UNIVERSITY OF CAPE COAST

EVALUATION OF COMMUNITY-BASED DISEASE SURVEILLANCE SYSTEM IN THE CENTRAL REGION OF GHANA

BENJAMIN ADJEI

2024

UNIVERSITY OF CAPE COAST

EVALUATION OF COMMUNITY-BASED DISEASE SURVEILLANCE SYSTEM IN THE CENTRAL REGION OF GHANA

BY

BENJAMIN ADJEI

Thesis submitted to the Department of Health, Physical Education and Recreation of the Faculty of Science and Technology Education, College of Education Studies, University of Cape Coast, in partial fulfilment of the requirements for the award of Doctor of Philosophy Degree in Health Promotion (Community Health Promotion)

FEBRUARY 2024

DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature: …… Date: ……

Name: Benjamin Adjei

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor's Signature: …… Date……

Name: Prof. Joseph Kwame Mintah

Co-Supervisor's Signature: ……. Date: ……

Name: Dr. Thomas Hormenu

ABSTRACT

The study sought to evaluate the community-based surveillance (CBS) system in the Central Region of Ghana. A mixed-method approach was used for the study. Questionnaires were used to assess CBSVs and focal persons quantitatively. A total of 1381 communities were accessed and out of these, 898 had CBSVs which they were interviewed. Also, the performance of 477 focal persons from Community-based Health Planning and Services (CHPS) compounds, sub-districts, and district levels on supportive functions to CBSVs was assessed. Moreover, an interview guide was used to ascertain the views of opinion leaders on the CBS system. SPSS Version 22 was used to analyse the quantitative data while NVivo 10 was used to analyse the qualitative data. The results showed that CBSVs' knowledge of priority diseases and events is low; CBSVs received low support from facility surveillance focal persons; CBSVs' performance on their core and quality surveillance functions was low. CBSVs in the urban areas performed well in reporting while CBSVs in the rural areas did well in providing feedback. The facility focal persons' performance on supportive functions to the CBSVs was also low but had a high impact on CBSVs' work. Opinion leaders perceived inadequate motivation to CBSVs; conflicts with nurses; frequent travel; aging and late response to CBSV reports by health authorities affect CBSVs work. It is recommended that the District Health Management Teams (DHMTs) should train CBSVs and health staff on priority diseases and events; mobilise resources for CBSVs work; create an electronic reporting tool for CBSVs; improve feedbacks and reporting in urban and rural communities respectively; support opinion leaders to address conflicts, late response to reports and inadequate motivation to CBSVs.

ACKNOWLEDGMENTS

I thank the Almighty God for granting me life with good health to carry out this thesis successfully. I am grateful to my supervisors, Prof. J. K. Mintah and Dr. Thomas Hormenu for their guidance, patience and useful suggestions in aiding me to complete this thesis. Again, I would like to thank all my lecturers especially, Dr. Edward Wilson Ansah, Prof. Daniel Apaak, Prof. C. Anthony-Krueger, and Dr. Addae Boateng Adu Gyamfi for their encouragement. I cannot forget to thank Prof. Joseph Kwesi Ogah of blessed memory for his valuable contributions during the initial stages of this thesis. The warm reception of the lecturers and staff of the Health, Physical Education and Recreation (HPER) Department is duly acknowledged.

I am very grateful to the Regional Director of Health Services (RDHS), Central Region, Dr. Mrs. Akosua Agyeiwaa Owusu Sarpong, the Deputy Director Public Health, Dr. Kwabena Sarpong, and the formal RDHS, Dr. Alexis Nang-Beifubah for their immense support. My special thanks also go to the entire staff of the Regional and District Health Directorates especially, Mr. Emmanuel Edum Fotwe, Mr. Justice Yevugah, Mr. John Hammond, Nana Koree, Mr. Musah Aminu, Miss Ewurasi Essel and Mr. C. K. Eshun. I also wish to express gratitude to Dr. Wincharles Coker of the Department of Communicative Studies UCC, for the details he provided in editing the thesis.

I have been fortunate to receive great support from my course mates, especially Dr. Isaac Nyarko, Mr. Nathaniel Atikumi, and Mr. Adamu Saanid. Without them the academic work would not have been easy.

Finally, I wish to acknowledge the support and encouragement of my entire family and my Christian family during the period of my studies.

DEDICATION

To my parents and all my teachers

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
AEFI	Adverse Events Following Immunisation
AFP	Acute Flaccid Paralysis
CBS	Community-based Surveillance
CBSV	Community based Surveillance Volunteer
CDC	Centre for Disease Control and Prevention
CHC	Community Health Committee
CHN	Community Health Nurse
CHO	Community Health Officer
CHPS	Community based Health Planning and Services
CHV	Community Health Volunteer
CHW	Community Health Worker
CIPP	Context Input Process and Product
CSM	Cerebrospinal Meningitis
DHMT	District Health Management Team
GHS	Ghana Health Service
GSS	Ghana Statistical Service
HIV	Human Immunodeficiency Virus
HPER	Health, Physical Education and Recreation
IDSR	Integrated Disease Surveillance and Response
IHR	International Health Regulations
ILI	Influenza Like Illnesses
IOM	International Organisation of Migration
JHS	Junior High School

MMDA	Metropolitan Municipal and District Assemblies
MSLC	Middle School Leaving Certificate
NIDs	National Immunisation Days
PANAFEST	Pan African Festivals
PHC	Primary Health Care
PHEIC	Public Health Emergency of International Concern
PPV	Positive Predictive Value
QHP	Quality Health Partners
RDHS	Regional Director of Health Services
RHMT	Regional Health Management Team
SMS	Short Message Service
SOPs	Standard Operating Procedures
SPSS	Statistical Product of Social Sciences
STIs	Sexually Transmitted Infections
TBAs	Traditional Birth Attendance
USAID	United States Agency of International Development
UNICEF	United Nations Children's Fund
VHV	Village Health Volunteer
VHF	Viral Haemorrhagic Fever
VPV	Village Polio Volunteer
WHO	World Health Organisation

CHAPTER ONE

INTRODUCTION

An effective Integrated Disease Surveillance and Response (IDSR) system is vital to health promotion in all and at all levels of healthcare delivery. It ensures that diseases with epidemic potentials are detected and reported early for prompt action (Silenou *et. al.,* 2021) According to the World Health Organisation (WHO) (2022), countries that were successful in the control and prevention of the Ebola pandemic actively involved the communities in active case searches for prompt case detection and management. In the Central Region of Ghana, monitoring reports indicate a weak Community-Based Surveillance (CBS) system and the factors contributing to this situation are not known (GHS, 2018). A weak CBS system could have negative developmental and health implications on populations (Miller & Hagan, 2017). An evaluation of the CBS system in the Central Region could help determine its current status to aid in strategizing for future decision-making. This chapter presents the background of the study, a statement of the problem, the purpose of the study, research questions, and the significance of the study and ends with an outline of the rest of the study.

Background to the Study

In public health surveillance, data are continuously gathered systematically, analysed and used on a timely basis to improve public health practice (Ernest, Shang, Xin-Yu & Zhou, 2018). In practice, the ultimate stage in the surveillance chain is the application of the information to health promotion and disease prevention and control. Disease surveillance is vital to public health practice. In general, it provides a platform that helps in preventing

and controlling diseases spread within and across national borders. In addition, it also provides early warning on potential threats to the public at a given point in time. Also, it directly measures and predicts health conditions and events that may be prevailing in populations (Samaras, Sicilia & Garcia-Barriocanal, 2021).

Key surveillance indicators are periodically used to measure the progress and impact of the interventions to ascertain their output (WHO, 2015). For instance, oral polio and tetanus vaccinations are meant to protect the public against diseases such as poliomyelitis and neonatal tetanus that are targeted for eradication and elimination respectively. Thus, active surveillance is mounted on these diseases to determine their trends for further action. Also, the programme evaluates to find out the number of persons vaccinated against these diseases and the number of cases reported over a period of time. This equips decision-makers to lead and manage more effectively by providing timely and useful evidence for disease control and prevention (Fall *et al.*, 2019).

Effective integration and coordination of surveillance activities within sectors will ensure the achievement of the One World-One Health strategy being advocated by the WHO which seeks to promote a holistic approach to solving health problems. It extends to areas such as human, animal and plant health and to a greater extent security sectors (Bordier *et al.*, 2021). The areas could encompass communicable diseases, accidents and injuries, non-communicable diseases, occupational health, environmental health and health services. The collaboration of experts from various sectors of health-related agencies in the management of diseases produces good results (GHS, 2019)

Several types of surveillance are used in public health practice and the choice of a particular type depends on its purpose and location (GHS, 2019). Health facility-based surveillance goes on in health facilities; community-based surveillance is carried out at the community level and sentinel surveillance is performed at a designated facility or site for early warnings of epidemics. Surveillance could also be carried out in laboratories for detecting trends of events or diseases, which is a core function of the surveillance system (Chiolero, 2020). The type and purpose of the surveillance agenda could effectively be done when human resources have adequately been trained to manage the system (Avortri, Nabukalu & Nabyonga-Orem, 2019).

Through effective public health surveillance, a disease like smallpox has been eradicated from the world (Heymann, 2021). Also, Guinea worm and poliomyelitis have been eradicated from most countries in the world. Hitherto, these diseases were higher among the causes of death and irreversible deformities in developing countries (Rubenstein *et al.*, 2021). For each of these diseases, there were well-trained clinicians to manage them at the facility level. Nevertheless, there were focal persons who searched for more cases and reported them to the authorities. The public was also sensitised to continuously and actively search for cases in their communities and report to the appropriate authorities for a reward and prompt action to be taken (GHS, 2015).

Before 1963, the term *surveillance* was used in public health to describe the close monitoring of persons who have been exposed and was at risk for developing highly contagious and virulent diseases (Choi, 2012). When a case of this nature was suspected, the person was isolated or quarantined and monitored for a specific period to prevent the further spread of the disease.

There were also checks for manifestations of classical signs and symptoms in order to secure prompt treatment. This strategy was laudable but not efficient enough to bring all stakeholders and their resources on board to achieve a common goal. Surveillance interventions were centred mostly on the health sectors of various countries (WHO & Centres for Disease Control and Prevention (CDC), 2010).

The spread of communicable diseases in developing countries, and the prevention and control measures were not standardised and well-coordinated enough to allow for international comparison and evaluation. There was a lack of knowledge of public health, in general, and specifically the management of epidemics. There were consistent outbreaks that spread rapidly across international borders which could have been managed in an integrated manner to prevent deaths and deformities through cost-effective means (WHO & CDC, 2010) It became evident that there was a need for a comprehensive Public Health Surveillance and response system in developing countries to protect public health in an integrated manner (Kweku *et al.*, 2020b).

The WHO Regional Office for Africa (WHO/AFRO) at its 48th meeting of the Regional Committee for Africa held in Harare, Zimbabwe in September 1998, resolved to use Integrated Disease Surveillance and Response strategy to improve public health surveillance and response in the African Region (WHO, 2015). The intention was to link communities, health facilities, districts, regions and nations to ensure effective integration of the surveillance system to promote efficient coordination, stakeholder collaboration and rational use of resources to address health problems. Following the resolution, the WHO/AFRO and CDC

prepared a guideline for surveillance decision-making. Ghana, therefore, adopted this guideline to its national context (Adokiya *et al.*, 2015).

The complex nature of the emerging and re-emerging diseases affecting humans, animals and plants demands a sector-wide approach to managing outbreaks and events (Mohammed, Onavbavba, Wilson & Adigwe, 2022). Surveillance interventions for different diseases involve similar functions structures, processes and personnel; hence, integrating efforts will be cost-effective and also ensure the sustainability of interventions (WHO, 2017). For instance, effective control of rabies and Ebola diseases, demands the expertise of the Ghana Health Service, the Ministry of Food and Agriculture, the veterinary services and the academia (GHS, 2019).

WHO has endorsed that member states operate within the tenets of the International Health Regulations (IHR) (Eaneff, Graeden, McClelland & Katz, 2022). The IHR is a legal instrument that calls for the strengthening of national capacity for surveillance and control, including sites such as ports, airports and ground crossing, to provide prevention, alerts and response to international public health emergencies (WHO, 2022). It also facilitates global partnerships and international collaboration. All member states have designated IHR focal points that coordinate Public Health Conditions and Events of International Concern (PHEIC) such as Acute Flaccid Paralysis (AFP), cholera, *etc.* The goal of IDSR community to the national level while the IHR coordinates international surveillance (GHS, 2019).

The technical guideline for IDSR Ghana was first prepared in 2002 and went through changes in 2011 and 2017 due to the changing trends of disease conditions and events in the country and abroad (GHS, 2019). The need for all

countries to work toward achieving Sustainable Development Goals was also paramount and now the Sustainable Development Agenda is unprecedented (Silenou *et al.,* 2021). Ghana started with not more than 23 priority diseases, but as of 2019 has more than 43 diseases, including non-communicable diseases, mental health, and key events such as maternal and infant deaths (GHS, 2019).

In the technical guidelines, the priority diseases have been classified under epidemic-prone, diseases targeted for eradication and elimination, and diseases of public health importance. The following diseases have been included under epidemic-prone diseases: cholera, measles, yellow fever, meningococcal meningitis, acute hemorrhagic fever syndrome (Ebola, Marburg, Rift Valley, Lassa, Crimean Congo, and West Nile Fever), and anthrax. The rest are dengue fever, diarrhoea with blood (shigella), plague, pertussis and influenza-like illness (ILI). Diseases targeted for eradication and elimination include; Guinea Worm, poliomyelitis, onchocerciasis, leprosy, and neonatal tetanus. The rest are trachoma, yaws, trypanosomiasis and lymphatic filariasis (GHS, 2019).

Diseases and events of public health importance are; acute viral hepatitis, Buruli ulcer, diarrhoea with dehydration less than 5 years of age, Human Immune-deficiency Virus and Acquired Immune-Deficiency Syndrome (HIV/AIDS) (new cases). The rest are malaria (new cases), tuberculosis, rabies, pneumonia in children under 5 years of age, sexually transmitted infections (STIs), and typhoid fever. In addition, non-communicable diseases and events such as; Malnutrition in children under 5 years of age, diabetes mellitus, hypertension, maternal deaths, neonatal deaths, adverse events following immunisation (AEFI), mental health (epilepsy) and injuries (road traffic

accidents) are also recorded under Disease of Public Health Importance (GHS, 2019).

At each health level of implementation, various key surveillance stakeholders come in to provide human, material and financial resources to ensure efficient and effective case identification, investigation, and reporting. International partners such as the WHO, United Nations Children's Fund (UNICEF), United States Agency for International Development (USAID), CDC Atlanta and Bureau for Global Health provide technical expertise and financial support for effective routine surveillance in times of outbreak (Bordier *et al.*, 2021).

There are also collaborative efforts with local partners to ensure that there is an effective coordination in country and check whether the standards set are being adhered to. The community, the health sector and other departments such as Water and Sanitation, Food and Agriculture, and Security Agencies have been playing a tremendous role as far as implementation is concerned. Additionally, private health care providers, municipal, metropolitan, and district assemblies (MMDAs), and academic institutions also collaborate to play their roles and responsibilities to enrich and strengthen the internal surveillance system (Adokiya *et al.*, 2015).

Ghana's health care system has, over the years, been premised on the Primary Health Care (PHC) model which was adopted in 1977 (Miller & Hagan, 2017). The PHC model in Ghana was designed at the district level to have a three-tiered system; level A, B, and C. Level A is the community level, with a Community-based Health Planning and Services (CHPS) facility; B is the sub-district level, with a health center; and C, the district level with a district hospital

(GHS, 2005). These levels work to provide appropriate quality health care services supported by a system of referrals and supervision to the appropriate levels of care when needed. At the community level, diseases of epidemic potential must be detected early, investigated and reported to the sub-district level within 24 hours, then to the district level, which provides the first level of comprehensive care (WHO & CDC, 2010).

Effective CBS system requires that at the community level, there should be laid down structures that are efficient and sensitive enough to detect diseases of epidemic potentials and priority events (Guerra & Acharya, 2019). The GHS (2019), recommends for a well-trained person residing in the community perform this duty. This person should be selected and accepted by the community. Studies have shown that community involvement and participation in the early detection and management of outbreaks is paramount to effective disease control; hence, the effectiveness of community-based disease surveillance cannot be overemphasised (Kweku *et al.,* 2020b).

The CBS system was introduced into Ghana's surveillance system in 1998. This was after the Ministry of Health initiated a village-based surveillance system for guinea worm control in the Northern Region as part of the Guinea Worm Eradication Programme in the early 90s. At the time, a focal person, known as a village volunteer, was trained to use basic case definitions to identify guinea worm diseases and report them to the nearest health authorities for action (Adokiya *et al., 2015*). The main strategy used was predominantly a house-to-house case search and hence, this initiative proved very effective, and by 1996, the guinea worm disease was under control in the region (Merali *et al.,* 2020).

However, in 1997, there were yellow fever and cerebrospinal meningitis (CSM) outbreaks in the Northern Region and some parts of Ghana; hence, the Ministry of Health decided to broaden the scope of the GWEP volunteers to serve other disease reporting needs by searching for cases such as measles, neonatal tetanus, poliomyelitis *etc*. These new volunteers were called CBSVs. By January 1998, about 3600 CBSVs had received training and resources to work to bring the situation under control (Maes & Zimicki, 2000).

In Ghana, the CBS system is considered part of the entire surveillance system. It is described as the "backbone" of disease surveillance (GHS, 2019). The community is the basic unit where the cases are usually detected and sometimes managed and by involving the CBSVs, community ownership is adequately sustained. The role of the CBS system in the communities cannot be underestimated. It helps in case identification, reporting, investigation and confirmation. It also helps in data analyses, providing responses to outbreaks and giving feedback about diseases or events of public health concern to the health sector and the communities in which they serve (WHO, 2015).

Besides the above-mentioned tasks, in the community, the surveillance focal person helps to mobilise human and material resources for health promotion programmes and serves as a link between the community and the entire health sector (GHS, 2019). According to IDSR guidelines, CBSVs have been used by the health sector and the communities as multipurpose volunteers to achieve objectives of major health programmes such as National Immunisation Days (NIDs) against Poliomyelitis and Guinea worm eradication. The CBS system has been used for case finding during outbreaks, and to

increase sensitivity for the detection of diseases targeted for eradication. They are also used for birth and death registrations in the communities.

The initiation and formation of the CBS system in a community start in the health sector (WHO, 2015). Following the WHO-AFRO recommendations to have focal persons at all levels within the surveillance structure, the sub-district health and CHPS team plans and visits each community to discuss with the opinion leaders, the importance of establishing a community-based surveillance system to track priority disease of epidemic potentials and events (GHS, 2019). Upon agreement, the criteria for selecting the focal person (s) are given to the opinion leaders who, then, select some members of their community and present them to the health team for consideration.

The selection of the CBSVs is based on the following criteria: It is recommended that the volunteers be resident in the community; should be well-known; respected and accepted by the community; and should be gainfully employed. Also, they should be literate enough to record events/data on the register provided, however, an illiterate volunteer can have a literate assistant (GHS, 2019). Where ethnic and religious differences exist and are likely to be a problem, the groups must be identified and involved in the selection**.** The selected community members are trained on key competencies to identify priority diseases and events, and presented with tools such as registers to report to the health sector (GHS, 2017).

