E-Alam, 2018).

2.2.4 RHIS History, Performance and Use in Ghana

There is growing interest in the use of reliable evidence for decision making in health. Quality data from a data repository can provide the platform for improving health system performance. Such information aggregated over time becomes a valuable resource in providing reliable evidence for health decision making (Mutale et al., 2013; Jones, Rudin, Perry, & Shekelle, 2014; MEASURE Evaluation, 2017).

Routine Health Information System (RHIS), coined from (WHO, 1999) definition of Health Information System, is the mechanisms and procedures for acquiring and analysing ***routine*** data, providing information for the management of a health program or system, and for monitoring health activities. The flow of data from health information systems into decision-making is illustrated in Figure 2 below.

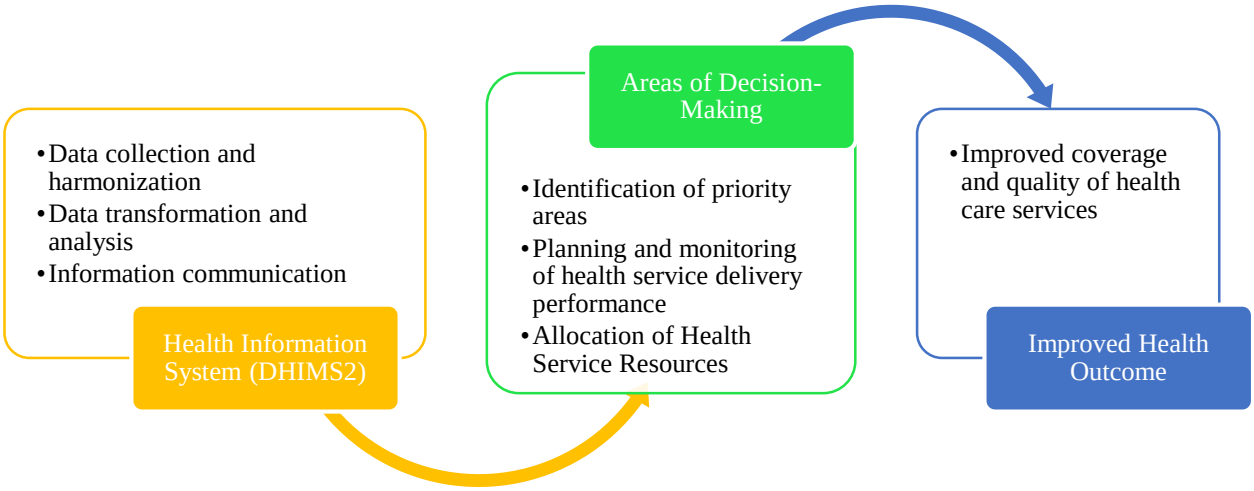


Figure 2: The flow of data from health information systems into decision-making

Having emphasised the need for evidence-based decision making, for a successful and effective use of aggregated data for decision making, the flow of data must meet basic benchmarks. As show in Figure 2, data flow starts with the HIS, for use in areas of decision-making in order to achieve an improved health outcome. HIS in the Ghanaian health sector is the DHIMS2 being used for data collection and harmonisation, data transformation and analysis and information communication. Under areas of decision making, we have identification of priority areas, planning and monitoring of health service delivery and allocation of health service resources among others, which result in improved health outcome through improved coverage and quality of health care services. Adherence to these benchmarks for flow of data ensure credibility and viability in data and information usage in informed decision making for improved services in the health sector.

In Low- and Middle-Income Countries (LMIC), routine health information systems remain weak (de Savingy & Taghreed, 2009). It is characterized by record duplications, fragmentation, incompleteness and multiple storage formats (Abouzahr & Boerma, 2005). Lately, governments of LMIC have initiated sequence of health data repository reforms with

the aim of improving the quality and reliability of data for health decision-making (Mutale et al., 2013).

One of such major reforms is the adoption of an open-source District Health Information System (DHIS2) by countries like Ghana, Kenya, Tanzania and Sierra Leone. Such information systems harmonize nation-wide data and serve as bases for understanding health patterns, making informed decisions and forming actions to improve lives (Adaletey, Jolliffe, Braa, & Ofosu, 2015; Bakar, Sheikh, & Sultan, 2012; Kossi, Sæbø, Braa, Jalloh, & Manya, 2013).

The University of Oslo has, through the Health Information Systems Programme (HISP), been involved in HIS reform since the mid-1990s, with the District Health Information Software (DHIS2) currently being at the core of this involvement. DHIS2 is a data warehouse software for health data, with tools for data collection, analysis and presentation. The software is used in the systems of health information of many countries in both Africa and Asia, including several West African countries (Poppe, Jolliffe, Adaletey, Braa, & Manya, 2013).

In 2010, Ghana decided to use DHIS2 as the platform for its HIS. The country already had a national, computerized health information system, but this system had many problems. The Health Information Systems Programme (HISP) group at the University of Oslo signed an agreement with the Ghana Health Service, under which the University agreed to train GHS staff and support the DHIS2 implementation.

In Ghana, the DHIS2, referred to as the District Health Information Management System (DHIMS 2), was implemented by the Ghana Health Service (GHS) in partnership with the University of Oslo. The GHS is responsible for health service delivery in Ghana. It operates a decentralized system at five different reporting functional levels: National, Regional,

District, Sub-district and Facility. GHS collects, analyzes and reports on all routine health services data from all health delivery institutions including public, missions, private and quasi-government facilities in the country (Nyonator, Ofosu, Osei, & Atweam, 2012).

The earlier computerised system Ghana had was not web-based and had a large component being paper-based. This was very tedious and inefficient. With the implementation of the DHIMS 2, the paper-based system was replaced with a more efficient computer system, making it easier to synchronize and analyze data. This has led to a reduction in the information transmission bottlenecks/timelines. Currently, the DHIMS2 is accessible in 170 out of 216 districts with about 5163 registered users (Nyonator et al., 2012).

2.2.5 Determinants Affecting Utilization of Routine Health Information

Use of routine health information is essential for improved evidence-based decision-making within the health sector. This is however fraught with determinants that are characterized under technical, organizational and behavioural factors.

2.2.5.1 Technical Factors Affecting Utilization of Routine Health Information

In improving upon the use of routine health information for decision making, a weighing component in this regard is the technical factors affecting its utilisation.

As attested to by Mboro, (2017) improved key competencies to data indicated that there must be data demand and use at all levels of the healthcare system. These could be done by developing skills in data quality assurance, analysis, interpretation, synthesis, presentation, and use as lack of these, result in poor data quality which affects its use (Simwanza & Church, 2001). Because inadequate expertise in the basics of M&E affects not only the quality of the data collected, but also the ability to transform information into policy (Mohr & Batalden, 2002).

Health information managers frequently brawl with the capacity to comprehend and interpret information analysis in the intervention perspective due to failure in correcting during pre- and/or post-service training of health professionals. In this regard, training in good data management and its significance at all levels of the health sector would aid in enhancing data and information use (Mboro, 2017; Mohr & Batalden, 2002).

Also, of note is the availability of the needed IT tools and equipment with the required maintenance for the gathering and use of data and information. Executing IT data collection solutions save time, limit the amount of mistakes and increase information timeliness and consistency (Chaulagai et al., 2005).

2.2.5.2 Organizational Factors Affecting Utilization of Routine Health Information

The efficiency of a body is directly connected to the output of its employees (Belita, Mbindyo, & English, 2013). The organization is administered by guidelines, procedures and systems. These guidelines, procedures and systems have the ability to support or obstruct an individual's ability to use data in decision making. Managers in health decide how to produce and deploy data on the basis of a willingness to make the good choices and enhance services (Aqil et al., 2009).

Culture of information is achieved when everyone asks for data and pointers for planning, taking decisions or proposing innovative actions, also when statistics talks they are the best for all choices (Nutley, Levitt, Solesbury, & Martin, 2012). The organization culture may foster or discourage information use. Safeguarding the sustainability of the health data scheme is as essential as establishing a culture that promotes the use of data in decision-making procedures (Kihuba et al., 2014).

An organisation with structures and procedures for enhancing the interaction between information consumers and manufacturers, offering clear rules for data quality procedures

and identifying roles and duties linked to information utilization, monitoring and feedback will enhance evidentiary decision-making (Aqil et al., 2009; Kihuba et al., 2014; Mboro, 2017; S. Nutley et al., 2012).

Once administrative mechanisms are in place to promote a philosophy of data-informed policymaking, data manufacturers and users value information and comprehend how it is used in the health system, resulting in information being of greater quality, conveyed and shared through the health system, and therefore used in decision-making(Health Metrics Network, 2007). As a unified work of information consumers and information manufacturers, the awareness of the procedures and techniques of information collection, the accessible information sources and the quality of those information is increased. These assist to better address data use obstacles and enhance data sharing (Koon, Nambiar, & Rao, 2012; Patton, 2008).

2.2.5.3 Behavioural Factors Affecting Utilization of Routine Health Information

Behavioural variables explain the collection and use of data by health employees (or fail to do so). Senior management's perceptions and attitudes towards data will have a decisive impact on the use of health information (Mboro, 2017).

Any action to reinforce the health information system that does not address behavioural variables such as attitudes towards the use of health information, motivation and information-based decision-making incentives will lead in bad data quality, underreporting, uncommon use of information and bad decision-making (Mboro, 2017).

To enhance the use of health information in developing countries, there is need to strengthen health workers sense of data ownership and eliminate the perception that the health worker's role ends when they collect data and transmit it to the next level. For consistent information use to occur, data need to be of high quality so that information users are confident that the

data they are consulting are accurate, complete, and timely. Since without quality data, data-informed decision making will drop or not occur and program efficiency and effectiveness will suffer (Braa, Heywood, & Sahay, 2012; Mavimbe, Braa, & Bjune, 2005; Mboro, 2017).

2.3 Empirical Review

For any information system to be valued, the generated information must appropriately inform decision which will consequently result in improved health service performance. Some studies have been conducted to evaluate how the utilization of data from health information systems is feeding into decision-making to improve health care services.

A study to evaluate the utilization of a health management information system (HMIS) at the district level in Jimma Zone in Ethiopia Abajebel et al., (2011) highlighted the factors associated with utilization of HMIS, this was a cross-sectional study with population selected from district health offices, health centres and health posts. In this study, the rate of utilization of information from the HMIS was 32.9%, which was far below national expectations. The study also reported that although an average of 57% of participants tried to transform data into information, only 32.1% used the information for decision making. Other factors identified included poorly coordinated processes, no capacity building on the use of HMIS as well as the lack of guidelines on using HMIS, the absence of internet connection for remotely accessing and transmitting data and the low level of staff commitment.

Another cross-sectional study in Ethiopia assessed the utilization of health information systems with special emphasis on HIV/AIDS data. In this study, the general utilization of information from the health information system was 22.5%. This study also identified influencing factors similar to those previously identified in the forgoing literature reviewed.

In the case of the study "Utilization of healthcare information among healthcare Workers in Gucha Sub-county, Kisii County, Kenya", Obwocha, Ayodo, Nyangura, & Thomas, (2016) assessed the utilization of health information among healthcare workers in Kenya, where they exposed inadequate information communication technology (ICT) infrastructure and computers as well as low levels of commitment as major challenges to health information use. The study also indicated that while most service providers generate a lot of information, the use was very little.

Mboro (2017) "Use of Routine Health Information for Decision Making Among Health Workers at Coast General Hospital, Mombasa County, Kenya" study aimed at assessing technical, organizational and behavioural factors that influenced information use among health workers at Coast General Hospital (CGH), Mombasa County, Kenya. The research adopted a descriptive cross-sectional study design to collect quantitative and qualitative data using self-administered questionnaire, interview guide for key informants and discussion guide for focus groups. Simple random sampling was employed to choose 236 health personnel for the study. In the findings, he showed that 69.6% of the participants use routine health information for decision making with 30.0% reporting having received minimal training in information management areas. He also identified inadequate support from the immediate supervisor and compounded by unclear roles and responsibilities as hindrances to information use. This led him to conclude that the partial use of routine health information for decision making with the interplay of technical, organizational, and behavioural determinants. He therefore recommended the need for the health sector management to provide training to improve health workers' skills with specific focus on information use and the need for targeted regular review meetings, feedback and support supervision.

In another study conducted in Kenya by Akaco, Erastus, Edward, & Scott (2013) on information request as well as usage in Central and Eastern Kenya's health sector identifies

barriers to the use of data and recommends practices dealing with data use and data requirements constraints for health programs, through a research that took place in five districts in the Central and Eastern provinces, decision-makers, managers of health facilities, staff of health facilities and officers of health records, by analysing 140 questionnaires using STATA 12 and In Vivo software, they found that most of the policy makers and managers of facilities interviewed use data in decision-making, but producers of data seldom participate in policymaking processes that they suspect may result in low motivation to provide high-quality data. Their study also highlighted data quality, accuracy, completeness and timeliness concerns expressed by all three respondent groups and split across both provinces. They therefore recommended the need for technical and financial support to enhance health sector staff capacity.

Additionally, a study conducted in Uganda by Boone, David; Tran Ba Huy, Ronald; Pervilhac, Cyril; La Tour, (2008) on Routine Data Quality Assessment Tool: Guidelines for Implementations showed that staff in most of facilities reported using aggregated data from Health Management Information System information for the management of medical supplies and drugs, personnel decisions and improvement of services. However, the quality of HMIS data has been shown to be frequently compromised by incompleteness and inaccuracy, which means that employees do not always rely on it to make decisions. Computer shortages and frequent power failures also reduced staff's ability to input data, assess data and delayed reporting process. Furthermore, the ability of staff to do data analysis, interpretation and use were limited so information precision and timeliness had an impact on data quality and thus use.

Similarly, Aqil et al., (2009) in the PRISM Case Studies: Strengthening and Evaluating RHIS study, it was reported that processes for scrutiny of information accurateness and providing response on the scheduled reports submitted remained not implemented, making

it hard for staff to comprehend the significance of information collected not only to improve their own delivery but also to improve their departmental or higher level or as a whole.

Another study in Tanzania conducted by Harrison & Bakari, (2008) to review the constraints on the use of data for decision-making called for workforce enlightenment and structural guidelines to improve the use of data. Also, the study respondents mentioned high workload, absence of motivations, insufficient practical expertise, and not enough understanding about sources of data being insufficient as hindrance to health information use.

Furthermore, Health Metrics Network, (2007) wrote on elements that contribute to the empirical usage of good data based on quality as technical factors (e.g. data collection tools, processes), IT devices, data analysis, environmental, organizational and behavioural factors were certified in the Manual Framework and Standards for Country Health Information Systems.

In summation, Routine Health Information Network, (2003) in their paper Second International RHINO Workshop paper on: Improving the Quality and Use of Routine District Health Information, it was stated that routine management of evidence systems must be immersed to the lower level in order to advance the indigenous usage of information from health. Routine Health Information Network, (2003) asserted that when lower supervisors and providers of health services are involved with the design of tools for collecting and reporting data, one selected individual or group would be accountable for data at the district level, and information should be made available to all potential users of information.

2.4 Summary

Reviewed literature exposed the several issues and factors influencing the use of aggregated data and RHI, they identified to be organisational factors like organisational culture, supervision, technical factors like inadequate skills, inadequate access to equipment like computer, and behavioural factors like negative perception, attitude of health workers. Also, the literature established varied use of health data information which some sectors reporting high use and others low use.

CHAPTER THREE

METHODS

3.1. Study Design

Descriptive cross-sectional study design was employed to collect information on factors that influence aggregated data use. This design aims to describe the various determinants of routine health information (DHIMS2 Data) use among health workers using quantitative approaches of data collection methods.

3.2. Study Area

The Ga West Municipality is currently one of the 29 Metropolitan, Municipal and District Assemblies (MMDAs) in the Greater Accra Region with its capital being Amasaman (Government of Ghana, 2017). The municipality lies within latitude 50º 48^{1}North, 5º 29^{1} North and longitudes 0º 8^{1} west and 0º 30^{1} west respectively and occupies a land area of 284.01sq km. The municipality is zoned into six zonal councils namely Pokuase; Mayera, Ofankor, Ayikai Doblo, Kotoku and Amasaman (Figure 3). The population according to the 2010 census was 217,091 with a growth rate of 3.4%. Female population represents 49% of the total population whilst male population was 51%. The population is mainly concentrated along the peri-urban areas of the municipality particularly on the border with the Accra Metropolis and Ga East District (Ghana Statistical Service, 2010).

The Ga West Municipal Assembly (GWMA) is the highest administrative and political authority, which represents the central government. The General Assembly is made up of twenty-five (25) elected members and eleven (11) appointed assembly members plus the Chief Executive as an ex-officio member. The municipality has poor road infrastructure, a very important factor in the delivery of health care that makes access to health care very difficult. Women tend to be delivered at home or with Traditional Birth Attendants (TBA's) because of the poor road network (Darko, 2015).

The Municipal Health Management Team in the Municipality is responsible for delivering health service. The team is made up of Institutional Heads and sub-district heads that are responsible for delivering health services to specific areas and populations. The Municipality is divided into five sub-districts, namely Amasaman, Oduman, Kotoku, Pokuase and Ofankor. There are approximately 39 different health facilities made up of government and private facilities that provide curative and preventive health services. The Municipality have on record twenty (20) trained traditional birth attendants that provides health care in areas where needed.