According to the IDSR technical guidelines, the CBS's system has become very important because, hitherto, diseases affecting people in the communities only get to the attention of the health authorities after the media brings them to light (GHS, 2019). Also, according to GHS technical guidelines

there were no properly developed community structures that helped to detect and report unusual events in the communities to health staff at the sub-district level for investigations and necessary actions. Moreover, existing health information was based on the little information gathered at the health facilities. The guidelines indicate that there was underreporting because facility-based surveillance was mostly carried out passively, and information gathered depended on the healthcare-seeking behaviour of the people. Hence, setting up the CBSVs system complements the efforts made by the health facilities (GHS, 2019).

The CBSVs are trained and supervised by the staff of the nearest health facility and other members of the community. They are trained to use simple case definitions to identify selected epidemic-prone diseases such as cholera, meningitis, Guinea worm, measles, neonatal tetanus, and Acute Flaccid Paralysis (AFP), and report immediately, within 24 hours, to the nearest health facility for action taken (WHO& CDC, 2010). Besides, they are also expected to report on any unusual events, births, infant deaths, and maternal deaths which are related to pregnancy occurring in the community (WHO, 2015). Information on all these conditions including the community profile is captured in a community register which is used as a monthly reporting tool by the volunteer.

The effectiveness or otherwise of the surveillance activities in the community have implications on health service delivery in the country in particular and the world as a whole. As such, periodic evaluation of the activities is very necessary (WHO, 2015). Evaluation of the surveillance system is the periodic assessment of the relevance, effectiveness and impact of activities in light of the objectives for which it was formulated (Groseclose & Buckeridge,

2017). The WHO (2022) posits that indicators for the evaluation should be identified from a broader component of surveillance, including the surveillance system structures, core functions, support functions and quality functions.

The surveillance system structures look at how well the surveillance activities comply with the standards about the regulations and laws, key strategies, networking and partnership and involvement of stakeholders. The structures ensure that the operational procedures are adhered to improve the quality of the surveillance system. The core functions measure the system's process and output, including case detection, case registration, case confirmation and reporting. The rest are data analysis and interpretation, epidemic preparedness, response and control, and feedback (WHO, 2022).

The support function indicators look at issues that facilitate the implementation of the core functions. They include training, supervision, communication facilities, resources, monitoring and evaluation and coordination of the system. The quality function component looks at attributes such as completeness and timeliness of reporting (Groseclose & Buckeridge, 2017). Also, it further highlights the usefulness, sensitivity and state of positive predictive value (PPV). The representativeness, specificity, flexibility, acceptability, and reliability of the surveillance data are also checked under this function (Nsubuga *et al.,* 2006). The interplay of these functions provides an effective surveillance system.

In sub-Saharan Africa, weak community-based surveillance has been noted as a challenge and this could hinder the progress to achieving "one-world-one health strategy" (Nsubuga *et al.,* 2006). Reports indicate that, there are low community engagement leading to lack of active community participation and

involvement of community members in surveillance activities which is greatly affecting case identification (Fall *et al.,* 2019). Also, inadequate reporting and poor-quality data at the lower level is a sign of weakness affecting decision making (Mremi *et al.,* 2022). Moreover, limited capacity building due to insufficient training and support from health workers hinder volunteers' performance (Nsubuga *et al.,* 2006). In addition, ineffective feedback mechanisms which is a key challenge in sub-Saharan Africa led to lack of motivation and trust, resulting in decreased in reporting and surveillance effectiveness (Masiira *et al.*, 2019)

The situation in the Central Region is not far different from other areas. Reports indicate that non-availability of CBSVs, poor supervision, poor reporting, inadequate funds for managing CBS programmes are some of the indicators affecting the CBS system (GHS, 2018). Occasional visit by CHOs to the communities to help in addressing these factors have not completely brought positive outcomes in the community-based surveillance system which could affect the progress of one world-one health strategy in the region (GHS, 2021). The system works with weaknesses that need to be investigated further.

Statement of the Problem

The extent of prevalence of the priority diseases in the Central Region is critical. Measles, Guinea worm, AFP or Poliomyelitis, CSM, Cholera and Neonatal tetanus are all diseases of public health concern. A case of each of them is an epidemic which warrants a quick response to bring the situation under control. In 2023, the annual report indicated that there were no cases of Guinea, cholera and poliomyelitis and neonatal tetanus. However, there were 6 confirmed meningitis cases and 15 confirmed measles cases. There were also 4

confirmed yellow fever cases, 1 monkey pox case, 88 confirmed Covid-19 cases and 43 New flu illnesses cases. The above situation indicated that the Central Region is at risk of recording outbreaks (GHS, 2023). These diseases were captured in the facilities, there could be more in the communities that have not been diagnosed or were wrongfully diagnosed which could lead to high unrecorded mortalities.

In this era of constant outbreaks of diseases such as cholera and meningitis and increasing events such as maternal and child deaths, coupled with inadequate health facilities in our various communities, the disease surveillance activities in the communities should not be neglected but rather be strengthened to provide complete and timely reports on priority diseases and events (GHS, 2018). There is a need for a constant flow of information between the communities and the health sector (Ng'etich, Voyi & Mutero, 2021). Also, various stakeholders at the community, sub-district and district levels are to get involved in community-based surveillance activities to provide support in diverse ways. It is a requirement that periodically formal monitoring and evaluation should be carried out on surveillance activities at all levels to ascertain the effectiveness of interventions being carried out to guide decision-making (WHO, 2015).

However, a review of available literature and records indicates the following gaps. In 2020, preliminary records reviewed in Abura Aseibu Kwamansese District in the Central Region indicated that about 65% of the communities were not under active surveillance and factors contributing to these are not known and documented. In addition, monitoring reports show inadequate knowledge of CBSVs on priority diseases and events and the non-

availability of CBSVs in the communities has not been investigated by earlier studies. There is also little documented evidence on the evaluation of CBSVs' performance since its inception in 1998 in the Central Region (GHS, 2015).

Moreover, the world is becoming more urban and differences in the performance of CBSVs in urban and rural and coastal and forest areas were not the focus of previous studies (Mandyata, Olowski & Mutale, 2017). Further reviews showed that little is known about the extent to which the CHPS, sub-district and district surveillance focal persons perform supportive surveillance functions to aid the work of CBSVs in the community (GHS, 2015). Besides, community opinion leaders' participation and perception of the CBSVs activities in the communities have not been fully assessed (Adokiya, *et al.*, 2015). Therefore, there is a need for a systematic evaluation of the CBS system in the Central Region to fill in these gaps.

Purpose of the Study

The purpose of this study was to evaluate the CBS system in the Central Region of Ghana. Specifically, the study sought to find out the knowledge level of the CBSVs on case definitions of priority diseases and health events and their performance on the core and quality of surveillance functions in the communities, explored the extent to which the surveillance focal persons at district, sub-district and CHPS levels perform their supportive surveillance functions to the CBSVs system and ascertain the perception of opinion leaders on CBSVs activities.

Research Questions

The research sought to find answers to the following questions:

1. What is the knowledge level of CBSVs on the case definitions of priority diseases and vital health events in the Community Volunteer Registers in the Central Region?
2. What is the extent to which CBSVs in the community receive support from the surveillance focal persons in the Central Region?
3. What is the extent of the performance of CBSVs on the core and quality surveillance functions in the communities in the Central Region?
4. What are the differences in performance between CBSVs in coastal and forest areas and those of urban and rural areas in terms of their core surveillance functions in the Central Region?
5. How does the performance of the surveillance focal persons at the districts, sub-districts and CHPS levels on supportive surveillance functions affect CBSVs core functions in the Central Region?
6. What do the opinion leaders in the CHPS compounds perceive to be factors affecting the implementation of CBSVs activities in the Central Region?

Significance of the Study

The findings of the study will be beneficial to the community, the health sector, Non-governmental Organisations and international partners. Academic, research institutions and all relevant stakeholders in health, including students could also make a lot of gains from the findings of the study. Most of the diseases and events reported in the health facilities are from the communities and as such the community may need periodic feedbacks on surveillance

updates, research findings, laboratory results, coverage of interventions and their effectiveness and how they affect the community's health.

The Sustainable Development goal three (3) talks about good health and well-being, which focuses on improving the prevention of communicable diseases and reducing maternal mortalities in the communities (GHS, 2019). The results of this study could be used to help in achieving the Sustainable Development Goal three (3) through improving CBSVs and staff knowledge to monitor diseases trends in the communities, help CBSVs to provide quality community surveillance data to assist stakeholders to prioritize interventions and allocate resources efficiently (GHS, 2023). This study will help in the achievement of the Universal Health Coverage which is about increasing all persons' access to health care they need and protecting them from poverty and premature deaths in their communities (Tarkang, 2022).

The Ministry of Health, Ghana Health Service, the academia, Non-Governmental Organisations, community opinion leaders and international partners like UNICEF, CDC, WHO *etc.* could use the findings concerning the background characteristics of CBSVs to improve on designing criteria for selecting CBSVs. These stakeholders and partners could also use the findings on the surveillance system structures and the knowledge level of CBSVs on priority diseases and events to aid policy formulation on CBSVs training, as well as improving their core, supportive and quality functions. This will ensure a very sensitive and reliable community-based surveillance system.

Delimitation

The study was delimited to the Central Region of Ghana. Several volunteers support health programmes in the communities, however, the study

focused on community-based surveillance volunteers in the forest and coastal, and rural and urban communities. Also, the study used surveillance focal persons at the districts, sub-districts and CHPS levels in the public health facilities and the selected opinion leaders at the CHPS compound. The study aimed at evaluation of the CBS system hence a mixed method design was used. Afari-Asiedu *et al.,* (2018), in their study in Ghana recommended that in the evaluation of surveillance, all stakeholders in the CBS system should be assessed. CBSVs and facility focal persons were quantitatively assessed. However, the opinion leaders were evaluated with the qualitative method. This was used because of the questions the study sought to answer. The CBSVs were used because they work on surveillance in the communities. Knowledge level of CBSVs on priority disease, performance of CBSVs on their core and quality surveillance functions and focal persons' performance on supportive functions were some of the variables assessed. The CBSVs that were included in the study were those between the ages of 20 and 85 years. These age categories were selected due to their activeness in the CBS activities within the communities.

Limitations

The mixed method approach used demanded more time and resources however, simplified questionnaires and continuous supervision were used to ensure that the work was done on schedule. Also, systematic sampling used to select the CBSVs allowed some of the communities not selected which introduced some level of bias, however, 62% of the communities in the region were sampled to increase the power of the study. The sample size was very large and arrangements for meeting times and seeking consent from all the

respondents made the process more laborious, however, the use of easy-to-understand questionnaires helped in addressing this challenge.

The inaccessible nature of some of the roads to the communities made it impossible to use four-wheel drive and in this case motorbikes and bicycles were used as an alternative to the communities. The COVID-19 pandemic also posed a lot of challenges to time, resources and interactions with respondents. The study utilized a cross-sectional design which was aimed to collect data at one particular point in time and could lead to information bias and could have impact on the outcome of the study. However, responses of the participants were reviewed to eliminate the impact of this weakness.

Definition of Terms

Evaluation: Evaluation of the surveillance system is the periodic assessment of the relevance, effectiveness and impact of activities in light of the objectives for which it was formulated (WHO, 2006). In this study, the volunteers' knowledge, the performance of their core functions, and support functions were assessed.

Community-Based Surveillance System: It is part of the Integrated Disease Surveillance and Response (IDSR) system whereby a trained Community-based Disease Surveillance Volunteer looks for diseases and events of public health concern and reports them to the health authorities for action (GHS, 2019).

Organisation of the Study

The study is organised into five chapters. Chapter one has been explained, which comprises the background of the study, a statement of the problem, the purpose of the study, and the research questions. The rest are the significance of the study, limitations and delimitations of the study. In chapter two, related literature was reviewed. The concepts of community and disease

surveillance and response were reviewed. Also, community leadership and surveillance were also examined. Reviews were further done on the scope of surveillance, history of surveillance in Ghana, CBSVs activities in disease control, knowledge on priority diseases and events, the theory of the ice-burg phenomenon, the theory of performance, Context Inputs Product (CIPP) model and the WHO model for evaluating disease surveillance systems were studied critically, upon which the conceptual framework for the study was developed.

Chapter three discussed the methodology of the study. The design, study area, population, and sampling procedures for the study. The data collection instruments, data collection procedures, and data analysis plan were described in this chapter. Chapter four analysed and discussed the results while Chapter five gave the summary, conclusions, and recommendations based on the findings of the study.

CHAPTER TWO

LITERATURE REVIEW

The purpose of this study was to evaluate the CBS system in the Central Region of Ghana. It examines the knowledge level of the CBSVs on case definitions of priority diseases and health events and their performance on the core and quality of surveillance functions in the communities. The study also explored the extent to which the surveillance focal persons at district, sub-district and CHPS levels perform their supportive surveillance functions to the CBS system. The perceptions of the opinion leaders on CBSVs were also ascertained. The relevant literature that underpins the study was done using books, research articles, journals, magazines, reports and conference proceedings. Some of the key words used in the search included: *evaluation, public health surveillance, community, community-based surveillance, surveillance core functions, surveillance support function*s and *surveillance quality functions*. The rest are *surveillance system structures, knowledge on surveillance* and the *WHO framework of surveillance*. The chapter has been organised under the following headings:

1. Community and disease surveillance
2. Types of communities and surveillance
3. Community leadership structures and disease surveillance
4. Definitions and scope of disease surveillance and surveillance methods
5. History and activities of CBSVs system in Ghana
6. Factors influencing the implementation of CBSVs activities
7. Knowledge of priority diseases and events

8. Theories and models: theory of iceberg phenomenon, theory of performance, Context, Input, Process, Product (CIPP) evaluation model, WHO framework for evaluation of surveillance
9. Conceptual framework for the study
10. Summary

Community and Disease Surveillance

In most parts of the world, there is a shift from predominantly facility-based healthcare delivery to community-based healthcare and health promotion (Nurjono *et al.,* 2020). Community-based healthcare delivery increases access to health services. Hence, governments of various countries have adopted this strategy to address equity gaps in healthcare delivery (WHO, 2016). Diseases occurring in the communities can best be monitored by the community members and this reiterates the importance of involving the community in monitoring and reporting disease patterns to appropriate authorities for redress (Annabelle, 2019). The nature, type or form of the community has an influence on the surveillance activities that go on in that community (Chatio, Welaga, Tabong & Akweongo, 2019). The leadership and the communication structures and processes also influence the success or failure of surveillance performance in that community (Plianbangchang, 2018).

The dynamic nature of the community has led various experts to have different opinions on how to define it (Cobigo, Martin & Mcheimech, 2016). In a broader sense Cobigo *et. al.* described a community as a network of people who are linked by where they live, the nature of work they do, their ethnic background and other factors. In this definition, the importance of networking in the community which could be internal or external is highlighted. Networking

promotes migration, it facilitates information flow and maintain the living standard of the rural and urban communities. However, networking could also increase contacts and promote transmission of diseases in various settings in the community (Naug, Collins & State, 2020).

The definition continues to emphasise on the nature of works that are predominant in the community. This could expose the indigenous people to constant interactions with outsiders which could have positive and negative consequences on disease transmission and control (Siegel, 2020). In the forest areas where mining is carried out, pollution of air and water bodies is predominant and these could expose the populace to skin and lung diseases such as Buruli Ulcer and Pulmonary Tuberculosis (Aboagye et al., 2017). Cholera and other diarrhea diseases are often reported in the coastal communities in Ghana where fishing is predominant (Issahaku *et al.*, 2020).

Wilterdink and Form (2023) describe a community as a place to live, a collection of people, and a social system with special arrangements, that share institutions, interactions, and power structures. The compositions and elements in the community are versatile and rich and these could be identified, critically analysed, and tap to improve surveillance in the community. The physical, social, and biological environments must be sound and safe to accommodate its members to improve cohesion (Jennings & Bamkole, 2019). The power structures in the community are also important to help in the governance of the community (Haward-Mills et al., 2018). Health, security, education, religion and traditional and other social institutions in the community have various roles to play in disease causation and prevention. Thus, knowledge and expertise from

these institutions when properly harnessed could improve surveillance and reduce the disease burden in the community (Hou, 2014).

WHO (2023) defines a community as being a social group determined by geographic boundaries and/or common values and interest in development. The issue of a geographic location is prominent in this definition. In this era where resources are scarce and the population dynamics have constantly heightened, the boundaries and populations of communities must be clear to guide resource mobilisation and allocation for surveillance activities. Moreover, the developmental status of a community is also significant in relation to disease surveillance in terms of monitoring and supervision (Mremi, *et al.*, 2021)

In urban communities where hotel and hospitality businesses are booming the lifestyle of the people promotes diseases such as sexually transmitted infections (STIs) and their associated diseases (Newmyer, Evans & Graif, 2022). Besides, Newmyer *et al*., (2022), posited that mobilizing the people for health programmes in urban communities becomes very difficult which may also affect surveillance work in the community. According to Solnes, van Pelt, de Bruin and Shields-Zeeman (2019), the rural community also has its own health challenges such as access to childcare services. Mobilisation of rural communities for health programmes could be easier as compared to the urban communities (Solnes *et al*., 2019).

A critical analysis of the above-mentioned definitions guides the researcher to attempt to define a community as a group of people with common norms, values, and needs who live in a given geographical area and have structures, leaders and institutions within the locality that govern their interaction towards a common purpose. This definition becomes very

imperative because the study communities have all these features that can be examined and used to help in the surveillance work in the community. The interaction between community members and their leaders improves healthcare delivery (Cobigo *et al.*, 2016). Although some groups of people in the same community may have different values and norms that may not be common for all in the community, these groups should be identified and managed (Nurjono *et al.*, 2020).

Types of Communities and Surveillance

The community is described under the following types: rural, urban, traditional, solidarity and neighbourhood. Understanding the type of a community one deals with ensures effective planning and implementation of disease surveillance and health promotion programmes (Abeka-Quansah & Ofei, 2009; Cobigo *et al.*, 2016). Each of the types mentioned has different features that make it unique and these features should be recognised by the health promoter in each of the settings and use to the advantage the community (Heward-Mills *et al.*, 2018). Decision making and strategies used in administration and implementation of health promotion programmes may also change depending on the nature of the community in question (De Liddo & Concilio, 2017).

The rural community refers to a population of less than 5000 residing in the same geographical area (Ghana Statistical Service (GSS), 2014). They share the same needs, have common problems, who are more united and have the informal way of instruction. The elders and old people are able to direct and correct any one in the community (Abaka-Quansah & Ofei, 2009). Certain important characteristics are worthy to note. According to Abekah-Quansah and

Ofei (2009) in the rural community, there has a high sense of belonging with rigid social relations. Generally, there are inadequate social amenities, social control is through sanctions by the traditional leaders and the basic unit of association is homogeneous family. In addition, members tend up to be self-employed.

Heward-Mills *et al.* (2018) posited that rural communities seek health information and health care only when crisis occur and because of this perception towards diseases and other health problems in the rural areas, health practitioners need to combine different approaches in solving problems in the communities. There should be an active approach of where health care delivery are put to the door steps of the populace (Kweku *et al.*, 2020b). However, spirit of volunteerism is high and social mobilisation and implementation of health programmes tends to be easier in this setting. (Chatio *et al.*, 2019).