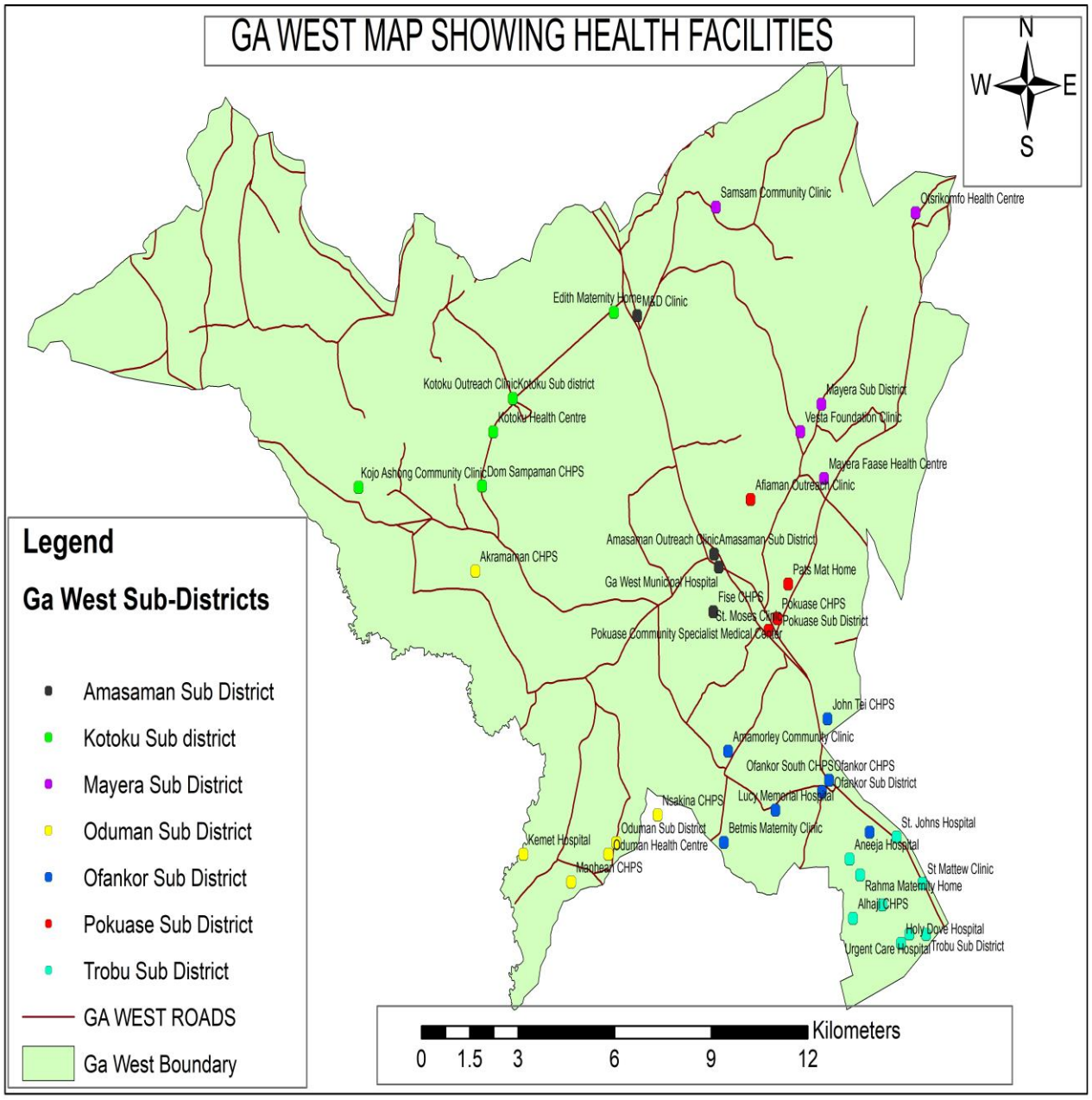


Figure 3: Map of Ga West Municipality

Table 1: Distribution of health facilities by the public and private sector

No.	Sub District	Facilities	Location	Ownership
1	Amasaman Sub District	Ga West Municipal Hospital	Amasaman	Government
2		M&D Clinic	Medie	Private
3		Shallom Maternity Home	Sapeiman	Private
4	Kotoku Sub District	Dom Sampaman CHPS	Dom Sampaman	Government
5		Edith Maternity Home	Medie	
6		Kojo Ashong Community Clinic	Kojo Ashong	Government
7		Kotoku Health Centre	Kotoku	Government
8		Ahiabukorpe CHPS	Ahiabukorpe	Government
9	Mayera Sub District	Mayera Faase Health Centre	Mayera Faase	Government
10		Otsrikomfo Health Centre	Otsrikomfo	Government
11		Samsam Community Clinic	Samsam	Government
12		Mawusi Maternity Home	Mayera	Private
13	Oduman Sub District	Akramaman CHPS	Akramaman	Government
14		Kemet Hospital	Manhaen	Private
15		Nsakina CHPS	Nsakina	Government
16		Oduman Health Centre	Oduman	Government
17		Osag Medical Center	Oshuiman	Private
18		Obeyeyie Medical Center	Obeyeyie	Private
19	Ofankor Sub District	Amamorley Community Clinic	Amamorley	Government
20		Betmis Maternity Clinic	Omanjor	Private
21		Lizzie (ga West) Maternity Home	Ofankor	Private
22		Lucy Memorial Hospital	Ofankor	Private
23		Unimed Clinic	Ofankor	Private
24	Pokuase Sub District	MAXBETH Maternity Home	Afiaman	Private
25		Pats Mat Home	Pokuase	Private
26		Pokuase Health Center	Pokuase	Government
27		St. Moses Clinic	Pokuase	Private
28		Hobem Clinic	Pokuase	Private
29		Skyview Hospital	Pokuase	Private
30		ACP Clinic	Pokuase ACP	Private
31	Trobu Sub District	Aneeja Hospital	Tantra Hill	Private
32		Holy Dove Hospital	New Achimota	Private
33		Maranatha Health Service	Tantra Hill	Private

No.	Sub District	Facilities	Location	Ownership
34		Rahma Maternity Home	Tantra Hill	Private
35		St Mattew Clinic	Mile 7	Private
36		St. John's Hospital	Tantra Hill	Private
37		Urgent Care Hospital	New Achimota	Private
38		Tantra Community Clinic	Tantra Hill	Private
39		BJ Medical Center	Alhaji	Private

3.3. Study Population

Study subjects comprised professional health workers (Physicians, Nurse/Midwife, Technical Officer, Pharmacist, Epidemiologist and Laboratory Technician) who are permanently employed with the Ghana Health Service and other private facilities in the district. These were health care providers that had regular contact with clients and often collected health data that are aggregated and analysed for health decisions on matters relating to health service delivery.

3.3.1. Inclusion Criteria

Professional health workers and managers who are permanently employed for at least one year and stationed at the District Health Directorate of the Ga West Municipality and its sub districts.

3.3.2. Exclusion Criteria

The other Staff who do not collect, process, assess and submit Routine Health Information data in this area of study and those who were sick or on-leave and could not respond to questions were also excluded.

3.4. Study Variables

Dependent Variable	Independent Variable	
Use of routine health information for decision making	Attitude	Behavioral Factors
	Perception	
	Motivation	
	Infrastructure	Organizational Factors
	Roles and Responsibilities	
	Feedbacks and meetings	
	Supervision	
	Skills and Training	Technical Factors
	Competency	
	Availability of service	

3.5. Sampling

3.5.1 Sample Size Determination

The sample size (n) was calculated using Fisher's model.

The formula used to estimate the smallest possible categorical sample size is $n = z^2pq/ d^2$

Where;

n = desired sample size,

z = z-score, usually set at 1.96 which corresponds to 95% confidence level,

p = is the prevalence of the outcome variable from literature, to be measured which is 50%

in the absence of literature of a study is a similar setting and/population

q = 1 – p and

d = permitted margin of error set by researcher (5%) = 0.05

Applying the formula, the required sample size will be $n=1.96^2 (0.5) (0.5)/0.05^2 = 384$.

Since the population is less than the target population which is 10000 which is always equivalent to 484 according to statistical rule of thumb, the final sample estimate was N= n/ {1 + (n/N)} = 384/ {1+ (384/484)} = 214.