GSS (2010) indicated that populations in the urban settings should be 5000 or more. These settings have different ethnic groups, ideas, beliefs and culture. However, their needs and problems could be the same or different (Nukunya, 2007). In the urban communities, there is little sense of belonging or feeling for one another; everyone is for himself. Usually, social control is enforced by law enforcement agencies like the police and court. People of different cultures and tribes are identified and social problems are heightened (Abaka-Quansah & Ofei, 2009). Social and basic amenities are available. Attitude towards illness is future oriented. That is, they are concerned with how to prevent themselves from getting ill. The characteristics of urban settlements make them prone to complex health issues. Hence, multiple approaches must be used in solving them. In these settings mobilizing members in the urban

population for health programmes turn to be relatively difficult (Mandyata *et al.*, 2017).

Traditional communities are old and established settlements of people with certain common identifiable traits. In the traditional community, ethnic characteristics such as clans, family ties, religions and occupation among others, are found to be common. Important natural bounds such as common leadership, language, traditions and customs hold members of this type of community together (Nukunya, 2007). These characteristics could provide useful criteria for segmenting such as communities into recognisable and practical units to facilitate mobilisation for sustained health and development activities (Abeka-Quansah & Ofei, 2009). On the other hand, the beliefs and customs of some of such traditional communities could hinder the work of health workers. Beliefs and customary practices may conflict with conventional acceptable health practices. According to Nukunya (2007) most rural towns and villages are typical traditional communities.

Solidarity communities are where people seem to be living in a common territory because of common heritage such as nationality, ethnicity, religion or language (Abaka-Quansah & Ofei, 2009). For instance, the Frafra community in Cape Coast could be described as solidarity community. Since they often define themselves as belonging to that group and emotionally loyal to it, the possibility of them working as a community to promote their own health and well-being is high. On the other hand, if they object to a type of health information because it contradicts their belief systems, it could hinder the promotion of health programmes (Heward-Mills *et al.*, 2018).

Neighbourhood community is another territorially bound conception of the community which could be recognised and used to promote community mobilisation and disease surveillance. This develops as people live in areas together for a period of time and in the process develop familiarity out of which strong loyalty may grow (Abaka-Quansah & Ofei, 2009). Examples of such communities are the workers' estates, residential settlements, Zongos, *etc.* Furthermore, neighbourhood integration may not be totally based on loyalty and personalities, but on share interest and common problems such as unsanitary surrounding, poor water and sanitation facilities and outbreak of common illnesses, which may call for attention from all. Moreover, neighbourhood communities when properly identified and recognize through a problem focus, can effectively serve as manageable units which could be organized for effective and sustainable participation in health service delivery (Abaka-Quansah & Ofei, 2009).

Community Leadership Structures and Disease Surveillance

People and institutions in the community must be governed for effective control in the community and this could be done through traditional, political and formal political leaderships (Baldwin & Raffler, 2019). The traditional leadership in the community is a leadership positions, and responsibilities are assigned to individuals who are known to be indigenous, part of founders of the community and are heir of the resources and property of the land (Nukunya, 2007). These individuals who are heirs, are respected in the community and are described as paramount chiefs, divisional chiefs, queen mothers, elders and spiritual leaders *etc.* to head the community (Seidu, 2016).

According to Seidu (2016) community leaders have numerous roles to perform. They act as spokes persons, custodians of culture and lands, judges, overseers, arbitrator, financiers, counselors *etc.* for the people. These roles give the community leader a lot of powers to make decisions on behalf of the community. Hence, Seidu posits that health promoter must always focus on capturing the interest of the community leaders and actively involve them during planning, implementation and monitoring of health programmes and projects in the community to ensure ownership, active participation and sustainability of programmes. In Ghana, community leaders are actively involved in the selection and motivation of Community-based Disease Surveillance Volunteers (GHS, 2017).

The political leadership structures in the community may differ in certain communities but the similarities far outweigh the differences. There is always the overall head and their subordinates who are assigned to take charge of the towns, communities, clans *etc.* In additions, there are leaders assigned to have over sight on property, security, welfare, health and advocate for the people in the entire community, town or the traditional area (Nukunya, 2007). These leaders are known by the community and are usually held accountable to the community. As elders in the community, matters arising in the community in their respective areas are noted and are brought forward for discussions during leadership meetings or community meetings and durbars (Seidu, 2016).

Leaders are responsible for different roles. It is, therefore, very expedient that depending on the area of your operation as a health worker you try to identify the community leader responsible, and discuss your opinions and idea with him or her who will, then, link you to the overall leader or the chief in

the community for further and detailed deliberations on the issues (Chi, 2020). On the other hand, you may see the chief and he will then refer you to work with his subordinate. It is also important that protocols are observed during community work to ensure that you are accepted in the community (Kweku *et al.*, 2020b). Hou (2014), posits that most health programmes fail in the community because the right people in the community were not consulted to lead in the organisations and discussions on issues that boarder the entire community. Community leaders are more comfortable to participate in programmes when they are simple, efficient, effective and easy to understand and are compatible to their culture.(Avortri *et al.*, 2019).

Concept and Scope of Surveillance

Disease surveillance has been found to be one of the key pillars in disease control and prevention (Fall *et al.*, 2019). The concept was formally focused on communicable diseases but now in most part of the world, non-communicable diseases have been identified to be part of surveillance (GHS, 2019). Surveillance is defined in many ways. Surveillance means to watch over with great attention, with authority and often with suspicion (Rubenstein *et al.*, 2021). Another simple definition for surveillance is a process of watchfulness over health events which may occur in a population (Groseclose & Buckeridge, 2017). It has been defined as the ongoing and systematic collection, analysis, interpretation of health data in the process of describing and monitoring a health event with the objective of supporting the planning, implementation and evaluation of public health interventions and programmes (GHS, 2019).

More specifically, communicable disease surveillance is the continuous monitoring of the frequency and the distribution of disease and deaths due to

infections that can be transmitted from human to human or from animals, food, water or the environment to humans, and the monitoring of risk factors for those infections (Ng'etich *et al.,* 2021). This definition ensures that health information is gathered at different levels for effective planning and decision making on disease control activities. Disease surveillance provides essential monitoring and evaluation outcomes that promote cost effective health care delivery (Nsubuga *et al.,* 2006).

The scope of disease surveillance is very broad; it includes diseases and events of public health significance, documentations, investigations and planned response (Fall *et al.,* 2019). Reasons for conducting public health surveillance can include the need to assess the health status of a population, establish public health priorities, and reduce the burden of disease in a population by appropriately targeting effective disease prevention and control activities (Nsubuga *et al.,* 2006). These activities are carried out by well-trained focal persons.

Surveillance Methods

Surveillance methods are processes that are used by institutions, groups, facilities and individuals to carry out surveillance strategies to prevent the occurrence of diseases or to reduce its burden (WHO, 2015). Various surveillance methods are used for disease control and health promotion depending on the nature of the event or the disease in question and where the surveillance activity is being carried out. The methods include active surveillance, passive surveillance, sentinel surveillance and syndromic surveillance. These methods can be combined by the surveillance focal persons to ensure effective surveillance system at a point in time (Olkowski *et al.,* 2016)

Active surveillance

Active surveillance is defined as a special effort to collect data and confirm diagnoses to ensure more complete reports such as surveys and outbreak (Rubenstein *et al.*, 2021). With this method the focal person and his team move to search for cases rather than sitting down for the cases to report as usual +at the facility. This type of surveillance is particularly useful in establishing prevalence rates for conditions, where there may be a lack of data or where cases occur sporadically (Nsubuga *et al.*, 2006). Another illustration of active surveillance is the process of case ascertainment during an outbreak investigation. In the elimination and eradication stage of disease control this method is often used. At the community level the active surveillance has proven to be very reliable in the eradication of Guinea worm and poliomyelitis diseases (Senyonjo, Downs, Schmidt, Bailey & Blanchet, 2021).

Passive surveillance

The overall purpose of passive surveillance systems is to assess trends in diseases, risk factors for disease prevention and control (Olkowski *et al.*, 2016). Communicable disease surveillance is heavily reliant on passive surveillance (Gao, Wang, Liu & Zhao, 2022). However, these systems are likely to underestimate the true burden of illness as many people with notifiable conditions may only have mild illness and do not seek care, while others may be incorrectly diagnosed or may not receive laboratory testing to confirm a diagnosis. Passive surveillance has many weaknesses. In general, there is a significant variation in the quality of reporting systems from country to country; reflecting economic, social, cultural and epidemiological differences (Samaras *et al.*, 2021).

Sentinel surveillance

In sentinel surveillance, high-quality data is acquired in an efficient and scientific manner from a targeted sample of the population under surveillance so that the information gathered after analysis can be used on the populations or among sub-populations at higher risk of getting the disease (WHO, 2020). Sentinel surveillance provides an alternative to population-based surveillance for the collection and analysis of individual patient-related information (Senyonjo *et al.*, 2021). According to Olkowski (2016), the systems is established for the purpose of enabling simple, early detection of disease which offer advantages over passive surveillance, which is known to have limitations due to incomplete reporting.

Syndromic surveillance

Syndromic surveillance could be explain as methods relying on detection of conditions based on clinical case features, which are noticeable before confirmed diagnoses are made (Samaras *et al.*, 2021). Preceding laboratory confirmation of an infectious disease, a client may exhibit behavioral patterns, symptoms or signs that are notified by a physician. Samaras *et. al*. posit that this type of surveillance provides a quick estimate of the disease situation monitored and is suitable for example, detecting bio terror.

History and Activities of CBSVs System in Ghana

Community-based Surveillance (CBS) is an active process of community participation in detecting, reporting, responding to and monitoring health events in the community (WHO, 2015). The scope of CBS is limited to systematic on-going collection of data on events and diseases using simplified case definitions and forms to reporting to health facilities for verification,

investigation, collation, analysis and response for necessary action (Guerra *et al.*, 2019). In Ghana CBSVs commencement can be traced to the 1980s, when in 1988 the Ministry of Health in Northern Region introduced the village-based surveillance system for Guinea worm (GHS, 2017). The goal of the village-based system, anchored on the reporting of Guinea Worm on village-by-village basis by a village volunteer. It is to detect, contain and eradicate guinea worm in the whole of Northern Region (GHS, 2019).

The efforts of the village volunteers contributed to a significant reduction of the Guinea worm cases. In the Northern Region, for example, the case load for Guinea worm cases reduced from 104,000 in 1989 to 4,207 in 1996 (GHS, 2017). Whilst the cases of Guinea worm had reduced drastically, there was an outbreak of yellow fever in 1996-1997, and cerebrospinal meningitis in early 1997 that needed more community support for prompt response. However, the village volunteers were inadequate for the job and that resulted in the establishment of a Community Based Surveillance Volunteer system whose scope was expanded to include monthly detection and reporting of cases of polio, cerebrospinal meningitis (CSM), Guinea worm, measles as well as infant deaths, pregnancy-related deaths, all other deaths, new births, and unusual events. The CBS which was originally focused in the Northern Region was reviewed and became nationally operational in 1998 (Maes & Zimicki, 2000).

According to Maes and Zimicki (2000), the pioneering work was done by the Regional Health Management Team (RHMT) of the Ghana Health Service in the Northern Region, a technical working group comprising of key stakeholders of health and international partners. The USAID funded-project of Quality Health Partners (QHP) provided a tremendous support in the production

of guidelines for establishing CBSVs system. Other organisations such as CDC and International Organisation for Migration (IOM) were also involved. The technical working team of the Ghana Health Service comprising of Dr. Lawson Ahadzie, Mr. Adamu Wiah, Mr. James Addo, Mr. Michael Adjabeng and Ms Elizabeth Alhassan offered a great support in designing the guidelines. The rest of the team members were, Ms. Amy Takyi, Mr. Ernest Ofosu Boateng and Mr. Kwame Kodom Achempem (GHS, 2017). The work of this team provided a sound footing for the CBSVs system.

Since the inception of the CBS system, the Ghana Health Service and its partners such as the CDC, IOM, WHO, communities *etc.* have helped in the training and scaling up of the CBSVs work in Ghana (GHS, 2017). The work of the CBSVs has been very useful to the communities in which they work, the Ghana Health Service and Ghana as a whole. CBSVs have been very influential by linking the Health Sector with the communities in which they serve. They support in the provision of case search on priority diseases and events which lead to the eradication of Guinea Worm and poliomyelitis. They also aid in the organisation of the profile for the communities and support in the registration of all births and follow up to ensure that children registered are provided with essential health services such as immunisation and growth promotion by the staff of Ghana Health Service (GHS, 2019). The efforts of the CBSVs have been acknowledged in diverse ways with support to the health staff that supervise them.

The CBSVs work alongside the Community Health Officers (CHOs) who live in the communities provide health service including disease surveillance in the rural communities (Kweku *et al.*, 2020a). The CHOs provide

direct supervision to the CBSVs. Other members of the community also provide supervision to ensure smooth running of the CBS system in the community (Merali *et al.,* 2020). During supervision the CHOs discuss the implications of the data collected and interventions needed to be carried out with the CBSVs and the community leaders. It is expected that the CHOs work on surveillance would be supervised by the subdistrict and the subdistrict in turn would be supervised by the District Health Management Team (GHS, 2017).

In effect, the CBS in Ghana was established over three decades ago to support GHS and partners to carry out surveillance in the communities (GHS, 2002). CBSVs were trained and assigned the responsibilities to notify the nearest health facility of the occurrence of diseases or health conditions selected for community-based surveillance. Since the commencement of CBS system, the CBSVs have worked in collaboration with the CHOs to address various health problems in the communities including eradication of Guinea Worm and Poliomyelitis diseases (McGowan *et al*., 2022). The purpose of establishing the CBS system in the community has been laudable, and has even become more important as communities keep on expanding and management of prevailing and emerging diseases become more complex (WHO, 2022).

Community-based disease surveillance in Ghana has been a focal point in public health research, aiming to enhance early detection and response to infectious diseases at the grassroots level. Numerous studies have underscored the importance of involving local communities in surveillance efforts to improve health outcomes and minimize the spread of diseases. A study conducted by Addo, Atinga, Addo-Lartey & Asante (2018), highlighted the effectiveness of community-based surveillance in detecting outbreaks of

infectious diseases such as cholera and meningitis in rural Ghana. The researchers found that community volunteers, trained in basic surveillance techniques, played a crucial role in timely reporting and response, which significantly contributed to disease control efforts.

Moreover, research by Binka *et al.* (2007), emphasized the integration of community-based surveillance into the national health system of Ghana. Their findings indicated that leveraging local knowledge and resources through community participation not only enhanced the sensitivity of disease detection but also promoted community ownership of health initiatives. This approach facilitated the rapid identification of emerging health threats and facilitated targeted interventions, thereby reducing morbidity and mortality associated with infectious diseases.

Furthermore, a study by Owusu-Agyei *et al.* (2019), examined the sustainability of community-based surveillance programs in Ghana. Their research underscored the importance of continuous training, supervision, and feedback mechanisms to maintain the effectiveness of surveillance networks over time. The study highlighted challenges such as resource constraints and the need for institutional support to ensure the long-term viability of community-led surveillance initiatives. By addressing these factors, the researchers proposed strategies to strengthen community health systems and improve overall public health outcomes in Ghana.

In conclusion, studies on community-based disease surveillance in Ghana have demonstrated its pivotal role in enhancing early detection, response, and control of infectious diseases at the local level. These initiatives not only empower communities but also complement national health systems by filling

gaps in surveillance coverage and fostering a collaborative approach to public health. However, this study focuses on evaluating the community-based disease surveillance system in the central region of Ghana which has not been the focus of previous researchers

Factors Influencing the Implementation of CBSVs Activities

CBSVs perform a lot of functions in their communities including surveillance activities, births and death registration, growth promotion activities, health assessment, defaulter tracing, referral of cases, reporting, drug dispensation, health education, records keeping and many others (Groseclose & Buckeridge, 2017). As a result of their unlimited functions, volunteers cannot be under rated in quality and accessible healthcare service delivery worldwide (Mandyata *et al.,* 2017). A lot of factors influence the work of community-based surveillance volunteers or community health workers in Ghana and beyond. Some of these factors are selection and recruitment processes, incentives, level of education of CBSVs, monitoring and supervision, economic situations and understanding protocols and guidelines. The rest include training and training related factors, knowledge level of community members, work load, health systems functionality and travel and transport (Mremi *et al.*, 2022).

Selection and recruitment processes of CBSVs could influence their work in the community. CBSVs in Ghana are reported that being selected by their community influenced their sense of duty as well as the pride they feel for their role and motivation (Ahorlu, Okyere & Ampadu, 2018). However, if selection is done solely by the health worker, it will bring their spirit down especially in a situation where they are not approved by their community members (Johnson, Schopp, Waggie & Frantz, 2022). According to Ahorlu *et*

al. community support and its involvement in CBSVs selection and monitoring generally resulted in over 90% motivation and performance in Buruli ulcer detection.

Higher levels of education of CBSVs in Kenya were associated with good record-keeping, appropriate use of job aids and appropriately counseling of clients. Although CBSVs with lower level of education were still able to satisfy and convince their clients to adopt evidence-based maternal care practices there were still some concepts they could not explain (Raghupathi & Raghupathi, 2020). CBSVs gained more respect in general if they were able to prescribe drugs. However, sometimes this could lead to community expectations that could not be met. More years of education may lead to better performance but may also lead to a higher dropout rate since they usually leave the community to seek for employment in the urban areas (Guerra *et al.*, 2019).

Monitoring and supervision are key ways of influencing CBSVs performance (Sahal, 2011). It is an opportunity for the supervisor to provide information and instructions, identify areas for improvement, help with problem solving, provide additional training, and encourage the spirit of volunteerism (Hamalaw, Bayati, Babakir-Mina, Benvenuto, Fabris, Guarino, Giovanetti & Ciccozzi, 2022). CBSVs in Ghana found supervision increased credibility and recognition; it made them feel part of the team (Avortri *et al.*, 2019). The ways in which supervision was motivating or demotivating CBSVs was sometimes associated with the skills and attitudes of supervisors. CBSVs in the middle part of Ghana felt de-motivated by the supervision they received (Afari-Asiedu *et al.*, 2018). According to Afari-Asiedu *et al.* (2018), the CBSVs identified the

need for good quality supervision and recommended that supervision increase retention.

The economic context and its influence on the performance of CBSVs were highlighted in a number of studies; they related mainly to livelihoods and willingness to volunteer, and requested compensation for services rendered (Ballard *et al.*, 2021). A lack of financial or material compensation for services rendered could lead to an inability of CBSVs to provide for their family and is particularly seen in areas of pervasive poverty (McGowan *et al.*, 2022). The willingness to become a Community Health Worker (CHW) could be influenced by the wish to earn an income or the hope of being compensated eventually, especially in situations where there is high unemployment or fewer opportunities (Javanparast, Windle, Freeman, & Baum, 2018).

A well-structured training have tremendous impact on CBSVs activities (Merali *et al.*, 2020). Lack of skills of the CBSVs to use effective health education strategies and community dialogue interventions may lead to a lack of compliance with their advice, frustration, and blaming the client to be 'ignorant'. CBSVs reported that training increased motivation and some studies linked training to CHW knowledge and performance (Geldsetzer, De Neve, Boudreaux, Bärnighausen & Bossert, 2017). An 8-day training course for TBAs in Pakistan found that TBAs in the intervention arm showed better performance than untrained TBAs (Kok *et al.*, 2015). The friendly environment of the training centres, the nature of the trainer–trainee relationships and the highly qualified trainers were particularly noted as having a positive impact on the learning process and motivation.