Subcategories	**Sample Size**
• DHMT (Managers) (30)	13
• Others (454)	201
• Total Sample Size	214

3.5.2 Sampling methods

The study employed the use of multi stage sampling technique. The study was conducted in the Ga West Municipality which is made up of 7 sub districts. The entire district was divided into 8 clusters including the District Health Administration as one cluster. Considering the staff, the district health directorate staff were categorised as Managers and staff at the sub district level were classified as other staff and these included physicians, nurses/midwifes, technical officers, pharmacists, epidemiologists and laboratory technicians. Out of the Managers at the District Health Directorate a simple random sampling was applied and then 30 of them sampled. At the sub district level random sampling was applied to all the 7 samples in selecting 27 per each sub district. A list of all the 30 members of the DHMT was obtained from the Ga West District Directorate of Health Services. The names were assigned numbers from 1 – 30. Random numbers from 1 – 30 were generated and the first 13 numbers selected. From these random numbers generated, the names that match the numbers were identified and contacted for inclusion in the study. When a participant who was randomly selected declined participation, the random numbers were generated again and the first

number on the list which was not in the initial numbers chosen is then selected for inclusion until the 13 senior level managers are reached. For the other 201 participants, a list of the names of all the health care providers on the Ga West District human resource payroll was obtained. The lists from all the seven sub-districts in the district were merged in no particular order. The total number of staff (454) was the sample frame. This sample frame was divided by the desired sample size for that category (201) to obtain a sample interval of approximately three. Every third name on the merged list was then selected and compiled. These persons were then contacted for inclusion in the study. If a selected staff declined to participate in the study, the next person on the merged list was automatically selected for participation until the desired sample of at least 201 was obtained.

3.6 Data Collection Techniques/ Methods and Tools

This research adopted quantitative data collection approach. The data collection instrument used in the gathering of data was structured questionnaire by the use of OBAT tool. The OBAT tool was also used to measure the level of promotion of information culture in the study area, which is a key component to the use of routine data for decision making. In the study, the following indicators were evaluated and analysed to measure the promotion of an information culture in the study area; data quality, use of routine aggregate data (RHIS data), evidence-based decision-making, problem solving, feedback, accountability and empowerment. The questionnaire was administered by using face-to-face interview. The perceived quality of the data in the study area was determined by asking respondent's if their managers or superiors follow data quality procedures in the compilation and submission of periodic reports (e.g., monthly reports) in DHIMS2. A five-point Likert scale (from '1' being 'strongly disagree' to '5' being 'strongly agree') was used to measure the respondent's views on managers or superiors' attitude towards promoting information

culture, health care decisions, staff attitude towards the promotion of culture, and staff personal feeling towards information culture.

The study also assessed whether organizational mechanisms were in place for producing the desired results in RHIS performance. Five key areas were observed in analysing the existence of organizational mechanisms that promote RHIS performance and encourage the use of routine aggregate data for decision-making, these include; information use guidelines and strategic document, data visualization, RHIS analytic data production, feedback to health facilities and lastly, routine decision-making forums and processes.

3.7 Quality Assurance

Quality assurance procedures and precautions were undertaken to ensure the collection of data from study participants were reliable and valid. Two research assistants were selected and trained to administer the study tool. Responses that were gathered were checked for mistakes and completeness before it was finally entered into Microsoft excel for statistical analysis. Data entry validation and cleaning was done to avoid and prevent data entry errors. A pre-test of the questionnaires was also done using 10 respondents at the Amasaman Government Hospital with similar characteristics as the study sample before data collection began. Care was taken to ensure that those who took part in the pre-testing of the questionnaire were not included in the main study. These people were given branded pens as way of making it easier for them to recall that they took part in the pre-test.

3.8 Data Processing and Management

Data was gathered and entered into Microsoft Excel, double-checked and cleaned to ensure accuracy before analyses took place. In the Excel sheets used for the data entry, the cells for each column (representing the variables) were pre-formatted based on the kind of data required for that variable. This action was to ensure error detection and consistency checks as well as out-of-range data, and extreme values. Questionnaires which had some of the

observations missing were completely dropped and not included in the analysis. Methods of processing were rigorously documented to ensure the utility and integrity of the data set.

3.9 Statistical Data Analysis

The statistical analysis was done using STATA (IC) version 15.0 and Microsoft Excel software. Descriptive statistic such as percentages and frequencies were used to summarize the data. Frequencies and relative frequencies (percentages) for the various categorical variables were computed.

Cronbach's alpha is the numerical coefficient of reliability used in the study for Likert scale scoring of each domain responses from 'agree' to 'strongly agree' were considered as action point. Cronbach's alpha is used in characterising questionnaires aimed at measuring features in the affective domain (attitude, motivation and the like). The proportion of respondents for each of the responses was computed and the average score for those who selected either 'agree' or 'strongly agree' was considered for the decision point. For instance, in the field of information use of aggregate routine data (DHIMS2), the average proportion ('agree' and strongly 'agree') for management's 'use of RHIS data for service performance monitoring and target setting', staff 'use of RHIS data for day-to-day facility and district management' and 'use of RHIS data to solve common service delivery problems' and 'whether the collection of routine data is relevant or useful to respondents'.

Self-perception of competency of staff in the use of RHIS was used as a proxy to measure the capacities of staff involved in the implementation of Routine Health Information System task in relation to the aggregate data.

The study gathered data regarding respondent's perceived self-efficacy covering their ability in the specific RHIS tasks. Respondents' competence in accomplishing various RHIS activities was rated on a scale from 0–10, where 0 is "no competence" and 10 is "very strong competence". The scale was recoded as 0 – 5 'Low', 6 – 7 'Moderate' and 8 – 10 being

'High'. Respondents who therefore obtained at least 8 points in respective of any RHIS task were rated as having high competent in performing the RHIS tasks. A combination of tables, charts and percentages were used in presenting the results. Ordinal scales from individual assessments were recoded into strongly disagree, disagree; neither disagree nor agree, agree, and strongly agree.

3.10 Ethical Issues

The Ghana Health Service Ethics Review Committee (GHS-ERC) gave approval for the study with code number GHS-ERC 056/05/19. Permission was also sought from the Greater Accra Regional Health Directorate and the Ga West Municipal Health Directorate who were also adequately and appropriately informed about the study. The objectives and rationale for this study was clearly explained to all the participants and their consent was sought before including them in the study.

Confidentiality of identity and information, voluntary participation and option of withdrawal and benefits and potential risks were explained to all participants.

Participants were also assured of privacy and confidentiality, which were adhered to and maintained at all periods in the entire duration of the study. Information and data collected are under lock and key and are made available only to the study's principal investigator and supervisor.

3.11 **Conflict Of Interest**

The researcher declares no conflict of interest in this study.

3.12 Limitation of the Study

The study findings may not be generalized to the entire Greater Accra region as the study was only conducted among participants working in the Ga West Municipality.

CHAPTER FOUR

RESULTS

4.1 Socio-Demographic Characteristics of Respondents

The results regarding the respondents' characteristics as shown in Table 2 showed that the majority 62.1% (133/214) of respondents were females and all respondents (100%) had at least Post-secondary or higher education. With regards to distribution of the respondents by ownership of the facility, the government facilities were the majority (67.8%, 145/214) and majority (88.8%) of the facilities were located in the peri-urban areas. Most of the respondents (42.1%) were nurses/midwives. The study revealed that 39.3% of the respondents have been in employment between 1-5years and 38.3% have been employed for 6-10 years (Table 2).

On RHIS training, it was established that the majority (69.6%) of respondents never received any formal training, while those receiving such formal training (38.4%) were largely in the area of data management (data collection, transmission, storage and/or data quality assurance) (Table 2). Only 18.5% of the respondents who received formal RHIS training indicated they were trained in data analysis and use.

The average score for perceived quality of data from the perspective of staff other than upper management was 79.0%, which is also one of the highest performance areas in the study area in promoting information culture. Feedback as a measure of the desire of managers in the study area to involve staff in in the promotion of information culture was 77.5%.

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Table 2: Background Characteristics RHIS training of Study participants

Variable	Frequency	Percent
Sex (n=214)		
Female	133	62.1
Male	81	37.9
Educational level of respondents (n=214)		
Post -secondary or higher	214	100.0
Facility location (n=214)		
Peri-urban	190	88.8
Rural	24	11.2
Job Title (n=214)		
Epidemiologist	5	2.3
Laboratory	25	11.7
Nurses/Midwife	90	42.1
Pharmacist	10	4.7
Physician	9	4.2
Technician	14	6.5
Other staff	61	28.5
Number of years of employment (n=214)		
Less than 1 year	10	4.7
1-5 years	84	39.3
6-10 years	82	38.3
11-20 years	26	12.1
Above 20 years	12	5.6
Number of years of working with RHIS Data (n=214)		
Less than 1 year	23	10.7
1-5 years	106	49.5
6-10 years	67	31.3
11-20 years	12	5.6
Above 20 years	6	2.9
Facility Ownership (n=214)		
Government	145	67.8
Private	69	32.2
Ever received formal RHIS training (n=214)		
Never	149	69.6
Ever	65	30.4
Type of RHIS training received (n=65)		
Data analysis and use	21	32.3
Health statistics	21	32.3
ICT or data management/analysis applications	18	27.7
Other training	5	7.7

4.2 Culture of information on RHIS in the Ga West District

Data gathered from the study revealed that promotion of data quality (84.1%), use of routine aggregate data from DHIMS2 for decision making (79.0%), and feedback (77.5%) were areas that scored high agreement levels (Figure 3). Evidence-based Decision-making (64.8%), problem-solving (57.0%), responsibility (65.8%), and empowerment and accountability (50.9%) were the low perceived areas when it comes to promotion of Information culture in the study area.