The workload of CBSVs can be described in various dimensions. The vastness of the catchment area, the number of households to be served and their geographic distribution have influence in the work of the CBSVs (Ahorlu *et al.,* 2018). The situation can clearly be seen when the CBSV has a lot of functions to play, with regards to his position in the community such as being the Assemblyman, Community health management committee member *etc.* at the same time (Afari-Asiedu *et al.,* 2018). Various programmes must have innovative ways to reduce the burdens of CBSVs in the communities (McGowan *et al.,* 2022). According to Bordier *et al.* (2021), programme supervisors must evaluate the population to be served and the nature of the terrain of the community before they recruit and assign volunteers. Increasing the number of CBSVs or reducing the size of the catchment area by sharing it with other CBSVs and providing continuous training and supervision have also been beneficial (Hamalaw *et al.,* 2022).

A well-functioning health system including availability of resources and supplies are essential for CBSVs work (Bordier *et al.,* 2021). CBSVs need non-monetary material incentives, including tools and supplies such as bicycles, registers and weighing scales to do their work. Besides, studies showed that for volunteers to be effective, they should have clear operating procedures and guidelines, including clearly defined and demarcated roles and relationships with other relevant health practitioners (Fall *et al.,* 2019). The absence of support from professional health staff due to high professional staff turnover and lack of trust by professional staff and CBSVs have influence of CBSVs activities (Chatio *et al.,* 2019).

Knowledge of Priority Diseases and Events

Focal persons' knowledge of priority diseases and events are paramount for effective disease surveillance and control (Guerra & Acharya, 2019). According to Adokiya *et al.* (2015), efficient and prompt identification and management of cases could be achieved when focal persons have adequate knowledge on the situation they are dealing with. Appropriate knowledge of focal persons on the disease and events also helps to prevent oneself from contracting the condition and accordingly while waiting for resources from the higher levels (Johnson *et. al.*, 2022). The IDSR Technical Guidelines (2017) indicate that the focal persons' knowledge of priority disease should be 80% or more to ensure early case detection and referral.

The priority diseases are many at the facility level. However, at the community level a few of them have been selected for the CBSVs' to monitor and report on within 24 hours GHS (2019). They are measles, AFP/Poliomyelitis, Guinea worm, neonatal tetanus, meningitis, and cholera. The events are births, infant deaths, pregnancy-related deaths, and other deaths. The rests of the events are human illness or deaths after exposure to animals, any person bitten by a dog, or cat, an unexpectedly large number of children absent from school, and any event that causes public anxiety (GHS, 2017a). A thorough review has been made of case definitions and knowledge levels of these priority diseases and events on this subject.

The case definition of measles as a viral disease has been simplified to be used at the community level in the CBSVs' register as follows: Any person with fever and rash (GHS, 2017a). At the facility level suspected case definition is broadened to be defined as a person with generalized maculopapular rash and

fever plus one of the following: cough or coryza (running nose) or conjunctivitis (red eyes) or any person with whom a clinician suspects measles. Knowledge of measles among individuals and groups working in the communities and health facilities has not been stable. They could be high or low depending on time and place of assessment (Silenou *et al.,* 2021).

Studies on the knowledge level of measles show different results across the globe. A cross-sectional study done among United Arab Emirates residents above 18 years indicated that 94% of the population sampled had heard of measles but only 23% had high knowledge of the disease. Individuals with higher educational levels had more knowledge of various aspects of the disease (Ismayl, *et al.,* 2020). In another cross-sectional study on workers attending medical commissioning in Qatar, it was revealed that about 66.4% of the participants had average knowledge of measles while only 22.4% had above average awareness level of measles (Al-zoqari, Alyafei, Omar, Selim, & Singh, 2020) .

In Ibadan, a descriptive cross-sectional study on caregivers with children 6 months to 59 months indicated that about 52% had good knowledge of the main symptoms and signs of measles (Uchendu, Ige & Adeyera, 2019). Furthermore, in Uganda, a study conducted on the knowledge of focal persons for case definitions of priority diseases indicated that as high as 73% of the focal persons could not give the case definition of measles. The low knowledge of measles could affect the sensitivity of the surveillance system at that level to detect measles (Makova *et al.* 2022).

It is expedient to know AFP case definitions as it improves performance in case identifications in all setups (Odoom *et al.,* 2014). Poliomyelitis/AFP

which is caused by polioviruses has also been defined in the CBSVs register as any person who develops sudden weakness in the limbs. However, the facility-level case definition states as, any person under 15 years of age with acute flaccid paralysis or any person with paralytic illness at any age at which the clinician suspects poliomyelitis (GHS, 2019). The knowledge level of focal persons facilitated the eradication of polio in most countries. Fall *et al.* (2019), indicated that a high knowledge of focal persons on case definitions for Poliomyelitis increased an annualized non-AFP Polio rate of 2.8 per 100,000 children under 15 years in 2012 to 3.7 per 100,000 children in 2016 (Masiira *et al.*, 2019). Also in Somalia, a study on the assessment of the Village Polio Volunteer Programme (VPV) shows that there was an increase in cases of detection from 148 cases before the introduction of the VPV programme in 2012 to 279 cases after the introduction of the program in 2015 and from 2012 to 2015 the non-polio AFP rate improved from 2.8 to 4.8 cases per 100,000 persons aged under 15 years (Mbaeyi *et al.*, 2018).

Periodic assessment of the knowledge level of focal persons on AFP condition enables stakeholders to ascertain the knowledge gaps and sustain the strengths of the surveillance system (Alo, *et al.*, 2022) Results in the evaluation of knowledge of community leaders on AFP case detection and reporting in Nigeria posited that about 79 % of the people did not know about the case definition of AFP (Ningi *et al.*, 2018). Also, in Ethiopia, another survey indicated that Community Volunteers' knowledge of vaccine-preventable diseases was suboptimal (Asegedew, Tessema, Perry & Bisrat, 2019). Further, results on the evaluation of the AFP surveillance system in the Mwenezi district

in Masvingo 2018, show 52% of the participants have good knowledge of AFPs (Muzondo *et al.*, 2018).

The case definition of neonatal tetanus must be known in the communities and facilities because, it is a significant cause of neonatal mortalities in developing countries. Mortality rates could be as high as 100% and this makes the disease a priority worldwide (Nakubulwa, Opio, Alekat, Kibetenga & Alaroker, 2022). In the CBSVs register, the disease is defined as any newborn who can such and cry at birth and then, after 2 days, is unable to suck or feed and becomes stiff (GHS, 2017a). The definition is further described at the facility level as any newborn with a normal ability to suck and cry during the first two days of life, and who, between the 3rd and 28th day of age, cannot suck normally, and becomes stiff or has convulsions or both (GHS, 2019). Due to the fatal nature of the disease, it is highly recommended that tetanus diphtheria vaccines must be given to all females within the reproductive age group to offer protection against tetanus and also protect their babies against neonatal tetanus. In addition, all midwives and stakeholders involved in deliveries must be sensitized enough to know the cause and prevention of neonatal tetanus.

In a cross-sectional study in Alexandria among females attending health offices for services, 84% of the women had very poor knowledge of maternal neonatal tetanus (Mehanna, Ali & Kharboush, 2020). In another study in Nigeria, conducted among young women of childbearing age, the majority of respondents representing 64% had poor knowledge of the causes and risk factors for Neonatal tetanus (Adegbenro, Olowookere, Fehintola, Adegbenro & Orioke 2019). In 2017 a study in Western India posited that none of the participants

knew that pregnant women were vaccinated with tetanus toxoid to prevent their newborns against neonatal tetanus. In a scoping review conducted by Wilson et al. (2020), it was concluded that knowledge of neonatal tetanus and newborn care was poor and as such efforts must be made to provide continuous education for the population. Liyew and Ayalew (2021), posited that poor knowledge of neonatal tetanus disease and family structure systems have led to low tetanus vaccination coverage.

The CBSV system played a significant role in the eradication of the Guinea worm and this was through the use of the simplified case definition in the CBSVs register (McGowan *et al.,* 2022). The definition states as follows: any person with worms emerging from any part of the body (GHS, 2017a). The definition used at the facility level is a little more detailed. It states that an individual with a swollen or physical condition (*eg.* blister, boil, subcutaneous lesion, hanging worm) and at least one of the following conditions: the person should have travel link to an endemic area for the past 9 to 14 months, must live in a community which has linked to an endemic community or a case has been suspected and or a patient has a recent confirmed history of having guinea worm (Mremi *et al.,* 2021). The disease has been eradicated. However, surveillance continues (Al-awadi *et al.,* 2014).

Research conducted in Nigeria indicated that local volunteers in the community with indigenous knowledge submitted quite accurate reports of Guinea worm disease in their villages. Among the 164 volunteers, only 2 submitted false reports. However, local health workers who were in a case search were more likely to submit false positive reports (Aikhomu, Brieger & Kale, 2000). Due to strong knowledge-based of Community Volunteers and

intensive community-based surveillance, annual human cases dropped from 3,500,000 in 1986 to 54 cases in 2019 (Rubenstein *et al.,* 2021) . A cross-sectional study conducted in Juba in the Central Equatoria State indicated that about 56% of respondents know the symptoms and the cause of Guinea worm (Sebit Ebead, 2016).

Cholera could be fatal and can spread very fast and affect several numbers of people in a very short time (Otieno *et al.,* 2020). The simplified definition in the CBSVs register state that, any person 5 years of age or more with lots of watery diarrhea and sometimes vomiting profusely as well (GHS, 2017a). In the case of an outbreak, anybody who passes watery/loose stool can be suspected. Similarly, the definition for facility use also indicates that: in an area where the epidemic is not known to be occurring a patient 5 years of age or older presents with acute watery diarrhea and severe dehydration or dies from acute watery diarrhea (GHS, 2019). Recent reports have demonstrated that the annual estimates for cholera infections globally are up to 4 million patients, with up to 143,000 annual mortalities (Otieno *et al.*, 2020). Continuous surveillance and uptake of knowledge on the disease are therefore necessary for prompt identification and management of cases (Plianbangchang, 2018).

Knowledge of cholera varied across different settings (Masiira *et al.,* 2019). A survey conducted in Saudi Arabia, among people living in the Jazan region indicated that people's knowledge about cholera was very poor. About 90% of the respondents believed that the disease is not spread by others (Otieno *et al.,* 2020). Also, a cross-sectional study conducted in the Osiolo community in Kenya indicated that only 53% exhibited a higher knowledge of the cholera disease, although about 93% of them have heard about cholera (Orimbo, *et al.,*

2020). Volunteer knowledge of the disease is key hence the International Federation of Red Cross and Red Crescent Society in Sierra Leone recommends training for volunteers. Emergency appeal report in Sierra Leone indicated that the capacity of over 600 volunteers was built to support the combating of the cholera outbreak (International Fedration of Red Cross, 2016). In Ghana, an assessment of response to the cholera outbreak in two districts namely Akatsi district in the Volta Region and Komenda Edina Eguafo Abriem (KEEA) district in the Central Region revealed that inadequate community knowledge about the disease and its preventive measure are some of the contributing factors of its spread (Ohene, Klenyuie & Sarpeh, 2016).

Cerebro-Spinal Meningitis (CSM) is a bacterial infection that affects the meninges (GHS, 2019). Any person with fever and neck stiffness could be suspected to have CSM at the community level (GHS, 2017a). At the facility levels, the case definition state as follows: any person with sudden onset of fever (38.5) and one of the following signs: neck stiffness, bulging fontanelle, convulsions, altered consciousness, or other meningeal signs (Fall *et al.*, 2019). In the developing world, the fatality rate is near 10% and this makes it more significant to work on (Adokiya, *et al.*, 2015). In January 2020, 409 cases were reported in northern Ghana, and out of these over 40 deaths were recorded. Key resources such as access to health care and knowledge of the disease are always lacking. These cause delay in reporting and management of the disease (Hayden *et al.*, 2013).

According to Hayden *et al.* (2013) lack of knowledge about early symptoms of cerebrospinal meningitis caused delay in treatment which resulted in high morbidities and mortalities of the disease. A study conducted on

travelers from the United Kingdom to the Meningitis belt in Africa shows that about 73% of participants who had been to Africa before, knew the signs and symptoms of meningitis (Goodman, Masuet-Aumatell, Halbert & Zuckerman, 2014). In another study within the Ghanaian meningitis belt, it was realized that about 50% of the respondent understand the role of whether in the cause of meningitis which has implications on transmission, prevention and management of the disease (GHS, 2019). Wulifan, Dapilah & Angko (2022), also indicated inadequate knowledge on CSM diagnosis in cross border towns in the Upper East region in Ghana.

Event based public health surveillance focus on reports, stories, rumors and other information about health events that could be a serious threat to public health (WHO, 2014). Surveillance in the communities on priority events such as maternal and child mortalities, dog bites *etc.* that happen in the communities are to be noted and reported to the health authorities for prompt response (Njuguna *et al.*, 2022). According to the WHO, they are usually unstructured and unstandardized conditions however, a clear description could be assigned to them and reported for prompt action. CBSVs usually live in the communities and could detect these events and report them than the health workers.

The CBSVs knowledge on these events could reduce most of these preventable situations and reduce mortalities and morbidities (Asegedew *et al.*, 2019). A study conducted in Ghana on event-based approach to surveillance posited that CBSVs knowledge improves when they are trained on the event-based surveillance. The report further indicated that 89% of the events detected were reported to the districts within 24 hours while 87% of the reports received by districts were responded to within 48 hours (Merali *et al.*, 2020).

The Theory of the Iceberg Phenomenon

The theory of the iceberg phenomenon has been used in various fields such as, business, education, health *etc.* (Bhopal, 2016). This theory was propounded in the 1920s by Ernest Hemmingway, an American writer who beliefs that a deeper meaning of a story should never be evident on the surface but should shine through your writings implicitly. Hemmingway emphasised that only a tip of the iceberg showed in fiction, your readers will see only what is above the water but the knowledge that you have about your characters that never makes it into the story act as the bulk of the iceberg and that is what gives the story weight. In otherwise, you first read to get the surface meanings of certain statements in the story. but as you reflect on the actions and inactions of some characters in the story, you ascertain a deeper meaning that can affect your attitude.

In business, it has been applied in investigating customer need (Haider, 2009). A complain of one customer on a product could just be the tip of the iceberg, several customers out there may have many of such complains that have not come to the notice of the management (Esmer & Şen, 2021). In the field of education, most especially in a classroom setting one student may raise his hand to express his lack of understanding on a topic. However many other students may have similar problem on that same topic that need clarification (Rogers, 2014).

In applying the concept to health, the theory refers to the idea that majority of the diseases are hidden, like the part of an ice burg that lies beneath the water (McAteer, Elliott & Hannaford, 2011). This means that a case (s) clinician sees at the consulting room is just the tip of the iceberg; there are many

more in the community that have not been reported, not diagnosed or wrongly diagnosed and that need to be explored by the epidemiologist (Last & Adelaide, 2013). In the framework of community-based surveillance system, this theory highlights the importance of actively searching and reporting cases of disease with epidemic potentials, rather than relying solely on healthcare facilities to identify cases. Community-based surveillance systems aim to overcome the iceberg phenomenon by engaging communities in disease detection and reporting more quickly which will ultimately reduce the overall burden of disease (Eritja, *et al.,* 2022).

The theory has been applied in the control of several diseases including Malaria, Tuberculosis, Ebola virus disease *etc.* (Eritja *et al.,* 2021). In Ghana, when a case of any priority diseases is reported at the facility level details of the case is picked and a quick follow-up is made to trace contacts and search for more cases in the community where the case resides for management (GHS, 2019). The community-based surveillance system has helped in the eradication of Guinea worm and poliomyelitis in several countries (McGowan *et al.,* 2022). In Nigeria, the theory was applied in community-based surveillances in detection of meningitis from the consulting room linked to the communities and thereby improving case identification and treatment outcomes (Al-awadi *et al.,* 2014).

The theory has a lot of potential for early warning signs and case search but lacks way of attracting resources for its sustainability (Mora, Rasouli & Ba, 2021). Early detection and reporting of cases by community members themselves is a form of capacity building that must be encouraged (Ohene *et al.,* 2016). In applying the theory some of the recommended actions to improve

implementation and sustaining community-based surveillance systems included the need for ongoing training and support in resource provision and community engagement (Jeyarajasekar & Sivakumar, 2019). Overall, the theory of the iceberg phenomenon highlights the importance of community engagement and active disease surveillance in addressing the burden of diseases. Community-based surveillance systems can help uncover the hidden cases of disease and ultimately improve disease prevention and control efforts (McGowan *et al.*, 2022).

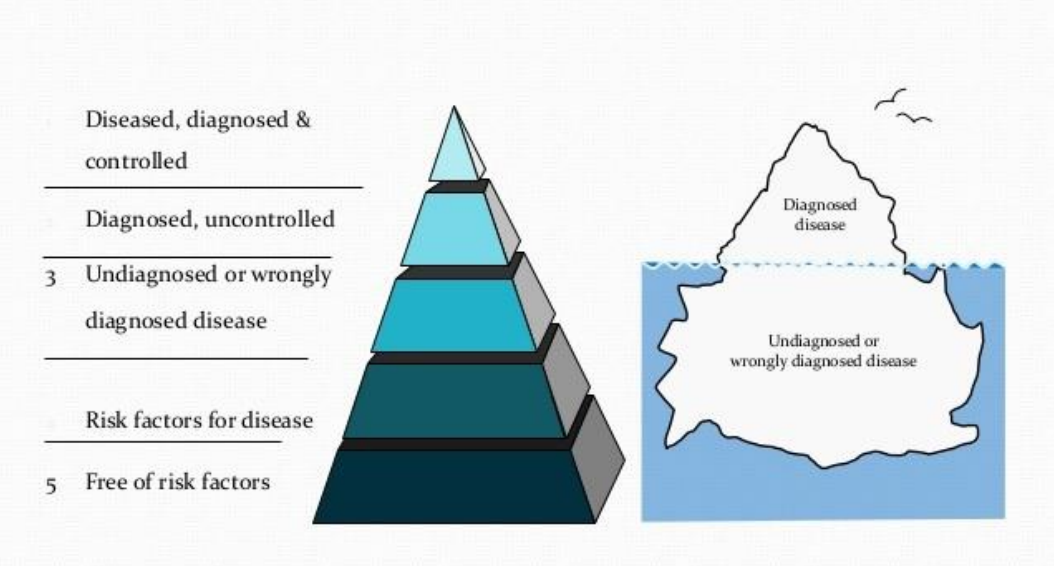


Figure 1: Pyramid and iceberg of disease (Bhopal, 2016).

The Theory of Performance (ToP)

The theory of performance essentially comprises ideas and constructs which form a basis that can be used to describe performance as well as performance improvement (Palmié, Parida, Mader & Wincent, 2023). It was propounded by Richard Schechner in the 1960s. According to Elger (2007), performance comes into play when an individual, group or an institution take complex series of action that integrates skills and knowledge to produce a valuable result. Level of performance depends on six components namely;

context, level of knowledge, level of skills and level of identity. The rest are personal factors and fixed factors (Egler, 2007). In addition, the theory explains that three axioms are proposed for effective performance improvement and these are performer's mind set, his emersion in an enriched environment and his ability to engage in a reflective practice. The components of the theory of performance could be used to explain CBSVs performance in the communities.