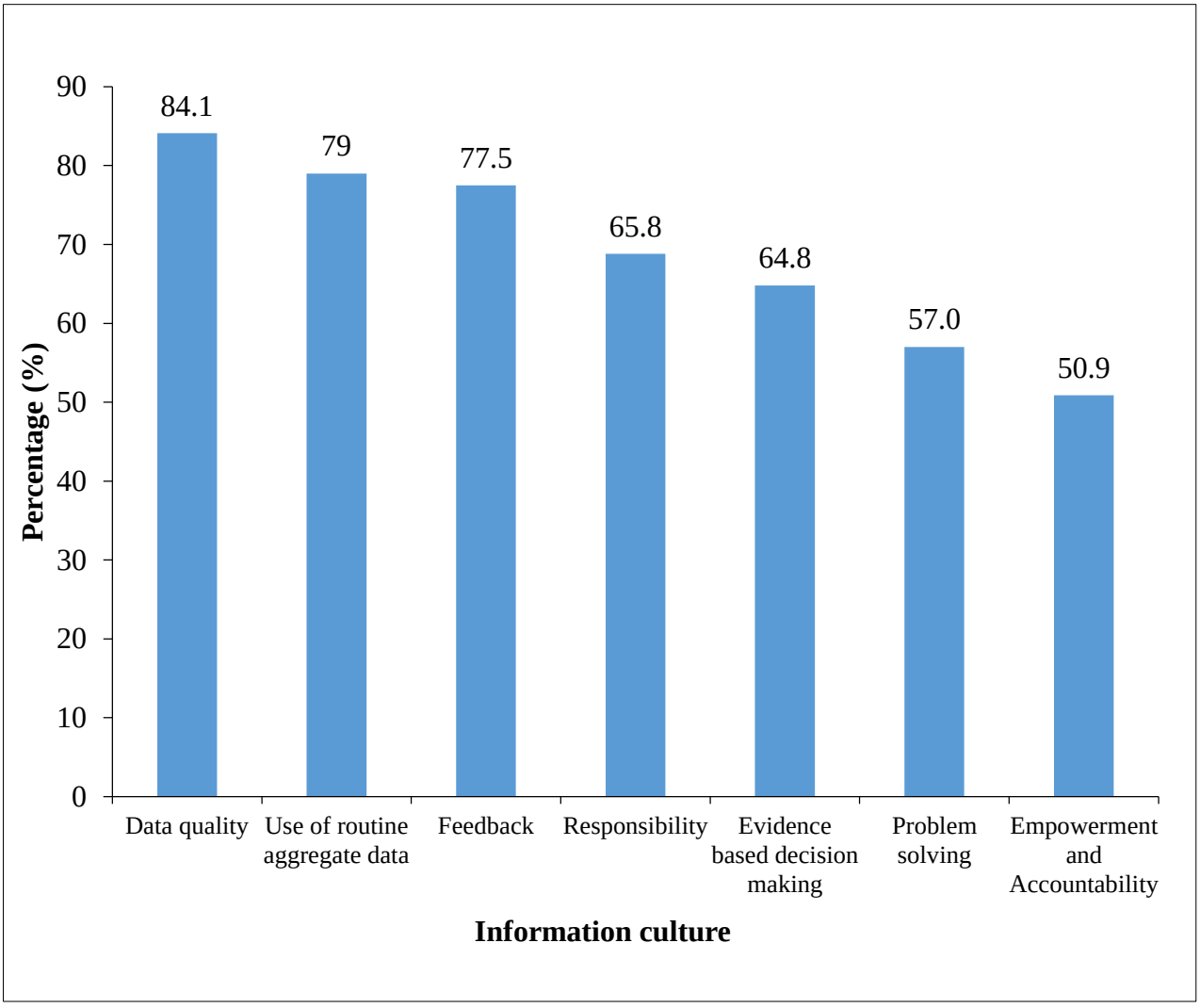

Figure 4: Promotion of Information Culture in the Ga West Municipality

Table 3: Promotion and existence of information culture on RHIS in Ga West District

Indicator	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	No. of Resp.
Basis for Health Care Decisions						
Personal preference of decision-makers	10.7	38.3	17.3	29.4	4.3	214
Superiors' directives	0	15	12.6	69.6	2.8	214
Evidence/facts/data	7	0.9	15.9	52.3	23.9	214
History (e.g., what was done last year)	5.1	7.5	14	52.8	20.6	214
Funding directives from higher levels	4.2	9.3	17.8	51.9	16.8	214
Managers or superiors' attitude towards promoting information Culture						
Seek input from relevant staff	7.0	8.9	6.5	59.3	18.3	214
Emphasize that data quality procedures be followed	0.0	5.1	10.7	56.1	28.1	214
Use RHIS data for service performance monitoring and target setting	3.3	0.0	15	64.5	17.2	214
Staff Attitude towards the promotion of culture						
Complete RHIS tasks (reporting, processing/aggregation, and/or analysis)	0.0	16.4	24.8	43.0	15.8	214
Display commitment to the RHIS mission	0.0	3.7	30.8	47.7	17.8	214
Pursue national targets and set feasible local targets for essential service performance	0.0	9.8	18.7	57.9	13.6	214
Feel "personal responsibility" for failing to reach performance targets	1.8	17.3	29.9	38.8	12.2	214
Use RHIS data for day-to-day management of the facility and district	0.0	0.0	20.6	65.0	14.4	214
Use RHIS data to solve common problems in service delivery	1.4	3.3	22.4	54.2	18.7	214
Prepare data visuals showing progress toward targets	7.0	1.9	22.9	51.4	16.8	214
Are able to make decisions appropriate to their job descriptions in response to the findings of data analysis	0.0	1.9	15.9	65.0	17.2	214
Are held accountable for poor performance	0.0	7.0	25.7	47.2	20.1	214
Admit mistakes if/when they occur and take corrective action	0.9	4.2	27.6	41.1	26.2	214
Staff Personal Feeling towards Information Culture						
I feel discouraged when the data that I collect/record are not used for taking action	0.5	2.8	17.8	42.5	36.4	214
I find collecting/recording data to be tedious (i.e., repetitive or duplicative)	1.9	27.6	21.0	45.3	4.2	214
I find that the data that I collect burdens my workload, making it difficult for me to complete my other duties	3.3	33.6	15.9	39.3	7.9	214
Collecting data is meaningful/useful for me	0.9	3.3	14.0	44.9	36.9	214
I feel that the data I collect are important for monitoring the performance of the health services provided at my facility/unit	0.0	6.5	4.2	48.6	40.7	214

Table 4: Cronbach's alpha Summary

Domain/Indicator	Cronbach's alpha	Percentage
Basis for Health Care Decisions	0.71	71%
Managers or superiors' attitude towards promoting information culture	0.24	24%
Staff Attitude towards the promotion of information culture	0.81	81%
Staff Personal feelings towards information culture	0.50	50%

The majority (69.6%) of respondents agreed that superiors' directives were the basis for health care decisions while most (23.9%) strongly agreed that evidence/facts/data was the basis of health care decisions (Table 3).

With regard to managers' attitude towards the promotion of information culture, more than two-thirds of the respondents (64.5%) agreed that managers or superiors' use RHIS data for service performance monitoring and target setting. Also, 59.3% of the respondents agreed that managers seek input from relevant staff while 56.1% indicated they agreed that mangers and superiors emphasise that data quality procedures be followed.

In relation to staff attitude towards the promotion of information culture, 65.0% of respondents agreed that they are able to make decisions appropriate to their job descriptions in response to findings of data analysis. Again, most of the respondents agreed that they are held responsible for poor performance (47.2%) and admit mistakes when they occur and take corrective action (41.1%) (Table 3).

With regard to staff feeling towards information culture, 42.5% of respondents agreed that they feel discouraged when data collected are not used for taking action (Table 3). Similarly, 45.3% of the respondents, however, find data collection to be tedious while 39.3% agreed that data collection puts additional workload on them and prevent them from completing other tasks. Most of the respondents also agreed that data collection was meaningful to them and important for monitoring of the health services at their facilities (Table 3).

In table 4, the Cronbach's alpha assessed internal consistency and reliability of each domain of the Likert scale questions from the tool. As shown above (table 4), the reliability of the basis of health care decisions is 71%, while the staff attitude towards the promotion of information culture is 81% which shows the consistency of the domain is excellent and reliable.

Also in the result above it was shown that Managers or superiors' attitude towards the promotion of information culture was 24% which shows a very low level of consistency of the test. Lastly, staff personal feeling towards information culture was 50% reliable and consistent which is intermediate.

4.3 Organizational mechanisms, commitment and support of upper management

From the study data as presented in Table 5, it was observed that copies of information use guidelines and strategic document were available in 66.7% of facilities including the District Health Directorate that were involved in the study. Paper or electronic copies of data visuals were observed at the district offices and in all the health facilities visited.