The level of identity as an element in the theory of performance is when the individual or the group assumes a status and develops to the extent of cultivating a key interest to identity itself to the organisation. For instance, a situation whereby an individual identifies himself as a CBSV to support the Health Sector to provide health services in the community. However hard the work is, he will be there to support and here, he is described as being matured or loyal to Health Sector in providing community-based disease surveillance services. At this point, the CBSV develops an inner motivation and satisfaction that drives him to work towards the surveillance goals of the health sector.

Next is the level of skills the individual has in making assumptions, setting goals and objectives and being able to humble enough to handle situations in an objective and tactful manner as he works. The CBSVs need a lot of skills in order to attain a high level of performance. They must have the ability to predict the outcome of a suspected disease based on the case definitions of the disease in question. The CBSVs are said to have high level of skills when they are able to identify a priority condition and know the immediate action he should take while informing the health authorities their technical support. Priority conditions occur due to negative lifestyle of some community members and it is the duty of the CBSVs to interact with such community

members to change their negative lifestyle to positive behaviors, and the CBSVs must be very tactful in dealing with such situations (GHS, 2019).

The knowledge level involves facts, information, concepts, theories and principles acquired by a person or group through experience or education. These skills must be recognised and should be communicating as the person works (Mehanna *et al.,* 2020). The CBSVs have been trained and provided with simplified case definitions on priority diseases. The simplified case definitions guide them to suspect cases and refer for prompt response to prevent outbreaks. Continuous provision of facts and information on priority conditions improves the knowledge level of the CBSVs to perform efficiently (WHO, 2015). It is also expected that as the CBSVs work, they gather more experiences which eventually improves their knowledge level.

Context of performance is also one of the components to consider. It comprises variables associated with the situation that the individual or the organisation performs (Palmié *et al.,* 2023). The CBSVs work their communities with the health workers. Their ability to function and perform effectively depends on the organisation of the community in which they work. When the leaderships structures are good, it would facilitate the work of the CBSVs. However, when the structures are poor their performance may be declining (Amegayibor, 2021). Also, the CBSVs need a peaceful environment to perform. This will enable them to feel free to enter houses and carry out their duties. Moreover, the CBSV will work efficiently in a context where there is mutual respect between the community members, the health sector and the CBSVs (McGowan *et al.,* 2022).

Another element is personal factors. These are related to personal circumstances individuals find themselves that could affect their performance. CBSVs who have disabilities or sicknesses that prevent them from walking or talking, produce poor results (Kante & Krishnan, 2023). According to Grinza and Rycx (2021) illness of an employee greatly reduces firms productivity, especially, when the worker absent himself and his work interrelates with other staff in the firm. Similarly, (Li, Liu, Zhaug & Haung, 2022) posit that aging negatively affects working memory capacity and task performance of an employee. In this case, a CBSV who is old may not be able to provide effective surveillance activities in times of epidemics. Educational level of an individual also affects his performance. A CBSV who cannot read and write will find it difficult to document all suspected cases and refer them appropriately. Fadihah (2019) indicated that educational background has a positive and significant effects on employees' performance.

The final component is the fixed factors. These include features that are exclusive to the individual and cannot be changed. For instance, features like sex and ability to communicate impact on performance. A female CBSV may feel very threatened working alone in a male dominated environment. A study on employees in Multinational National Cooperation in Nigeria indicated that sex role expectations have a significant influence on perceived work performance (Ekore & Attah, 2007). In another study in Ghana, Amegayibor (2021), suggested that demographic factors like sex, age and tenure impact employees performance. An effective communication on every business entity has a great influence on employees' performance. Thus CBSVs who are able to

communicate very well to their community members have a positive outcome on their performance (Novita, Clara & Dewi, 2023).

The components of the performance theory are very significant and could be used to improve performance in varied sectors. These factors interact to ensure high level performance of an individual, group or an institution. Inner motivations facilitate an employee to be very committed to an organisation and improves performance. Individual performance is enhanced when he is very skillful and knowledgeable in what he does. It is also worthy to note that the environment and the circumstance an employee finds him or herself can affect their output. Employees work better in a peaceful and respectful environment. One cannot work and produce good results if he or she is sick and old hence, all health collaborators must work towards improving the above components of theory of performance to improve health outcomes.

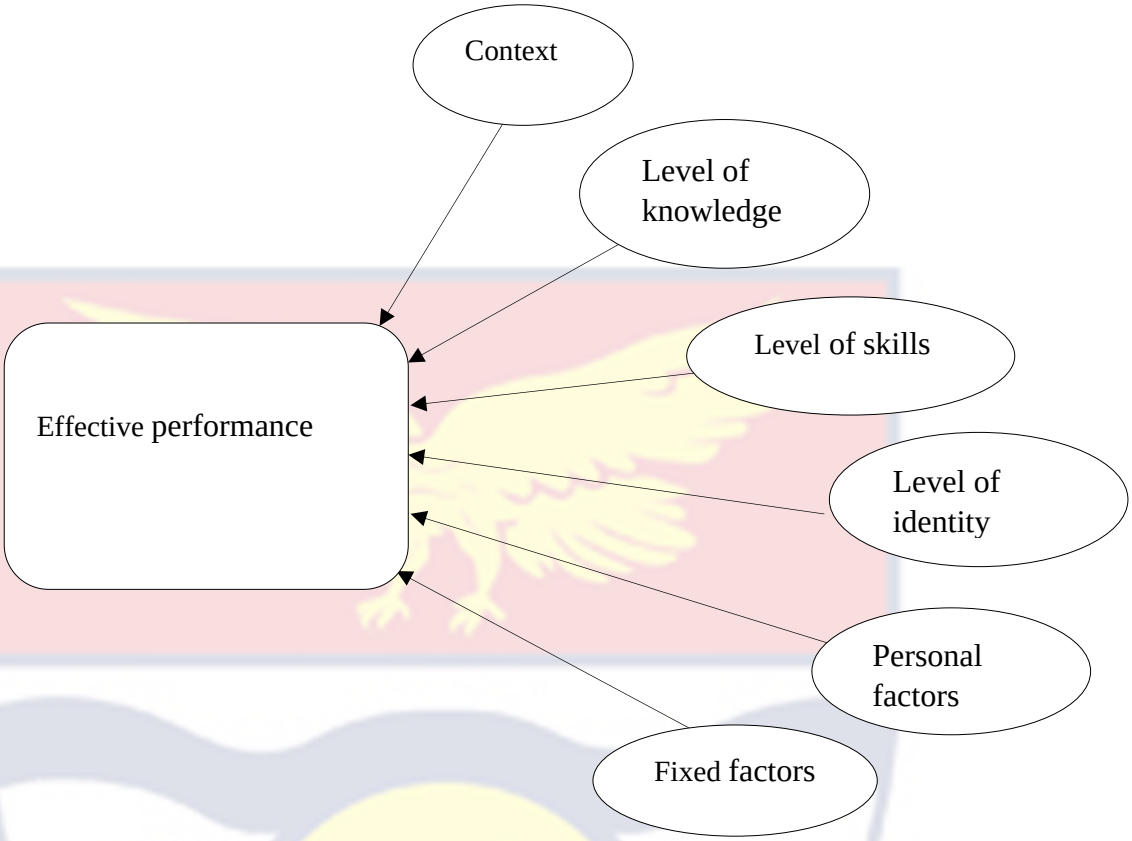


Figure 2: Components that interact to establish level of performance (Elger, 2007).

Context Input Process Product Model (CIPP)

The Context, Input, Process and Product (CIPP) evaluation model was propounded by Daniel Stufflebeam in the 1960s (Santiyadnya, 2021). The model is very useful in the evaluation of education and health programmes (Aziz, Mahmood & Rehman, 2018). It provides a very practical way of examining many different aspects of curriculum development processes. According to Stufflebeam (2007), the model concentrates on four areas of a programme and these areas are often combined to evaluate a programme. The four areas are context, inputs, process and product. These areas must thoroughly be examined and use for effective evaluation of a programme.

The context within which the programme was carried out must thoroughly be examined. The context includes the programme goals, objectives

and policies that support the vision of the institution, relevant environment and needs, opportunities and problems (Santiyadnya, 2021). In the area of community-based surveillance system, the service setting in the community has an overall goal of reducing morbidities and mortalities through early detection and referral of priority disease in the community (Gyamfi & Adjei, 2013). The IDSR technical guidelines contains a brief policy guidelines mission and vision of the community-based surveillance system. The context must be explained very well to all relevant stakeholders who will then internalise them and support in their implementation (GHS, 2019).

The inputs component of the model talks about the plan, resources and infrastructure that can be used to achieve the programme's goals and objectives (Aziz *et al.*, 2018). The CBS programme must have an action plan for the community that has all the details of resources that will be used (Adokiya, *et al.*, 2015). The plan must also contain all relevant stakeholders who will be available to provide support. All the resources and infrastructure for the CBSVs activities should be listed and provided for smooth implementation of the surveillance activities in the communities (Fall *et al.*, 2019). Furthermore, there should be a budget component which states the cost of activities and resources (Mandyata *et al.*, 2017). It is expected that in the evaluation of the CBSVs programme inputs that are used are thoroughly examined and evaluated (Ng'etichi, Voyi, Kirinyet & Mutero, 2021b).

Process evaluation serves to concentrate on strategies and activities carried out that will be accounted for by individuals (Nurjono *et al.*, 2020). This is done through monitoring areas that can potentially cause failures. In the community-based disease surveillance, the CBSV has the responsibility to carry

out case search on the priority diseases. They are also to detect, register, report, investigate and provide feedback to the communities and the health sector (Kweku *et al.*, 2020b). The evaluation process is significant since it has a direct impact on the outcome of the surveillance goals. Thus, in evaluation of surveillance system, the processes and methods must not be underestimated (Solnes *et al.*, 2019).

Product evaluations measure and interpret achievement of results, values skills and attitude. It is conducted during and after the programme to know its impact, effectiveness, sustainability and transportability (Aziz *et al.*, 2018). The surveillance systems outcome indicators must be examined and evaluated. In the case of community-based disease surveillance, timelines and completeness of reporting are very significant. In addition, the CBSVs ability to use the reporting tools by documenting all finding in the register and having the skill to work within the culture and traditions in the community will be much expected (Ng'etich *et al.*, 2021).

The model has widely been used by different expert to evaluate various programmes from different field. It was used by Aziz *et. al.*, (2018) to evaluate educational quality at schools in Islamabad and the results indicates that schools have advance effective communication processes and relevant courses but teachers focus more on theoretical work and rote learning which put pressure on students and had negative effects their intellectual abilities. It can also be adapted and used in evaluation of surveillance programmes in general and specifically at the community level (Tokmak, Baturay & Fadde, 2013).

In the implementation of surveillance activities, the programme must have a goal, clear objectives which have political and legal backing with reference documents and standard operating procedures and this could be describe as context of the programme (GHS, 2017). The inputs in surveillance could be attributed to the provision of registers, volunteers, communication equipment, funds, reference documents etc. The process evaluation attributes with reference to surveillance could be training, monitoring, supervision, reporting, investigating, data analysis and feedback (Njuguna et al., 2022). The final quality attributes such as completeness of reporting, timeliness of reporting, reduction of disease will be the product evaluation indicators (Ningi et al., 2018). The model has objectivity in focus but lacks flexibility to address emotional issues that may come up during evaluations.

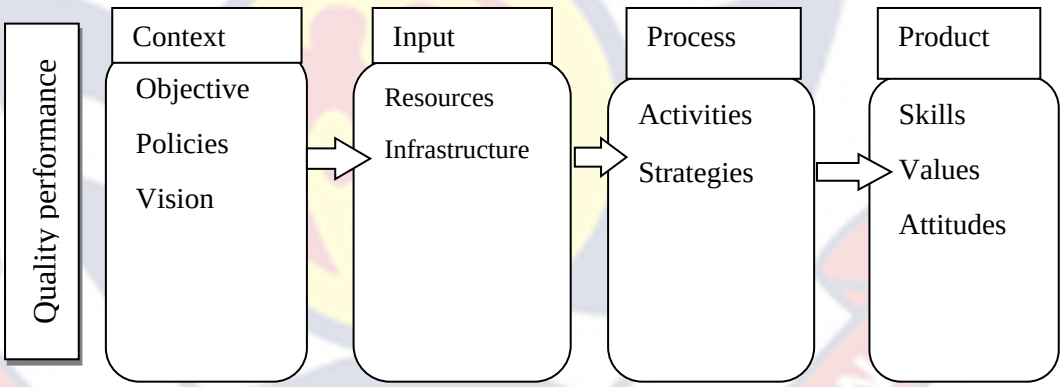


Figure 3: CIPP model for quality performance **(**Aziz *et al.*, 2018)

WHO Framework for Monitoring and Evaluation of Surveillance and Response System

The framework was prepared by the WHO in 2004 to help public health practitioners and countries to constantly review their performances in detecting and responding to communicable diseases and events (WHO 2004; WHO, 2006). It has been used in the monitoring and evaluation of surveillance systems in countries, regions and districts (Reintjes, Thelen, Reiche & Csohan, 2007).

Hamalaw *et al.,* (2022) used the framework to evaluate the surveillance and response system in Saudi Arabia. The same principle was used by Fall, to assess timelines of reporting of community-based surveillance and notification system in Nigeria (Fall *et al.,* 2019). The components of the framework are: surveillance system structure, surveillance core functions, surveillance support functions, surveillance quality functions and priority diseases for surveillance (WHO, 2006).

The surveillance system structures provide the surveillance system with laws and regulations that governs the surveillance system (Ezenyeaku, *et al.,* 2020). The WHO makes it mandatory for countries to apply the IHR 2005 contents to govern notifiable diseases and other communicable disease of public health importance at all levels (Fall *et al.,* 2019). The system structure also offers strategies for surveillance activities at all levels which depend on the priority diseases and conditions under surveillance (Senyonjo *et al.,* 2021). It helps in the development of objectives and plans for effective monitoring and evaluation. When clear rules and guidelines such as registers, case definitions and Standard Operating Procedures (SOPs) are provided to focal persons and they are continuously updated, ethics are always maintained to improve performance (Njuguna *et al.,* 2022).

Implementers and stakeholders are also considered under surveillance system structures. The WHO recommends for integrated disease surveillance systems which requires effective stakeholder collaboration (Bordier *et al.,* 2021). The Ghana Health Service, private health institutions, international organisations and the community collaborated in the past three decades to eradicate Guinea worm in Ghana (Merali *et al.,* 2020). Within the health sector,

it is also important for various units and departments to work together to achieve a common goal. Various surveillance networks and partnerships exist between countries. The laboratory and digital networks are good example of a country level networks services supporting implementation of surveillance activities (Silenou *et al.,* 2021).

Surveillance core function is another key component of the WHO framework for evaluating surveillance system. At each of the levels, surveillance focal persons are mandated to detect, register, investigate and report priority diseases and events. They are also trained to analyse reports and interpretate data, carry out response and control measures and provide feedbacks to the community. Detection of diseases and events need special knowledge and skills on the priority diseases and events. It is recommended that surveillance focal persons are given case definitions on priority diseases and events to guide them in their operations (GHS, 2017).

Appropriate recordings on priority diseases are a core function for the surveillance focal persons. There should be availability of surveillance registers and forms that must be filled correctly and kept safely by the focal persons (WHO/AFRO, 2017). Recording and provision of registers must be monitored and evaluated at least every year at all levels. Reported cases are expected to be investigated and confirmed timely- between 24-72 hours by an appropriate person and by a recommended laboratory (Ningi *et al.,* 2018). All priority diseases and events identified are expected to be reported within 24 hours to next level of reporting using the appropriate reporting forms (Fall *et al.,* 2019). Recording and reporting of priority diseases must be evaluated monthly at the community levels and quarterly at the facility levels (GHS, 2017).

Data analysis and interpretation, responding to outbreaks and providing timely feedback require special attention from focal persons. Routine data gathered need proper and timely analysis at each level for decision making (Njuguna *et al.*, 2022). The data gathered must be analysed by person, place and time. There should also be plans to address emergencies. These plans should aim at strategies to addressing priority diseases, budgeting and stating sources of funds and also ensuring availability of emergency drugs (Mandyata *et al.*, 2017). Finally, on the core functions, presence of feedback mechanism strengthens the surveillance system. Bulletins, daily, weekly, monthly or quarterly reports are sent to the next lower or higher levels to disseminate information (Hamalaw *et al.*, 2022).

Another key component of the framework is provision of supportive function. This includes; standard guidelines, training, supervision, communicating facilities, resources, monitoring and evaluation and coordination (Njuguna *et al.*, 2022). Supportive functions are described as fuel to facilitate the surveillance work. Provision of adequate supportive function is enough motivation to focal persons (Saleh Saleh, Kitau, Konradsen, Mboera & Schiøler, 2021). Mandyata *et al.* (2017), indicated that adequate support should be provided for focal persons to deliver especially under developing countries where resources in all forms are constraint.

Standard guidelines, training and supervision are key supportive functions that facilitate the implementation of the core surveillance functions (Sahal, 2011). A comprehensive standard guideline that defines priority diseases and events, standard case management protocols and standard operating procedures are paramount (GHS, 2017). These guidelines should be

updated periodically to existing disease conditions and must be available at all levels. There must be availability of surveillance training manuals at all facilities (Ng'etichi *et al.,* 2021). Training plans must also be developed for surveillance work at all levels. This will ensure that staff capacity is built for effective surveillance work. It is recommended that at least every two years, there should be refresher training for surveillance focal persons and supervision must be conducted according to plan. Focal persons should be evidence of such actions at all levels (McGowan *et al.,* 2022).

Resource mobilisation and communication facilities are essential for efficient performance of surveillance focal persons (Kok *et al.,* 2015). The world is becoming a global village, coupled with the emergence of new diseases with new strategies to deal with them. Thus, more resources such as communication facilities and computers are needed to ensure effective communication (Masiira *et al.,* 2019). It is also recommended that all facilities must have plans and budgets for surveillance resource (McGowan *et al.,* 2022). Stakeholder involvement is the key to effective resource mobilisation (Bordier *et al.,* 2021).

There should also be coordination, monitoring and evaluation of surveillance activities as a way of supportive function (Ezenyeaku *et al.,* 2020). For the effective implementation of surveillance plans and activities, there must be an excellent coordination between the implementers and other stakeholders (Saleh *et al.,* 2021). Monitoring plans must be available and should be carried out quarterly at the district and facility levels. Periodic evaluation should also be carried out to ensure whether surveillance objectives are being met or otherwise (Hamalaw *et al.,* 2022). It is also recommended that monitoring and

evaluation feedbacks are completed and disseminate timely enough for prompt decision making at all levels (Mremi *et al.*, 2022).

Surveillance quality functions are attributes such as completeness, timeliness, usefulness, sensitivity and positive predictive value. The rest are specificity, simplicity, flexibility, representativeness, acceptability and reliability. These are related to the use of data capturing tools and reporting (Adokiya *et al.*, 2015). The surveillance data, reporting forms and sites expected to report at a particular point in time must be complete to facilitate meaningful analysis and decision making (Ningi *et al.*, 2018). Zero reporting is very important as it indicates continuous case search and data review. Reporting should also be timely in order to be useful (Issahaku *et al.*, 2020). It is recommended that completeness and timeliness of reporting should be 80% or more at all levels to meet the national standards (GHS, 2019). Surveillance data could be used to detect early warning signs and support routine programme monitoring, hence, efforts must be made to evaluate how surveillance data is used for planning (Kuehne *et al.*, 2019).

The ability of the surveillance system to be flexible, sensitive, simple and acceptable to the surveillance focal persons and stakeholders cannot be underestimated (Fall *et al.*, 2019) . The surveillance system should be adoptable to changing needs, be sensitive to detect unusual events and tools, must be simple to use and be acceptable by the user. It also requires that surveillance data must be reliable and should be able to use to predict outbreaks and response actions (Barry *et al.*, 2021). Surveillance evaluators should be able to study these quality functions and evaluate them at the appropriate time at the appropriate levels (McGowan *et al.*, 2022).

Priority diseases for surveillance are also to be considered during the evaluation of surveillance system (Mremi *et al.*, 2021). These conditions and events differ from country to country. In some countries there are some regional priorities (WHO, 2017). Currently Ghana has 44 priority conditions and events. These are reported at the CHPS, Sub-district and District levels on weekly basis (GHS, 2019). At the community level, six priority diseases and six events are expected to be reported within 24 hours when they are identified. The diseases are meningitis, acute flaccid paralysis, Guinea worm, measles, neonatal tetanus and cholera and the events are births, infant deaths, pregnancy related deaths and other death. It is also expected that all unusual events are reported to the nearest health facility (GHS, 2017a).

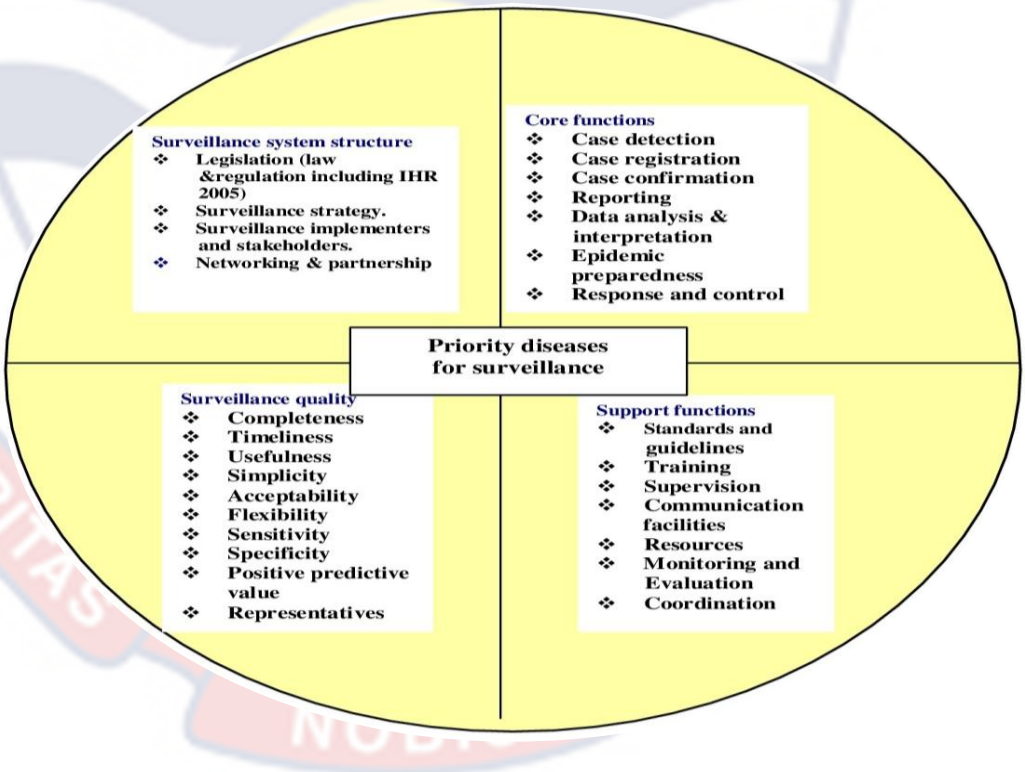


Figure 4: WHO framework for monitoring and evaluation of disease surveillance system (WHO, 2006)

Conceptual Framework of the Study

Literature was reviewed on various research works, theories and models. Upon careful studies, the following models and theories were selected to explain the study: the theory of the iceberg phenomenon, the theory of performance, the CIPP model and the WHO framework for monitoring and evaluation of disease surveillance systems (Bhopal, 2016; Palmie *et al.,* 2023; Aziz *et al.,* 2018; WHO, 2006). The theory of the iceberg phenomenon was used to explain the basis and the need for community-based surveillance, while the theory of performance brings to bear the components of performance system which clarifies levels of performance and performance improvements to help us to understand the performance of CBSVs. The CIPP model is an evaluation model describes the general areas to consider during evaluation of a programme. It highlights the importance of evaluating goals and objectives, resources provided, activities conducted and monitoring of results and outcome of a programme (Palmié *et al.,* 2023). The WHO framework describes the key elements needed to be considered when evaluating surveillance system (WHO, 2006). However, the CIPP model and the WHO framework for evaluating surveillance system were adapted to construct the frame work for this study. Figure 5 depicts the framework for this study.

The explanation of framework for the study begins from the point where the health workers, for that matter Ghana Health Service and the opinion leaders in the communities, conceive the idea to establish community-based surveillance system (GHS, 2019). The team therefore orient themselves with the objectives, goals, guidelines, standard operating procedures and laws and regulations that govern the surveillance system. The CIPP model describes this

stage as context, while the WHO frame work for evaluating surveillance system explains this part as surveillance system structures. The IDSR technical guidelines indicates that the surveillance volunteer must have reference documents that contain enough information to guide his operations. Hence, this study assessed the availability of community registers and reporting forms in each of the communities.

Next on the framework is where the health worker and the opinion leaders provide inputs or supportive functions as described by the CIPP model and the WHO framework for evaluating surveillance systems respectively. The supportive functions include training, communication materials, motivation, supervision, monitoring, evaluation, coordination and other needed resources (Adokiya *et al.*,2015). The framework indicates that the provision of effective systems structures/context and inputs/supportive functions increase the knowledge level of the CBSVs to perform their core mandates (Saleh *et al.*, 2021). The study sought to ascertain the extent the CBSVs receive supportive functions. The extent at which focal persons at various levels perform each of the supportive function variables to the CBSVs was studied and opinion leaders' perception on CBSVs activities in the community was also considered.

When the CBSVs are provided with the inputs they perform their core functions/processes or activities very well (Fall *et al.*, 2019). These activities are described as case detection, registration, confirmation and reporting. The rest are data analysis and interpretation, epidemic preparedness, response and control and feedback. In this study the community register will be reviewed for number of priority diseases identified, recorded and reported by the CBSVs

(GHS, 2019). Also, CBSVs' interaction and experience on epidemic response and number of feedbacks provided or received will be reviewed (GHS, 2017).

The CBSVs' performance on the core functions are finally measured through their ability to improve on the quality functions/product which is the outcome of what we seek to achieve (Mremi *et al.*, 2021). These are completeness of reporting, timeliness of reporting, usefulness of surveillance data, acceptability of the surveillance system, simplicity of the system and flexibility of the system (GHS, 2019). A higher timeliness and completeness reporting rates provide a good basis for prompt decision making (Ng'etichi *et al.*, 2021). Hence, the study assessed the extent of improvement in the quality of performance using these and other variables of quality surveillance functions.

The knowledge level of CBSVs on the priority diseases and events and the regulations and guidelines are improved when training and other resources needed for the work are provided (Kallay & Eggers, 2021). The expectation is that CBSVs have high knowledge on all the priority diseases and events. The knowledge is centered of the case definitions of the priority diseases and events (Kuehne *et al.*, 2019). Thus, the knowledge level of CBSVs on case definitions on all the priority diseases and events in the CBSVs register will be assessed. Studying and considering each of the components of the framework gives a comprehensive evaluation to the entire community-based surveillance system however, this requires a lot of time and resources (Mandyata *et al.*, 2017).

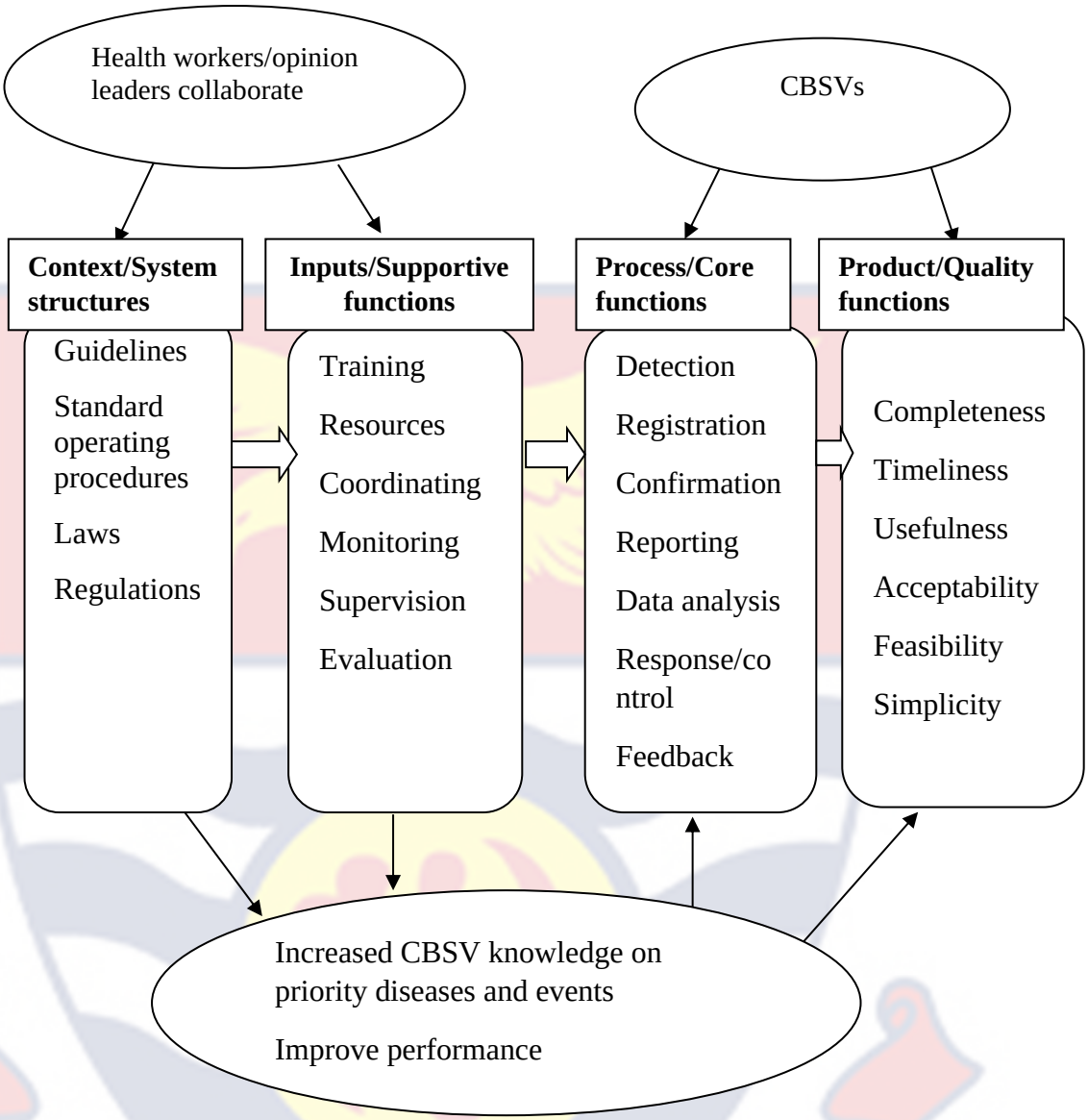


Figure 5: A conceptual framework for evaluating the CBS system.

Source: Author's construct

Chapter Summary

This chapter reviewed the related literature on the subject of study. Concepts of community and disease surveillance, history and activities of CBSVs in Ghana and factors influencing CBSVs system were examined. There were also reviews on the knowledge level on priority diseases and events. The theory of the iceberg phenomenon was used to explain the basis and the need for surveillance. The theory of performance brought to bear the components of an effective performance system. The CIPP model was reviewed to consider evaluation of programme and finally the WHO framework described the key elements needed to be considered when evaluating surveillance system. The CIPP model and the WHO framework for evaluating surveillance system were adapted to construct the frame work for this study. Components of the framework were used as the basis for the development of this research.

CHAPTER THREE

RESEARCH METHODS

The purpose of this study was to evaluate the CBSVs system in the Central Region of Ghana. It also sought to examine the knowledge level of the CBSVs on case definitions of priority diseases, health events and their performance on the core and quality surveillance functions in the communities. The study also explored the extent the surveillance focal persons at district, sub-district and CHPS levels performed their supportive surveillance functions to the CBSVs system. The opinion leaders' perceptions on CBSVs performance were also ascertained. This chapter presents the methodology for the study. It discusses the study design, study area, population, sampling procedures and the data collection instruments used. The chapter also details data collection procedures, data processing and analysis and finally the summary of the chapter.

Research Design

The study used the mixed methods approach. The convergent mixed method was adopted because it helped in answering the research questions more fully and gave an in-depth understanding of the phenomenon and questions under study (Ezenyeaku *et al.*, 2020; Alemu *et al.* 2019). This method was used so that the results of the opinion leaders' perception could be used to support the findings from the extent at which CBSVs receive support from the facility focal persons. Ng'etich *et al.*, (2021) used the mixed method in the evaluation of surveillance system attributes in Kenya. Shorten and Smith (2017) posits that blending quantitative and qualitative methods of research gives a final product which can highlight the significant contribution of both methods. Nevertheless,

more time and resources were invested to complete this kind of research (Fraenkel, Wallen & Hyun, 2015).

Considering the nature of the phenomenon under study, a cross sectional design was used to ensure that both quantitative and qualitative data were collected at one point in time to answer the research questions (Ng'etich *et al.,* 2021). The quantitative research method was used to assess the knowledge level of CBSVs on priority diseases and events and the level CBSVs and the facility focal persons perform their surveillance functions. It was also used to ascertain the differences between CBSVs performance in the coastal and forest areas, and urban and rural areas. The cross-sectional study has varied strengths. Fraenkel *et al.* (2015) posits that, in cross sectional surveys, a wide range of data are collected on people's characteristics to make sound generalization. It helps to make health-policy decisions. Hence, this design was appropriate because data were collected from a large number of CBSVs and other surveillance focal persons. However, a key weakness of the cross-sectional study was that, it could not distinguish between a long standing and newly occurring situations.

The qualitative approach was employed, using the interview guide as a means to collect data from the opinion leaders. The essence was to know their perception about factors affecting CBSVs activities in the community. The views of the opinion leaders are very important because they are major stakeholders in community surveillance system (Gao *et al.,* 2022). The opinion leaders are influential and could be used as change agents and resource persons in the community. The qualitative method therefore has a greater potential of explaining the reality more fully (Ng'etich *et al.,* 2021).

Study Area

The study was carried out in the Central Region of Ghana. The region shares border on the East with the Greater Accra Region, on the North with Ashanti Region and on the North-East with the Eastern Region and on the West with the Western Region. The region has 22 administrative districts, 112 sub-districts, 343 functional CHPS compounds and 2, 232 communities (GHS, 2021; GSS, 2021). About 51.8% of the region is rural (GSS, 2021). However, in this study about 80% of participants were from rural and forest while 20% were from the urban and coastal areas. From the 2020 population census, an estimated population of 2,989,594 was projected for the year 2023, with an annual growth rate of 2.4%. The population of children between 0-11 months constitutes 4% of the total population which stands at 119,598. Below is the Map showing the 22 districts.

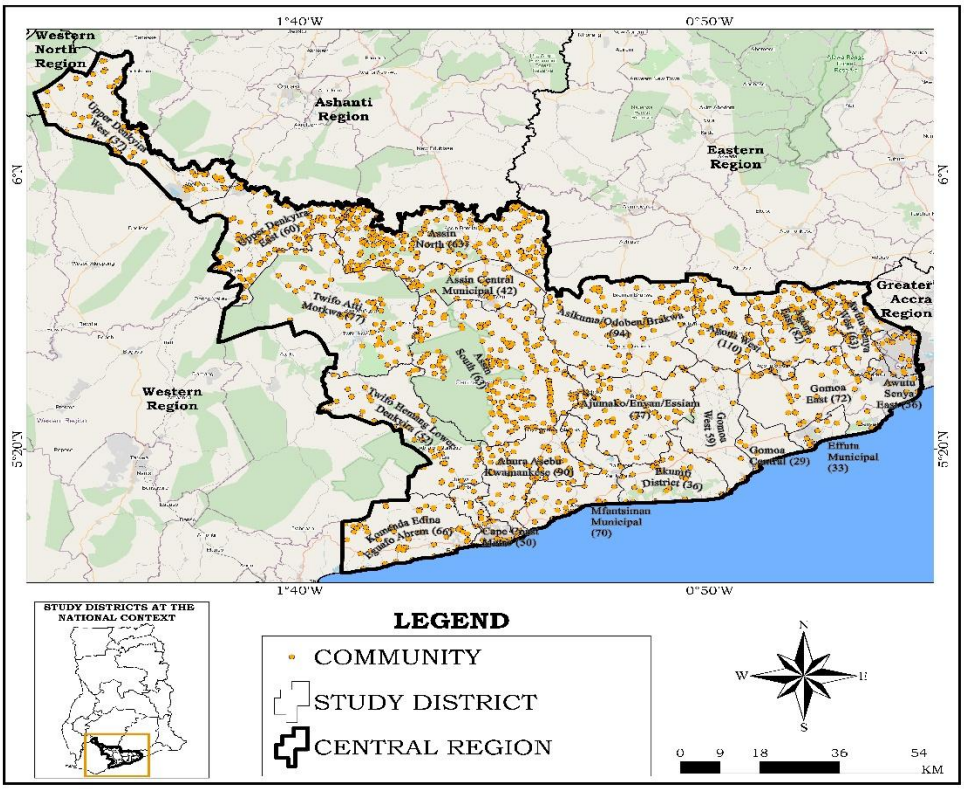


Figure 6: Map showing the 22 districts and the selected communities for the study

The region is characterized by two main rainy seasons in a year. The major rainy season occurs in the months of April to July, peaking in June. The mean monthly temperature ranges from 24°C in the coolest month (August) to about 30°C in the hottest months (Baah, 2018). The major rainy season peaks in October and spans the months of September to November. The vegetation is divided into dry coastal savannah stretching about 15 km inland, and a tropical rain forest covering hinterland areas (Feurer, 2013). There is one forest reserve, the Kakum National Park which is located at about 25km from Cape Coast in the Twifu Hemang Lower Denkyira District (GSS, 2021).

Akans predominantly constitute more than 82% of the population. The majority of the Akans are Fantes, the indigenes of most districts in the region. The region is endowed with rich cultural events including annual festivals such as Aboakyir, Fetu Afahye and Bakatue. An international festival, the Pan African Historical Theatre Festival (PANAFEST) is hosted every two years by the region. The monuments attract tourists and other travelers who wish to discover the historical links between Africa and the Americas and Europe originating from the Trans-Atlantic slave trade. This makes the region one of the key tourism centres in Ghana with a rich wealth of beaches, forts and castles and festivals. The presence of these monuments attracts a lot of people to the region which calls for continuous disease surveillance to ensure good health in the area.