It was also observed that the district health directorate and facilities have access to analysed RHIS data (e.g., summary tables, charts, maps) as well as produce report or bulletin (annual, quarterly, etc.) based on an analysis of RHIS data from DHIMS2. Evidence of the provision of feedback to health facilities was also visible in the past three months preceding the study in the area of data quality (including data accuracy, reporting timeliness, and/or report completeness).

The study area also recorded the availability of performance monitoring or management teams in place and have routine team meetings to discuss performance monitoring.

Table 5: Organisational commitment and support for enhancing RHIS in Ga West District

Variable	Frequency	Percent
Written guidelines on RHIS information display, use, and feedback (n=18)		
Yes, but copy not available	6	33.3
Yes, copy available	12	66.7
Copies of the national RHIS strategic plans, district annual plans, and/or district performance targets (n=18)		
Yes, copy available at the district office	18	100
Availability of data visuals (graphs, tables, maps, etc.) showing achievements toward targets (indicators, geographic and/or temporal trends, and situation data (n=18)		
Yes, paper or electronic copies of data visuals observed at the district offices	18	100
Facility/Facility access to analysed RHIS data (n=18)		
Yes, observed electronic	3	16.7
Yes, observed paper-based	15	83.3
Facility/BMC report or bulletin (annual, quarterly, etc.) based on an analysis of RHIS data (n=18)		
Yes, observed	15	83.3
District feedback reports to health facilities using RHIS information in the past three months (n=18)		
Yes, Observed	15	83.3
Feedback on data quality (including data accuracy, reporting timeliness, and/or report completeness) (n=18)		
Yes, Observed	18	100
Feedback on service performance based on reported RHIS data (e.g., appreciation/acknowledgment of good performance; resource allocation/mobilization) (n=18)		
Yes observed	15	83.3
Availability of facility/BMC performance monitoring or management team (n=18)		
Yes	15	83.3
Frequency of performance review/management meetings (n=18)		
Monthly	15	83.3
Weekly	3	16.7
How many times did the performance monitoring/ management meetings take place during the past three months (n=18)		
One time	3	16.7
Three times	3	16.7
Four times	12	66.7

4.4 Perceived Self-Efficacy regarding Implementation of RHIS Task

Forty-eight percent of the respondents expressed high level of perceived competence to check RHIS data accuracy (Table 6). More than a half of the respondents (54.2%) also had high perceived competence to calculate percentages and rates accurately using the RHIS data.

Similarly, 53.2% were rated high perceived competence in their ability to explain the implications of the results of data analysis, 57.0% with the ability to use data for identifying service performance gaps and setting performance targets. In like manner, 53.8% had high perceived competence to use RHIS data for operational or managerial decisions such as service delivery, budget allocation, distribution of roles and responsibilities among others (Table 6).

Table 6: Self-perception of competency by RHIS Tasks

	Level of Perceived competence		
Variable	**Low (%)**	**Moderate (%)**	**High (%)**
Ability to check data accuracy	22.9	29.0	48.1
Ability to calculate percentages/rates correctly	23.8	22.0	54.2
Ability to explain the implication of the results of data analysis	15.0	31.8	53.2
Ability to use data for identifying service performance gaps and setting performance targets	19.2	23.8	57.0
Ability to use data for making operational/management decisions (e.g., for service delivery, budget allocation, distribution of roles and responsibilities	14.0	32.2	53.8

4.5 Level of use of RHIS data in the Ga West District

More than two-third (64.5%) of the respondents agreed that management use RHIS data for monitoring and target setting while 17.2% strongly agreed (Table 2). Furthermore, 65.0% agreed that staff use RHIS data for day-to-day management of the facilities while 14.4% strongly agreed. Fifty-four percent of respondents also indicated that they agreed that staff and management use RHIS data to solve problems in service delivery (Table 3). On average, 78.0% of respondents ('agree'+ 'strongly agree') indicated the use of data in the above three areas (monitoring and target setting, day-to-day management and solve problems).

CHAPTER FIVE

DISCUSSION

5.1 Introduction

The current study examined the use of aggregate data for district-level health decision-making in the Ga West Municipality. The study also assessed the extent of existence of information culture, organisational mechanisms, commitment and support for enhancing the use of routine aggregate data in the district as well as self-perceived competence of staff in performing RHIS tasks in the district.

5.1.1 Use of routine aggregate data for decision making

The study revealed 78.0% of respondents use routine health information generated for decision making among the health staff in Ga West Municipality of the Greater Accra region. This finding is in variance with (Hotchkiss, Diana, & Foreit, 2012) which established that the data collectors and lower level health management at the health facility level or district use little routine health information. The main areas of information use from the study were the use of aggregate data for service performance monitoring and target setting (81.8%), for day-to-day facility and district management (79.5%), to solve common service delivery problems (72.9%) and whether respondents feel collecting of routine data is meaningful/useful to them (81.8). This is consistent with the current practice whereby facilities and districts develop yearly plans/budgets and are entreated to use previous year data as their baseline information during the planning process. These findings are similar to that of Teresa Harrison & Nutley, (2010) which showed that most staff at district level reported using routine health information for program-related management especially planning, monitoring, medical supply and drug management. When everyone asks for facts and clear data to form the basis for decision-making, information culture is achieved

(Nutley, Gnassou, Traore, Bosso, & Mullen, 2014). Thus, information that is regularly used by the institutions that generate such data is characterized by a positive information culture.

5.1.2 Organizational mechanisms, commitment and support of upper management

The organization may promote or discourage information culture. Information culture is characterized by the use of information anytime decisions are being made (Aqil et al., 2009; Nutley et al., 2012). The results of the study revealed that 76.1% of the respondents agreed that health care decisions were made based on evidence/facts/data, 73.4% on history, 68.7% on Funding directives form higher levels 72.4% on Superior's directives and 33.6% on the personal preference of the decision-makers.

The majority (77.5%) of the respondents revealed that managers seek input from relevant staff in promoting information culture as well as sending feedback on data quality and performance achievements to the lower level, all geared towards promoting the use of routine data for decision making. When feedback is given to data collectors, they feel that their collection of data contribute to improvements and changes that benefit both themselves and patients and create ownership of the data (Health Metrics Network, 2007).

It was also observed that the district health directorate and facilities have access to analysed RHIS data (e.g., summary tables, charts, maps) as well as produce report or bulletin (annual, quarterly, etc.) based on analysis of RHIS data from DHIMS2. Evidence of the provision of feedback to health facilities was also visible in the past three months preceding the study in the area of data quality (including data accuracy, reporting timeliness, and/or report completeness) and service performance

The OBAT tool identifies a number of technical issues that may affect the use of health information. Technical factors can determine the use of health information for both the health care provider and the system. These include underlying determinants such as, training

in information areas, confidence in undertaking health information management tasks and health worker actual competence.

The study revealed that the majority (69.6%) of respondents never received any formal training, while those who received such formal training were largely (32.3%) in data management (data collection, transmission, storage and/or data quality assurance) as well as health statistics. A little above a quarter (27.7%) of the respondents who received formal RHIS training indicated they were trained in ICT or data management/analysis applications. According to Harrison & Bakari, (2008) inadequate analytical and data usage skills were a barrier to routine decision-making use of health information.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusions

The study sought to explore the use of information and the extent to which culture of information exists in the district, the commitment and support of upper management in enhancing the information system and also to assess whether mechanisms are in place for producing the desired results.

The study revealed that use of aggregate data for decision making among the health staff in Ga West Municipality of the Greater Accra region was high with the majority using it in planning, monitoring and evaluation and supply and drug management. It was also revealed from the study that high number of respondents agreed that the basis of management decisions in the study area is based on evidence or available data and also superior's directives and mangers mostly sought input from relevant staff.

Both management and staff promoted the culture of information in the district. Even though the promotion of Information culture in the study area is high, it still needs improvement as some of the decisions were based on personal liking, supervisor directives, funding directives and not on evidence/facts obtained from the routine data. Most of the staff felt data collection was important to them and used for monitoring health service performance. The level of training in RHIS activities among the respondents was very low which is woefully inadequate.

There was adequate organisational support and commitment to enhance RHIS data use. Most facilities had written guidelines on RHIS information display and had strategic plans, performance visuals displayed, and access to analysed RHIS data. Feedback on performance

and data quality was mostly given. The facilities held regular management meetings at least four times in the last 3 months preceding the study.

This is reflected in the number of respondents being able to perceive an efficacy level in the performance of RHIS task. The staff that had a problem-solving attitude were low according to the study.