Historically, Central Region was the former administrative center of the Gold Coast. Its capital, Cape Coast, with the local name Oguaa, was the capital of the Gold Coast until 1877, when the capital was moved to Accra (Ministry of Local Government, 2023). The region was the first area in the country to

make formal contact with the Europeans. This is why it is endowed with historical monuments such as forts and castles. The renowned ones are the Cape Coast Castle in Cape Coast, the Elmina Castle and Fort Sao Jago both in Elmina, the Fort William at Anomabo and Fort Good Hope at Senya. It was in the castle of Cape Coast that the historic Bond of 1844 was signed between the British and the Fante Confederation (GSS, 2010).

The main occupation in the region is agriculture and fishing which employs more than two thirds of the work force in the region. Cocoa and oil palm production are concentrated at Assin North and South, Twifu Hemang Lower Denkyira and Upper Denkyira East and Upper Denkyira West Districts. Other major agricultural enterprises include pineapple and grain production. Fishing is concentrated mainly in the coastal areas. This study revealed that about 58% of the CBSVs were farmers and 16% were traders.

The physical features and the vegetation in the region are remarkable. The region can be broadly divided into two: the coast, which consists of undulating plains with isolated hills and occasional cliffs characterized by sandy beaches and marsh in certain areas and the hinterland, where the land rises between 250 meters and 300 meters above sea level (GSS, 2021). The region lies within the dry equatorial zone and the moist semi-equatorial zone. Annual rainfall ranges from 1,000 mm along the coast to about 2000 mm in the interior. The wettest months are May to June and September to October while the drier period occurs in December to February and a brief period in August.

Population

The study used CBSVs, facility surveillance focal persons and community opinion leaders. The study population included CBSVs working on surveillance and lives in the communities. All other volunteers, for example fire volunteers were excluded. Facility focal persons who work on surveillance at the CHPS compounds, sub-districts and districts levels in the public health facilities were included in the study. Private facilities were not part of this study. This is because the private facilities are supervised by the public facility focal persons hence, the needed information could be gathered from them.

The role of the CBSVs in the community is to detect priority disease and report to health authorities. The CBSVs also educate the community members and organise them to participate in health programmes. The key task of the focal persons is to provide supportive supervision to the CBSVs. They also compile summary report from the CBSVs and report to the next higher level. The region has 2, 232 communities and each community should have a CBSVs, hence a population of 2, 232 CBSVs were estimated (GHS, 2021; GSS, 2021). The population for the surveillance focal persons at the CHPS compound, Sub-districts, and the districts levels were, 343, 112 and 22 respectively (GHS, 2021). Thus, a total of 477 surveillance focal persons were also estimated. In addition, a population of about 105 opinion leaders were estimated to be actively involved in the CBSVs work and reside in areas where the CBSVs operate (GHS, 2021). It is the duty of the opinion leaders to supervise and support the CBSVs in their surveillance activities in the communities. The opinion leaders are also part of the Community Health Committee at the CHPS zones. In the assessment by Sahal (2011), on communicable disease surveillance in

Khartoum State, Sudan, he considered all the levels of the Primary Health Care system. Hence, this study involved all the surveillance focal persons in the surveillance structure.

Among some of the characteristics of respondents recorded by this study were as follows: Out of the 1381 communities sampled, 65% (n=898) of the communities had CBSVs whiles 35% (n=483) had no CBSVs, with the main reasons that they have stopped work, travelled *etc*. The CBSVs in the 898 communities were interviewed to assess their knowledge levels on priority diseases, performance on their core and quality functions etc. For the 483 communities that had no CBSVs, further questions were not asked, after it was reported by the CHN that there was no CBSVs. However, it was a good finding to be on records that 35% of the communities in the Central Region had no CBSVs. About 68% (n=612) were males and 32% (n=286) were females.

More than 50% (n=530) of the CBSVs have lived in the communities for more than 20 years. This is an indication that, the CBSVs are qualified to be selected and work as surveillance agents (GHS, 2019). The results further indicated that 31% (n=329) of the CBSVs were 50 years and above. The highest age was 82 years with the lowest being 20 years. This is an suggest that ageing volunteers could be a problem and that could affect the work of CBSVs (Grinza & Rycx, 2021). The selection of the volunteers was mostly done by the communities which recorded 61% (n=547) and 30% (n=269) were selected by the health workers. The rest were selected by NGOs and in some areas, the CBSVs self-selected him or herself to work. The study further revealed that 78% (n=700) of the CBSVs were trained before they started but 22% (n=198) were

not trained which is fairly good when compared with the national standards of 80% (GHS, 2019).

The study revealed the following characteristics of the opinion leaders. All the opinion leaders have been involved in the CBSVs work for more than 8 years. Males dominate the respondents interviewed. Fifteen (15) representing about two-thirds, out of the 22 respondents were males, females were 7. The age of respondents ranged from 37 years to 80 years. About 14 of the respondents were more than 50 years. Only one respondent was below 40 years. About 15 representing two-thirds of the respondents attained JHS/MSLC levels, 6 had completed SHS and 1 had Diploma. None of the respondents had bachelors and postgraduate degrees.

The opinion leaders had varied primary occupations. About 11 of the respondents representing half of them were farmers, five (5) were traders. Two (2) respondents were on retirement and one (1) each was a mason, herbalist, an Assemblyman and an electrician. Most of the respondents were predominantly Christians. It is worthy to note that 21 out of the 22 respondents were Christians and 1 was a Muslim. The educational background of the opinion leaders was relatively low compared with the facility focal persons however, at the community level they could function and make meaningful decisions with the support of the health workers. Most of them are Christians and could be used as change agents in their churches

Participants from the CHPS, sub-districts and the district levels totaled up to 477 and some of their key characteristics were as follows: 31% (n=147) were males while 69% (n=330) were females. This could be the fact that about 82% (n=396) were nurses who are mostly females. Other categories of

participants were Disease Control Officers and Physician Assistants. About 89% (n=426) had educational level up to diploma level. Only about 11% (n=51) had bachelors and post graduate degrees. The reason may be that in the Ghana Health Service the structures are design such that officers with diplomas and certificates work at the CHPS and Sub-district levels.

Sampling Procedures

A total sample size of 1,381 CBSVs, 477 focal persons comprising: 343 CHPS surveillance focal persons, 112 sub-district surveillance focal persons and 22 district surveillance focal persons were used for the study. Also, 22 opinion leaders were also sampled for qualitative part of the study. The sample size for the CBSVs was estimated based on the following references: Hamalaw *et al.* (2022) in evaluating communicable disease surveillance in Iraq, used 25% of the facilities for the study. Aziz *et al.* (2018) recommended that in evaluating a programme at Rawalpindi a well representative figure that is statistically realistic must be considered. Afari-Asiedu *et al.* (2018) in a community study in the middle part of Ghana sampled 50% of the total communities and a focal person was selected from each of the communities. However, for comprehensive research sense, in this study, a total of 1, 381 communities were sampled from 2,232 communities in the region and the CBSVs residing in these communities were used for this study, representing about 62% of the communities in the region to increase the power of the study (Ezenyeaku *et al.*, 2020).

The sampling processes at the community level started from the district level, where, in each of the districts, with the support of the DHMT all the communities were listed, and a systematic random sampling was used to select

62% of the communities (Afari-Asiedu et al., 2018). For instance, Assin North district had 103 communities, thus, 62% of 103 was calculated a figure of 63 was attained. The next step was to divide total communities (103) by the required sample size, 63, which resulted to 1.6 and approximated to 2, referred to as the sampling interval.

To guard against selection bias, two (2) communities were assigned numbers (1 and 2) and one of them were randomly sampled as the starting point. Upon sampling, the number two (2) was selected which served as the starting point (sampling interval) for the randomly selection of the 63 communities out of the 103 total communities. So, on the list of 103 communities which were numbered, the 2nd community was selected while the 3rd community was systematically skipped and the 4th was also selected. This process was repeated consistently until the total 63 communities were selected. In each of the districts the same formula and processes were used to select the communities. The list of the communities has been provided at the appendix.

In each of the selected community, the research assistant visited the community and the Community Health Nurse (CHN) in-charge was contacted for details of the community in terms of whether there was a CBSV or not. Where there were no CBSVs, the CHN was asked of the name of the community, the developmental and the ecological status and the reasons for non-availability of a CBSV in the community. Some of the reasons were that they had travelled or stopped work. Where there were CBSVs, they were selected to participate in the study. This was necessary because in evaluation each of the selected communities should be assessed to ascertain the current

surveillance status to improve effectiveness and efficiency in the surveillance system (Groseclose & Buckeridge, 2017).

The sample size for the CHPS, sub-districts and districts focal persons were estimated as follows. Report from the Regional Health Directorate indicated that in each of the CHPS, sub-district and district levels there was one focal person working on surveillance (GHS, 2021). Thus, CHPS focal persons were 343, sub-districts 112 focal person and districts 22 focal persons were estimated. Census method was used at all the levels which meant that all the focal persons were interviewed. Sahal (2011); Phalkey *et. al.*, (2013) used census in the assessment of IDSR in Sudan and India, which resulted in a comprehensive evaluation of the surveillance system.

A total sample size of 22 opinion leaders was used for the qualitative portion of the study. Alemu *et al.* (2019), in evaluating public health surveillance in 12 facilities in Dangila, Ethiopia, selected 12 opinion leaders, one from each of the areas for the interview The DHMT in each of the 22 districts were consulted and one key opinion leader who was actively involved in CBS activities at the CHPS zones were purposively selected for the key informants' interviews. In a study at the middle belt of Ghana, Afari-Asiedu *et al.* (2018), used purposive sampling to select respondents for the community study on factors that influence the motivation and retention of volunteers supporting health activities in Ghana.

Data Collection Instruments

Structured questionnaires were used to collect the quantitative data from the CBSVs and the focal persons at the CHPS, sub-district and the district levels (Masiira *et al.,* 2019). WHO's (2006) framework and the generic questionnaire

for monitoring and evaluating surveillance and response system for communicable diseases were adapted and used. The framework was developed by experts of WHO and has also been used to evaluate the national surveillance system in Sudan and Kurdistan Region in Iraq (Sahal, 2011; Hamalaw *et al.,* 2022). Various components in the framework such as core, supportive and quality functions of the surveillance systems were studied and adapted to guide the themes, contents and focus of the questionnaire at each level (McGowan *et al.,* 2022). There were two (2) separate sets of questionnaires: one for the CBSVs and a combined questionnaire for CHPs, sub-district and the district focal persons. (Saleh *et al.,* 2021). One (1) interview guide was prepared and used for the opinion leaders at the CHPS compounds (Saleh *et al.,* 2021; Hamalaw *et al.,* 2022).

In each of the questionnaire, there were sections that focused on broader areas of the research questions to elicit information from the focal persons. In the questionnaire for the CBSVs, there were Sections A to G (See Appendix 1A). Section A focused on the background information and socio-demographic data of the CBSVs with 14 items (1-14). The items capture information on the district, sub-district and CHPS zone where the CBSV is located. Information was also asked on whether the location was rural or urban and coastal or forest. The rest of the information was on availability of the CBSVs in the community, the age, sex, educational level, marital status, religion, occupation and how long the CBSVs have stayed in the community. The responses of the items were coded appropriately to ensure quality data analysis (See Appendix 1A).

Section B of the CBSVs questionnaire examined the availability of surveillance systems structures that have been put in place in the community.

The section has14 items (questions 15-28) (See Appendix 1A). The questions were centered on how CBSVs were selected in the community, how long they have lived in the community, where the CBSVs were trained, the year they were trained and who did the training. Also, questions on whether CBSVs have a register, have been introduced to the community and have a list of case definitions of priority diseases to guide early case identification were also asked. Further, CBSVs were asked whether they have a copy of monthly reporting format, have submitted a report to the health authorities and if no why have they not done so? (See Appendix 1A).

Section C posed questions to test the CBSVs' knowledge on priority diseases and vital health events and conditions. There were seven items in this section (items 29-35). CBSVs were asked to state the case definition of AFP/poliomyelitis, Guinea worm, measles, neonatal tetanus, cholera and cerebrospinal meningitis. CBSVs were also asked to mention some of the events that need to be reported within 24 hours. The case definitions for each of the priority diseases were put under the specific disease. The responses were scored from *0* to *3*. If all the signs and symptoms of the specific disease/events were mentioned, *3* was scored and that was *excellent*. If more than half of the signs and symptoms of the disease/event are mentioned, *2* was scored and that was *good.* If half of the signs and symptoms of the disease/event are mentioned *1* was scored and that was an *average.* Finally, if less than half or none of the signs and symptoms are mentioned *0* was scored and that was *poor***.** The responses for each of the items were coded (See Appendix 1A).

There were 25 items under Section D (items 36-61). The section documented whether the CBSVs have received support from the higher level in

terms of training, resources, supervision, communication and coordination. Further questions were asked under each of the supportive function to find out the nature of the support, who provided the support, and number of times the support was received. Also, the CBSVs were asked to rank (on the scale of very low, low, high, very high) the extent at which supports have improved the surveillance work in their communities. The responses for each of the items were coded (See Appendix 1A).

Section E has 44 items (items 62-105) and it assessed the performance of CBSV on their core functions. The CBSVs were asked whether they have detected a priory disease or event, registered a case, confirmed a case or reported a case to the higher level. The rest of the items assessed whether the cases registered in the register have been summarised based on person, place and time, whether they have any plans for epidemics, responded and controlled any epidemics and have delivered feedback to the community. Also, the CBSVs were asked to rank (on the scale of very low, low, high, very high) the extent at which feedbacks have improved the surveillance work in the community. (See Appendix 1A).

The next section of the CBSVs questionnaire was Section F, which further captured CBSVs' quality functions, motivation and challenges. The items were 13 (items 106-118). Questions were asked on completeness, timeliness, usefulness, acceptability, flexibility and simplicity of data reporting tools. This section also solicited information on motivation and challenges of the CBS system. The CBSVs' registers were reviewed to ascertain whether they have completely been filled and also if reports were submitted on time. These were ranked and responses provided (see Appendix 1A). In this section, the

CBSVs were asked to rank (on the scale of very low, low, high, very high) the extent at which the data have been useful and acceptable for decision making. The rest of the questions assessed the CBSVs' willingness to change reporting tools and if the data in the CBSVs' register were simple to work with. The section also probed further by asking CBSVs what have been motivating them to work, what their needs are, what challenges they face and what they think can be done to improve the CBS system (see Appendix 1A).

The second questionnaire was a combined questionnaire used for the CHPS, sub-districts and district focal persons. The questionnaire had two sections: Section A addressed the focal persons' background information and Section B made enquiries about their performance on providing supportive functions to the CBSVs, including training, resources, supervision, communication and, coordination (See Appendix 1B). The challenges of the focal persons and their views to address them were also ascertained.

Section A has 17 items (items 1-17) and it focused on the background information and socio-demographic data of the focal person. The items captured information on the district, sub-district and CHPS zone where the focal person is located. Questions were also asked on whether the locations of the CBSVs were rural or urban and coastal or forest. Further questions asked under Section A were on the educational level of the focal persons, the category of profession under which the focal persons work, sex of focal persons and years served. They were also asked of the availability of IDSR technical guidelines, CBSVs' registers and monthly reporting forms at their levels of operation. Moreover, questions were asked on the last time registers were distributed and their plan of action to strengthen CBSVs activities (See Appendix 1B).

Section B of the second questionnaire had 32 items (items 18-49). The items asked information about training: the focal persons were asked if they have CBSVs training manual, a schedule for training CBSVs and have provided any training. They also enquired about the number of times trainings were done and how the trainings have affected the CBSVs work (See Appendix 1B). Questions were also asked on whether focal person has provided resources to CBSVs. CBSVs were asked to give reasons why they have not provided any resources. Enquiries were also made on whether focal persons have a budget line for CBSVs activities, the resources that have been provided to CBSVs, the number of times resources were provided and how the resources improved the CBSVs work. Focal persons were also asked if they have supervision schedule for CBSVs work. Again, CBSVs were asked if they have provided a visit and number of times they provided the visits. Information was also sought on the number of CBSVs supervised and the extent to which the supervision helped. (See Appendix 1B).

Further enquiries were also made on how focal persons have been communicating with the CBSVs. The focal persons were asked if they have a communication plan and have communicated to CBSVs in the past 3 months. They were asked to provide reasons for whether or not communication was done. They were also asked of the number of times they communicated and how the communication has improved the CBSVs work. Finally, under Section B of the second questionnaire, the items were on how the focal persons provided coordination. Enquiries were made to find out if they have committees that meet to discuss community-based surveillance issues, and the number of times the committee met in the past one year. The rest of the questionnaires were on how

the coordination has improved CBSVs work. There were also questions on if they have received CBSVs report for the past one year and how would they rate the performance of the CBSVs activities on the scale of (excellent, very good, good and poor). Focal persons were also asked of the challenges the encountered and their views on how to address these challenges.

The last instrument was the interview guide for the opinion leaders which also comprised of two sections. The first section explored the background information of the opinion leaders and the Section B posed questions on their perceptions of factors affecting the implementation of CBSVs activities in the communities (See Appendix 1C). The Section A comprised of 10 items (items 1-10) which asked of the district, sub-district, CHPS zone and the community where the opinion leaders were located and whether the location was rural or urban and coastal or forest. Their qualification, occupation, religion and sex were also asked in this section.

Under the Section B of the interview guide for the opinion leaders, there were 16 items (items 1-16) (See Appendix 1C). Opinion leaders were asked on how long they have been opinion leaders; how long they have been involved in CBSVs work; how they were selected and whether they have had any outbreak. Information was also solicited on how they receive feedbacks from the CBSVs, how often and whether they have provided resources to the CBSVs or not? The rest of the questions were, what do they think are the reasons why CBSVs activities in their communities are progressing or retrogressing? Are the CBSVs activities helping to improve the health of the community? what are some of the activities they do to improve the health of the community? How are those activities improving the health of the community? The opinion leaders were also

asked if they found it difficult getting someone to work as a CBSV in their community and give reasons for their answer. They were also asked to mention some of challenges of the CBSVs and their solutions and how the CBSVs should be motivated (See Appendix 1C).

Validity of the instruments

The questionnaires and the interview guide were submitted to experts in the Disease Surveillance Unit of the Ghana Health Service, Regional Health Directorate, Central Region, for review. The purpose was to check for face, content and construct validity of the instruments. The experts studied the appropriateness, logic and clarity of the questions. The instruments were further given to my supervisors for their final review. Comments made by the experts and the supervisors were used to effect corrections to improve the instruments.

To ensure the validity of the instruments, the researcher ensured that the items on the questionnaire represented the domain of interest. Again, the question items were reviewed by colleagues and experts in Disease Surveillance and finally my supervisors for scrutiny, corrections and clarity for face and content validity.

Reliability of the instruments

A pretest of the instrument was conducted to minimise errors of the instruments used for the data collection. The questionnaires and the interview guide were pre-tested in two districts; at Shama and Daboase districts (coastal and forest districts respectively) in the Western Region of Ghana, which has similar characteristics as most districts in the Central Region. The instrument was administered to 40 CBSVs and 40 focal persons at CHPS subdistricts and districts. Experiences from the pretest were used to revise the wording and

arrangement of the questions for better understanding of the respondents and the research assistants. Few questions were added to solicit more information also, some questions were restructured to address ambiguities.