6.2 Recommendations

In order to strengthen the use of aggregate data for decision making in the Ga West Municipality, the District Health Directorate liaising with the Ghana Health Service headquarters and Ministry of Health should apply appropriate and effective strategies that will promote and monitor the consistent use of routine aggregate data for decision;

1. The Ministry of Health should help in the creating organizational culture through increased demand for and use of routine health information for evidence-based decision making in all aspects of service delivery in the Municipality.
2. The Ministry of Health should organize continuous training to health workers with specific focus on use of routine health information and its significance through on-job trainings, mentorship for those already working and for sustainability, strengthening the curriculum in health training institutions through integrating health management information systems module in the training of all cadre of health staff.
3. The Government should strengthen organizational resources that supports information use at all levels through the provision of tools, computer, skilled personnel, automation, connectivity, complemented by targeted regular support supervision, review meetings and job descriptions outlining information roles and responsibilities

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APPENDICES

Appendix I: PARTICIPANT INFORMATION SHEET

The information sheet provides details about the research for participants to make an informed decision of whether to participate in the study or not. It outlines the nature of the research, what it involves, risks, benefits and compensation

i. **STUDY TITLE**: Use of Aggregate Data for Health Decision Making at District Level: Case Study of Ga West Municipal of the Greater Accra region

ii. **Institutional Affiliation**: School of Public Health, College of Health Sciences; University of Ghana, Legon.

iii. **Introduction**: The Principal Investigator is Ms. Rabiatu Alawiye, a student of the School of Public Health, University of Ghana. She is undertaking a study on the "*Use of Aggregate Data for Health decision Making at the District level: A Case Study of Ga West Municipal*" as part of a partial requirement for the award of Master of Science Public Health Monitoring and Evaluation (MSc. PH. M&E) Degree.

iv. **Background and Purpose of research**: Sound and reliable information is the basis of decision-making across all health system building blocks, and is critical for health system policy development and implementation, governance and regulation, health research, human resources development, health education and training, service delivery and financing. In less endowed and underdeveloped populations, the use of local data for health-system planning and decision-making is often limited to very few decisions.

Based on the above, I would like to conduct a study to assess the use of the data collected in facilities and how it informs decisions in the district level.

v. **Nature of study:** I am conducting a study to assess the use of aggregate data for health decision making at the district level and we are collecting information in Ga West Municipality in relation to this. Your facility has been selected to participate in this study by means of a random selection or chance selection process, much like taking a cup of beans from a bowl. You have been selected for interview because you your district has been picked.

vi. **Participant's Involvement:**

- **Duration /what is involved:** I would like to ask you a few questions about your job and role on the DHIMS 2 if I may, but you can refuse to answer any question I ask. The interview will last approximately 1 hour.
- **Potential Risks**: There will be no risk to you or your job if you participate I this interview.

Benefits: The findings from this study will help understand and appreciate the use of aggregate data for decision making at the lower level and its impact on service delivery.

- **Costs:** No cost will be incurred by you in respect to this study.
- **Compensation/Payment:** Participants will not be compensated for their participation on this study.
- **Confidentiality:** The information collected from you will be known to only the researcher and the supervisor and will be used for its intended purposes and will be stored under lock and key in a cabinet.
- **Voluntary participation/withdrawal**: Your participation in this survey is completely voluntary and you may terminate the interview anytime. You can also refuse to participate in the study entirely.
- **Outcome and Feedback**: Information collected from this study will be available at your district health office for all participants and the Ghana health Service Ethical Review Committee office at Adabraka.
- **Funding Information**: Self-funded.
- **Sharing of Participants Information/Data**: The data that will be generated from the study will be shared with School of Public Health for academic purposes, Ghana Health Service Ethical Review Committee and the Ga West Municipality which will serve as a reference point for all participants.

In case you need any further clarification on the research you can contact the following:

CONTACTS

1. *NAME: Ms. Rabiatu Alawiye*

   ADDRESS: Health Planning and Policy Management Department,

   School of Public Health, College of Health Sciences

   University of Ghana, Legon

2. *NAME: Dr. Samuel Dery*

   ADDRESS: Biostatistics Department, School of Public Health,

   College of Health Sciences, University of Ghana, Legon

For Ethical Issues please contact;

3. *NAME: Ms. Hannah Frimpong*
   ADDRESS: Ghana Health Service, Ethics Review Committee,
   Research and Development Division
   PHONE NUMBER: +233-507041223

Appendix II: STATEMENT OF PERSON GIVING CONSENT

STUDY TITLE: *Use of Aggregate Data for Health Decision Making at District Level: Case Study of Ga West Municipal of the Greater Accra region.*

PARTICIPANT STATEMENT

I recognize that I have read and understood the purpose and content of the Participants ' Information Sheet in a language I understand (English) satisfactorily explained to me. I fully understand the content and any potential implications and my right to change my mind (i.e. withdrawal from research) even after I signed this form.

NAME:……

DATE:……

SIGNATURE/THUMBPRINT:……

INVESTIGATOR STATEMENT AND SIGNATURE

I certify that the individual whose signature appears above has been explained the risk and benefits of taking part in this study.

NAME OF THE RESEARCHER:……

SIGNATURE:……

DATE:……

Appendix III: OBAT TOOL

Organizational and Behavioural Assessment Tool

FACILITY IDENTIFICATION [Valid for facility types 1-5]		
OBAT_105f	Region/state/province *Enter the alphanumeric code that identifies this level.*	☐☐
OBAT_106f	District *Enter the alphanumeric code that identifies this district.*	☐☐
OBAT_107f	Health facility number *Enter a 5-digit unit number. Include leading zeros.*	☐☐☐☐☐
OBAT_108f	Health facility name	
OBAT_109f	Location of the unit (Town/city/village)	
OBAT_110f	Urban/rural	1. Urban 2. Rural
OBAT_111f	Managing authority	1. Government/public 2. NGO/not-for-profit 3. Private-for-profit 4. Mission/faith-based/CBO 96. Other (specify) _____

Part 1. For Staff and Management at All Levels

INTRODUCTION		
I have read and understood the information given to me on this research. I know that my participation is voluntarily and that I can refuse to answer any question if I am not comfortable with i.e. have the right to end the interview at any time. I have enough information about the study aim, procedure, potential risk and benefits to make a decision that I want to participate in this study. I have been offered a copy of this information and consent form to keep for myself.		
OBAT_112	Survey start time (Use the 24-hour clock system, e.g., 14:30)	☐☐ :
SECTION 1.1: RESPONDENT BACKGROUND		
DD1	Current job title **(CIRCLE ANSWER)** *(Country-specific: adapt to the local country context and health system structure)*	1. District Director of Health Service 2. District Health Information Officer 3. Facility in-charge 96. Other (specify) _____
DD2	Sex	1. Male 2. Female
DD3a	Highest level of education achieved **(CIRCLE ONE ANSWER)**	1. None 2. Primary/Elementary 3. Secondary/High School 4. Post-secondary or higher
DD3b	If you received formal medical training, specify what type **(CIRCLE ALL THAT APPLY)**	1. Physician 2. Nurse/Midwife 3. Pharmacist 4. Epidemiologist 5. Laboratory 6. Technician 96. Other (specify) _____
DD4a	Number of years of employment (not just in current role)	☐☐
DD4b	Number of years working with health data or RHIS (not just in current role)	☐☐
DD5a	Have you ever received formal RHIS training?	1. Yes 2. No → **Go to Section 1.2**
DD5b	If *yes*, what type of formal RHIS training have you received in the past?	1. Health statistics

	(CIRCLE ALL THAT APPLY)	2. RHIS data management (data collection, transmission, storage, and/or data quality assurance) 3. Data analysis and use 4. Gender or gender M&E 5. ICT or data management/analysis applications 96. Other (specify)_____
DD5c	Did you receive training in RHIS-related activities in the past year?	1. Yes 2. No

SECTION 1.2: PROMOTION OF INFORMATION CULTURE

We would like to know your opinion (how strongly you agree or disagree) regarding certain aspects of the RHIS in (*COUNTRY*). There is no right or wrong answer, only an expression of your opinion based on a scale.

The scale assesses the intensity of your belief and ranges from "strongly disagree" (score of 1) to "strongly agree" (score of 5).

This information will remain confidential and will not be shared with anyone, except presented as an aggregated data report. Please be frank and choose your answers honestly.

Strongly disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree
1	2	3	4	5

To what extent, do you agree with the following statements, on a scale of 1-5?

Number	In the health department, decisions are based on:	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
D1	Personal preference of decision makers	1	2	3	4	5
D2	Superiors' directives	1	2	3	4	5
D3	Evidence/facts/data	1	2	3	4	5
D4	History (e.g., what was done last year)	1	2	3	4	5
D5	Funding directives from higher levels	1	2	3	4	5

To what extent, do you agree with the following statements, on a scale of 1-5?

Number	**In the health department, superiors (managers or higher-level supervisors):**	**Strongly disagree**	**Disagree**	**Neither disagree nor agree**	**Agree**	**Strongly agree**
S1	Seek input from relevant staff	1	2	3	4	5
S2	Emphasize that data quality procedures be followed in the compilation and submission of periodic reports (e.g., monthly reports)	1	2	3	4	5
S4	Use RHIS data for service performance monitoring and target setting	1	2	3	4	5

To what extent, do you agree with the following statements, on a scale of 1-5?

Number	**In the health department, staff:**	**Strongly disagree**	**Disagree**	**Neither disagree nor agree**	**Agree**	**Strongly agree**
P1	Complete RHIS tasks (reporting, processing/aggregation, and/or analysis) in a timely manner (i.e., meet appropriate deadlines)	1	2	3	4	5
P2	Display commitment to the RHIS mission (i.e., to generate and use good-quality—accurate, complete, and timely—data for evidence-based decision making)	1	2	3	4	5
P3	Pursue national targets and set feasible local targets for essential service performance	1	2	3	4	5
P4	Feel "personal responsibility" for failing to reach performance targets	1	2	3	4	5
P5	Use RHIS data for day-to-day management of the facility and district (e.g., service delivery, financial, commodities, and human resource management)	1	2	3	4	5
P6	Use RHIS data to solve common problems in service delivery	1	2	3	4	5

P7	Prepare data visuals (graphs, tables, maps, etc.) showing progress toward targets (indicators, geographic and/or temporal trends, or situation data)	1	2	3	4	5
P8	Are able to make decisions appropriate to their job descriptions in response to the findings of data analysis (e.g., changes in service delivery or management practices)	1	2	3	4	5
P9	Are held accountable for poor performance (e.g., failure to meet reporting deadlines)	1	2	3	4	5
P10	Admit mistakes if/when they occur and take corrective action	1	2	3	4	5

To what extent, do you agree with the following statements, on a scale of 1-5?

Number	**Personal feelings:**	**Strongly disagree**	**Disagree**	**Neither disagree nor agree**	**Agree**	**Strongly agree**
BC1	I feel discouraged when the data that I collect/record are not used for taking action (either for monitoring or decision making)	1	2	3	4	5
BC2	I find collecting/recording data to be tedious (i.e., repetitive or duplicative)	1	2	3	4	5
BC3	I find that the data that I collect burdens my workload, making it difficult for me to complete my other duties	1	2	3	4	5
BC4	Collecting data is meaningful/useful for me	1	2	3	4	5
BC5	I feel that the data I collect are important for monitoring the performance of the health services provided at my facility/unit	1	2	3	4	5

SECTION 1.3: SELF-PERCEPTION OF COMPETENCY TO PERFORM RHIS TASKS

This part of the questionnaire is about how you perceive your competence in performing tasks related to health information systems. A high perception of competence suggests that the person can perform the task, while a low perception of competence could indicate a need for improvement or training. We are interested in knowing how competent <u>you</u> feel in performing RHIS-related tasks. Please be frank and rate your competence honestly. **Please rate your competence in accomplishing various RHIS activities on a scale from 0–10, where 0 is "no competence" and 10 is "very strong competence".**												
Rate your competence in accomplishing the following RHIS activities/tasks on a scale from 0 to 10:												
SE1	I can check data accuracy	0	1	2	3	4	5	6	7	8	9	10
SE2	I can calculate percentages/rates correctly	0	1	2	3	4	5	6	7	8	9	10
SE3	I can explain the implication of the results of data analysis	0	1	2	3	4	5	6	7	8	9	10
SE4	I can use data for identifying service performance gaps and setting performance targets	0	1	2	3	4	5	6	7	8	9	10
SE5	I can use data for making operational/management decisions (e.g., for service delivery, budget allocation, distribution of roles and responsibilities, staff assignment, and logistics distribution)	0	1	2	3	4	5	6	7	8	9	10

Part 2. Use of Information: District Assessment Form

INFORMATION USE GUIDELINES AND STRATEGIC DOCUMENTS		
DU_001	Are there any written guidelines on RHIS information display, use, and feedback? **(OBSERVE)**	1. Yes, copy available at the district office 2. Yes, but copy not available at the district office 3. No
DU_002	Does the district office have copies of the national RHIS strategic plans, district annual plans, and/or district performance targets? **(OBSERVE)**	1. Yes, copy available at the district office 2. Yes, but copy not available at the district office 3. No
DATA VISUALIZATION		
DU_003	Does the district office prepare data visuals (graphs, tables, maps, etc.) showing achievements toward targets (indicators, geographic and/or temporal trends, and situation data)? **(OBSERVE)**	1. Yes, paper or electronic copies of data visuals observed at the district offices 2. No → **Go to DU_005**
RHIS ANALYTIC REPORT PRODUCTION		
DU_004	Does the district have access to analysed RHIS data (e.g., summary tables, charts, maps)? **(OBSERVE)**	1. Yes, observed paper-based 2. Yes, observed electronic 3. No
DU_005	Does the district office produce any report or bulletin (annual, quarterly, etc.) based on an analysis of RHIS data? **(OBSERVE)** (Excluding the monthly summary/aggregate reports submitted to the higher level)	1. Yes, observed 2. No
FEEDBACK TO HEALTH FACILITIES		
DU_006	Did the district send feedback reports using RHIS information to health facilities in the past three months? **(OBSERVE THE REPORT AND CHECK THE DATE)**	1. Yes, observed 2. No → **Go to DU_008**
DU_007	If yes, indicate the types of feedback reports:	
	1. Feedback on data quality (including data accuracy, reporting timeliness, and/or report completeness) (**OBSERVE)**	1. Yes, observed 2. No
	2. Feedback on service performance based on reported RHIS data (e.g., appreciation/acknowledgement of good performance; resource allocation/mobilization) **(OBSERVE)**	1. Yes, observed 2. No

ROUTINE DECISION-MAKING FORUMS AND PROCESSES AT THE DISTRICT OFFICE		
DU_08	Does the district have a performance monitoring or management team?	1. Yes 2. No
DU_09	Does the district have routine team meetings to discuss performance monitoring and management?	1. Yes 2. No → **Go to DU_020**
DU_010	If *yes*, how often are the performance review/management meetings supposed to take place?	1. Weekly 2. Monthly 3. Quarterly 4. Biannually 5. Annually 6. No schedule
DU_011	How many times did the performance monitoring/ management meetings take place during the past three months?	1. More than four times 2. Four times 3. Three times 4. Two times 5. One time 6. Not once
DU_012	Were minutes of the performance monitoring/management meetings maintained for the three review months from _____ to _____? **(OBSERVE)**	1. Yes 2. No → **Go to DU_020**
DU_013	If *yes*, please check the performance monitoring/management meeting records for the review months and see if the following topics were discussed.	
A	Did they have any discussions on RHIS management, such as data quality, completeness, or timeliness of reporting? **(OBSERVE)**	1. Yes 2. No
B	If *yes*, have they made any decisions based on the discussions of RHIS-related issues (including no interventions required at this time)?	1. Yes 2. No
C	If *yes*, has any follow-up action taken place on the decisions made during the previous meetings on RHIS-related issues (e.g., referring RHIS-related issues/problems for solution to the higher level)?	1. Yes 2. No

THANK YOU.

Appendix IV: Ethical Clearance

GHANA HEALTH SERVICE ETHICS REVIEW COMMITTEE

In case of reply the number and date of this Letter should be quoted.

MyRef. GHS/RDD/ERC/Admin/App/19/199
Your Ref. No.

Research & Development Division
Ghana Health Service
P. O. Box MB 190
Accra
GPS Address: GA-050-3303
Tel: +233-302-681109
Fax + 233-302-685424
Email: ghserc@gmail.com
19th June, 2019

Rabiatu Alawiye
University of Ghana
School of Public Health
Legon

The Ghana Health Service Ethics Review Committee has reviewed and given approval for the implementation of your Study Protocol.

GHS-ERC Number	**GHS-ERC 056/05/19**
Project Title	Use of Aggregate Data for Health Decision Making at District level: Case study of Ga West District of the Greater Accra Region
Approval Date	19th June, 2019
Expiry Date	18th June, 2020
GHS-ERC Decision	**Approved**

This approval requires the following from the Principal Investigator

- Submission of yearly progress report of the study to the Ethics Review Committee (ERC)
- Renewal of ethical approval if the study lasts for more than 12 months,
- Reporting of all serious adverse events related to this study to the ERC within three days verbally and seven days in writing.
- Submission of a final report after completion of the study
- Informing ERC if study cannot be implemented or is discontinued and reasons why
- Informing the ERC and your sponsor (where applicable) before any publication of the research findings.
- Please note that any modification of the study without ERC approval of the amendment is invalid.

The ERC may observe or cause to be observed procedures and records of the study during and after implementation.

Kindly quote the protocol identification number in all future correspondence in relation to this approved protocol

SIGNED.....
Dr. Cynthia Bannerman
(GHS-ERC CHAIRPERSON)

Cc: The Director, Research & Development Division, Ghana Health Service, Accra