Cronbach's Alpha was used to calculate the internal consistency of the items in the questionnaires at the pretest and real research stages which gave a reliability coefficient as follows: CBSVs questionnaire at the pretest state was α= 0.89; 40 participants and 99 items were used. The actual research had α=.98, using 1381 participants with 118 items. The difference in increase on the items was that, after the pretest some items were added to some of the sections. For instance, the number of times a supportive function was provided were added to make the questionnaire more comprehensive. With the Surveillance Focal Persons questionnaire, the result was α= 0.71 at the pretest stage, using 40 participants with 44 items. The actual research had α= .81, using 477 participants with 49 items. Questions such as the number of times a supportive function was provided were also added to answer the research question hence the difference. These agreed with Fraenkel *et al.* (2015) who opined that reliability of 0.7 or above is enough for a study, indicating that the instrument for the study was highly reliable. The interview guide was also administered to the opinion leaders and analysed for consistencies of common themes.

Data Collection Procedures

Prior to the start of the data collection, an introductory letter was provided by the Department of Health, Physical Education and Recreation to introduce the researcher to relevant institutions such as Ghana Health Service and Institutional Review Boards (See Appendix 2A). An ethical clearance was sought from the University of Cape Coast's Institutional Review Board in Cape

Coast (ID: UCCIRB/CES/2019/45) (See Appendix 2B), and Ghana Health Service Ethics Review Committee in Accra (ID: GHS-ERC001/02/20) (See Appendix 2C) respectively. Approval was also sought from the Central Regional Health Directorate (See Appendix 2D). In all, 12 weeks were used to collect the data.

In each of the districts the researcher was introduced to the District Health Management Team (DHMT) and with their support two national service personnel residing in the district were recruited and trained as research assistants to support in the data collection. This was to help reduce the cost of accommodation and other expenses. With the support of the DHMT, a movement plan was drawn to guide movements of the research assistants to the communities where the data collection was done within the period of 12 weeks. This ensured that travel time and revisits of participants who were not available for the first visits were considered and addressed. The data were collected from the focal persons at the district, sub-district, CHPS, and the community levels. At each of the levels, participants were assured of their anonymity and confidentiality.

At the district level, the researcher formally introduced the research team and explained the purpose of the study to the DHMT, headed by the District Director of Health Service (DDHS). At this point, the sub-districts, CHPS, communities and the opinion leaders for the key actors' interview selections were discussed. Also, formal communication to all levels about the study was concluded. Thereafter, the district surveillance focal person was identified. His or her consent was, then, sought, and upon agreement became eligible to participate in the study. The questionnaire was, then, administered by research

assistant to the focal persons at approximately 15-30 minutes to complete a questionnaire.

At the sub-district and the CHPS levels, formal introduction and consent of the focal persons were sought and upon agreement, the questionnaires were administered to the focal persons. At the community level, the research assistants went to the chief's palace or the CHO in-charge of the CHPS compound and made enquiries about the presence of CBSVs in the community. If there was a volunteer, the volunteer's consent was sought and upon agreement, the questionnaire was administered by the research assistant to the CBSVs. In the course of the administration of the questionnaire, the CBSV's Register were reviewed and some data in the register were captured to fill the questionnaire. In the absence of CBSVs, a portion of the questionnaire was filled with the help of the CHO and the reasons for absence of CBSVs were captured.

The key actors' interviews with the opinion leaders were conducted by the researcher and two research assistants. After the opinion leaders had been identified, the research team arranged with them the date and time they could meet them individually in their communities for the interviews. On the due date, the following items were mobilised and used for the interviews: pen, note pad, recorder and interview guide. Before the interview, the consent of the opinion leader was sought to participate in the study. Permission was also sought to take notes and record proceedings and upon agreement the researcher conducted the interview while one research assistant took notes and another also operated the recorder. An interview lasted between 45 to 60 minutes. At each of the levels, an appreciation was shown to respondents for being part of the study. Cost of

travelling, revisiting and managing participants in the midst of Covid-19 were some of the challenges recorded. However, continuous monitoring, daily reviews on data collection with research assistants and strictly observing the COVID-19 prevention protocols were used to mitigate the challenges.

Data Processing and Analysis

After the data collection, the quantitative data were edited and coded in Statistical Package for Social Sciences (SPSS). The data were kept confidential and under a pass worded computer and no other persons had access to them. The data were basically in two forms namely quantitative and qualitative data which were analysed and presented.

Quantitative analysis

Statistical Package for Social Sciences (SPSS) Version 21 was used to process the quantitative data. The data collected were screened to determine the accuracy and adequacy of the data, dealt with missing data and checked the effects of some of the values on the analysis. Frequencies were done for each of the questions/variables to check for errors and corrections were made accordingly. The Shapiro-Wilk Test was generated to determine the normality of the data set and was found to be zero (0) which is less than the critical value of 0.05. Hence the data set was not normally distributed. This helped the researcher to determine the assumptions of the specific procedures for the analysis. The analysis was done based on the research questions for the study.

Research question one: What is the knowledge level of CBSVs on the case definitions of priority diseases and vital health events in the Community Volunteer Registers in the Central Region? Research question one evaluated the knowledge level of CBSVs on the case definitions of priority diseases and vital

health events in the Community Volunteer Registers. Items 29-35 solicited information to answer this question. After screening the data, it was observed that the data were mainly ordinal and nominal scale; hence, descriptive statistics (percentages and proportions) was used to describe the knowledge level of CBSVs and presented the data, using frequency tables.

The descriptive statistics was used because it simplifies information and also helped in the comparison of knowledge levels of CBSVs which is the dependent variable on each of the priority disease and events which are the independent variables (Chatio *et al.*, 2019). The priority diseases and vital health events were: Acute Flaccid Paralysis (AFP) or poliomyelitis, Guinea worm, measles, neonatal tetanus, cerebrospinal meningitis (CSM) and cholera. The reportable events were any major event such as infant deaths, maternal deaths, dog bites and other related examples that were of public health significance.

In order to assess the CBSVs' knowledge level of the priority diseases and events, CBSVs were asked to give the case definition of each of the priority disease and events in their registers. The responses were scored from *0* to *3*. If all the signs and symptoms of the specific disease/events were mentioned, *3* was scored and that was *excellent*. If more than half of the signs and symptoms of the disease/event were mentioned, *2* was scored and that was *good.* If half of the signs and symptoms of the disease/event were mentioned *1* was scored and that was an *average.* Finally, if less than half or none of the signs and symptoms were mentioned *0* was scored and that was *poor***.** The scores were added up and converted to percentages and the results were interpreted on four level scale: Poor, Average, Good and Excellent.

The interpretation of the scores was explained in detailed as follows: *Poor* – were those who scored below 50%, which meant that CBSVs within this group *always* needed help to identify a priority disease or an event. *Average* – were those who scored from 50-69, meaning CBSVs *sometimes* need help to identify a priority disease or an event. *Good* – were CBSVs who scored within 70-79, these CBSVs *rarely* need help to identify a priority disease or event. Finally, *excellent* were those who scored from 80-100, these CBSVs *never* need help to identify a priority disease or event (Africa Excellence in Coastal Resilience, 2017). The interpretation *always* and *sometimes* and *rare* and *never* have been combined to make discussion more meaningful (Fraenkel, *et al.*, 2015).

Research question two: What is the extent to which CBSVs in the community receive support from the surveillance focal persons in the Central Region? Research question two was focused on finding out whether CBSVs in the communities are receiving supportive surveillance functions from the focal persons in the CHPs, sub-districts and districts in the Central Region. After screening the data, items 36-61 of the questionnaire were used to answer the question. The data that were generated from the questions were mostly nominal and ordinal; hence, descriptive statistics (percentages, and proportions) was used to describe the extent of performance the dependent variables in relations to supportive functions to the CBSVS which are the independent variables. The data were presented in frequency tables. The data were also used to explain the impact the supportive functions CBSVs received have had on their work.

Research question three: What is the extent of the performance of CBSVs on the core and quality surveillance functions in the communities in the

Central Region? Question three investigated the extent of performance of CBSVs on the core and quality surveillance functions in the communities in the Central Region. Items 64- 105 and 106-114 of the questionnaires gathered information to answer this question. The kind of data were generated from the questionnaire was mostly categorical and ordinal; thus, descriptive statistics was used to describe the extent of performance which are the dependent variables in relation to the CBSVs core and quality surveillance functions, the independent variables. Tables were used to present the frequencies of the results from the questions.

Research question four: What are the differences in performance between CBSVs in coastal and forest areas and those of urban and rural areas in terms of their core surveillance functions in the Central Region? Research question four compared the differences in performance between CBSVs in coastal and forest areas, and those of urban and rural areas in terms of their core surveillance functions in the Central Region. After screening the data items 2-3, that asked of the developmental (rural, urban) and ecological (coastal, forest) status of the CBSVs were the dependent variable used. Items 64, 67, 74,75,95,101 and 102 that enquire about performance of the CBSVs core functions were the independent variables that were used to answer the question.

A Chi-square test was used to establish whether there were any differences in CBSVs performances in terms of their (detection, reporting etc.) ability in the coastal-forest and urban-rural communities. It is posited that when the data meets the following assumptions: random selection data, categorical data and mutually exclusive categories and have larger sample size chi-square test is recommended (Frankael *et al.* 2015; Mertler, Vennatta, LaVenia, 2021).

T-test is more recommended when the data is continuous (Samaras *et al.* 2021). Further logistics regression analysis was performed on the variables that showed some differences with the dependent variables to determine the strength of the association. This process produce odds ratio, p-values, and confidence intervals for the variable measured and was discusses appropriately (Aboagye *et al.*, 2017).

Research question five: How does the performance of the surveillance focal persons at the districts, sub-districts and CHPS levels on supportive surveillance functions affect CBSVs core functions in the Central Region. Research question five explored whether the performance of the surveillance focal persons at the districts, sub-districts and CHPS levels on supportive surveillance functions has affected the CBSVs core functions in the Central Region. After screening the data, items 20-43 of the questionnaire for focal person were used to answer this question. Variables such as focal persons' ability to provide supervision, resources, communication materials and training were ranked by the focal persons, using a four-point scale (4-very high, 3-high, 2-low and 1-very low) (Phalkey *et al.*, 2013). The data generated were mostly ordinal and categorical hence, descriptive statistics was done and the data were converted to frequency and percentages and presented in tables.

Qualitative analysis

The sixth question: What do the opinion leaders in the CHPS compounds perceive to be factors affecting the implementation of CBSVs activities in the Central Region? This question established what the opinion leaders in the CHPS compounds perceive to be factors affecting the implementation of CBSVs' activities in the Central Region. The interviews were conducted with the opinion

leaders and was analysed, using NVivo 10 (QSR International, Memphis, USA). Member checks, which encompass taking data and tentatively interpreting it to the participants to check for accuracy in the interview interpretation, were done. The recorded interview data collected were played a number times and transcribed and imported into the NVivo software and themes of interest were generated using content analyses (Afari-Asiedu *et al.*, 2018).

The analysis was done as follows: firstly, the transcribed texts produced from the interviews was read several times, and notes that reflect the initial thoughts of participants was taken down. This enabled the researcher to familialise himself with the texts, and gain an understanding of the participant's experiences. Again, the transcripts were read several times in order to ensure that the true meaning of the text had been understood and captured. The initial notes and comments were written at left margin of the transcript. The transcripts were imported into NVivo 10 and major themes of interest were developed taking into consideration the study question. The data were coded into themes and summarise as narratives. The final themes generated were discussed with the supervisors and experts to ensure that all the experiences of the participants have been captured.

Trustworthiness of the qualitative data

To ensure trustworthiness of the qualitative data, the researcher engaged participants on the field to review the data collected and sought their inputs and confirm interpretations of their responses. The researcher also consistently used the interview guide and procedures reviewed by experts to collect the data. The ethical procedure such as maintaining privacy and confidentiality and also motivated respondents to give out trusted responses. The research design,

transcribed data, data analysis were reviewed by expert on surveillance and health promotion. These ways were used to improve the trustworthiness of the data collected.

Chapter Summary

This chapter described the research design, the study area and the methodology used in the study. The concurrent mixed method approach was adopted where quantitative data were gathered from CBSVs and focal persons in the CHPS, Sub-districts and district level using questionnaires and qualitative data obtained from opinion leaders in the CHPS zones using interview guide. The quantitative data was processed using SPSS version 22, Stata version 17 and Microsoft excel for descriptive and inferential statistics. NVivo 10 (QSR International, Memphis, USA) was used for the qualitative analyses.

CHAPTER FOUR

RESULTS AND DISCUSSION

The study sought to examine the CBSVs system in the Central Region of Ghana. It aimed to determine the CBSVs' understanding of case definitions for priority diseases and events, as well as their effectiveness in carrying out essential core and quality surveillance functions within the communities. The research also examined the support provided by surveillance focal persons at the district, sub-district, and CHPS levels to the CBSVs system. A total of 1,381 communities were selected for the evaluation, out of these 898 had CBSVs and they were subsequently interviewed. A total of 483 communities did not have CBSVs hence the questionnaire ended after it was declared and the reasons for the non-availability was given. All the 477 facilities' surveillance focal persons were included in the study. Furthermore, twenty-two opinion leaders were interviewed. This chapter presents results and discussions of the data analysed. The response rate was 100% for the CBSVs, focal persons and the opinion leaders' questionnaires.

Research Question One: What is the Knowledge Level of CBSVs on the Case Definitions of Priority Diseases and Vital Health Events in the Community Volunteer Registers?

The results for this research question are presented in Table 1. The results depict the general knowledge level of CBSVs on the case definitions of priority diseases and events. Generally, results in Table 1 indicate that about 28% (n=251) of the CBSVs had an excellent knowledge on the case definition of priority diseases and events while 18% (n=162) had good knowledge. It also shows that 29% (n=260) and 25% (n=225) of the CBSVs had an average and

poor knowledge on the case definition of the priority diseases and events respectively.

Table 1: General Knowledge of CBSVs on Case Definitions of Priority Disease and Events

Scores	Interpretation	Frequency	Percentage
80-100	Excellent	251	28
70 – 79	Good	162	18
50- 69	Average	260	29
Below 50	Poor	225	25
Total		**898**	**100**

Source: Field Data (2023)

Results on the CBSVs' knowledge on the specific priority diseases and events are presented in Table 2. The first on Table 2 is the reportable events. The results show that 27% (n=242) of the CBSVs had excellent knowledge on the reportable events, 40% (n=359) had good knowledge, 23% (n=207) had an average knowledge and 10% (n=90) had poor knowledge on the reportable events. Second on the Table 2 is Cerebrospinal Meningitis (CSM), the result indicates that 24% (n=215) of the CBSVs had an excellent knowledge on CSM, 26% (n=233) had good knowledge and 27% (n=243) had an average knowledge, while 23% (n=207) had poor knowledge.

Cholera is the third priority condition in Table 2. The results point out that about 56% (n=503) of the CBSVs had an excellent knowledge on cholera, 28% (n=251) had good knowledge while 11% (n=99) and 5% (n=45) of the CBSVs had average and poor knowledge on cholera respectively. The fourth priority condition in Table 2 is neonatal tetanus and the data shows that about 22% (n=198) of the CBSVs had an excellent knowledge on the case definition of neonatal tetanus and 30% (n=269) had good knowledge. However, 29%

(n=260) had an average knowledge, while 19% (n=171) recorded poor knowledge on the disease.

Results on the level of knowledge of CBSVs on measles which is the fifth priority condition in Table 2 show that about 46% (n=413) had excellent knowledge, 37% (n=332) had good knowledge, 13% (n=117) had average knowledge, and 4% (n=36) of the CBSVs had poor knowledge on measles. Furthermore, in Table 2, Guinea worm is the sixth condition and the data indicate 39% (n=350) had an excellent knowledge, 34% (n=305) had good knowledge, while 16% (n=144) and 11% (n=99) had average and poor knowledge respectively. Finally, the seventh and last condition which is an Acute Flaccid Paralysis (AFP)/Poliomyelitis, the results show that 38% (n=341) had excellent knowledge, 37% (n=332) had good knowledge, 16% (n=144) had average knowledge while, 9% (n=81) of CBSVs had poor knowledge on AFP.

Table 2: CBSVs Knowledge Level on Specific Priority Diseases and Events (n=898)

Reportable Events	Frequency	Percentage
Excellent	242	27
Good	359	40
Average	207	23
Poor	90	10
CSM		
Excellent	215	24
Good	233	26
Average	243	27
Poor	207	23
Cholera		
Excellent	503	56
Good	251	28
Average	99	11
Poor	45	5
Neonatal Tetanus		
Excellent	198	22
Good	269	30
Average	260	29
Poor	171	19

Table 2 continued

Measles		
Excellent	413	46
Good	332	37
Average	117	13
Poor	36	4
Guinea Worm		
Excellent	350	39
Good	305	34
Average	144	16
Poor	99	11
AFP/Poliomyelitis		
Excellent	341	38
Good	332	37
Average	144	16
Poor	81	9

Note: Interpretation in %: Excellent-80-100; Good- 70-79; Average- 50-69; Poor- Below 50
Source: Field Data (2023)

One key finding is that, from Table 1, generally, the knowledge of CBSVs on priority disease and event was low, because most (about 54%) of the CBSVs always and sometimes need support before they could detect a priority disease or events and report to the nearest health facility. The plausible reason could be inconsistent training of CBSVs on priority diseases and events (Merali *et al.*, 2020). The findings are consistent with the existing literature where International Organisation of Migration (IOM) prioritised low level of knowledge of CBSVs on priority diseases and events in 2017 thus, organized a training for 960 CBSVs and 163 supervisors in 2018 across five regions in Ghana (IOM, 2018).

The training by the IOM was aimed at building the capacity of the CBSVs to have adequate knowledge and skills to detect priority diseases and events for prompt reporting and response. In another study carried out in Congo by Stolka *et al.* (2018), only about 59% of community health workers could mention at least one of the two community-based case definition of Viral

Hemorrhagic Fever (VHF) used in the community. In the case of the facility level health workers, only 12% could state at least 4 out of 7 signs and symptoms used in the standard case definition for VHF.

Another significant finding was that CBSVs' knowledge on CSM and neonatal tetanus were relatively low as shown in Table 2, compared with the national standards of 80% or more (GHS, 2019). This finding is in agreement with a study by Mehanna in Alexandria which indicated that about 84% of women in the reproductive age in the communities have poor knowledge on Neonatal tetanus (Mehanna *et al.*, 2020). Lack of continuous education on Neonatal tetanus was stated as a key reason. And in this study, inadequate training for CBSVs on priority diseases has been identified as a key reason for the low knowledge. This is critical because cases that report to the health facilities for management are few, the bulk are found in the communities where they live, thus, when we miss cases we miss epidemics (Nakubulwa *et al.*, 2022).

The findings also confirm a study by Wulifan *et al.*, (2022) which indicates inadequate knowledge on CSM diagnosis in cross border towns in the Upper East region of Ghana. Codjoe and Nabie (2014) also confirm that in his study on the meningitis belt in Ghana. However, this finding on low knowledge on CSM conflicts with a study by Goodman *et al.* (2014) which indicated high knowledge of CSM among travelers to meningitis belt in Africa. The reason for the disagreement is that travelers to meningitis zone may have stayed in the meningitis belt where they might witness CSM epidemics, read or heard of CSM and sometimes get some protection before going there and this will improve their knowledge level on CSM (Goodman, *et al.*, 2014). However, this study

was conducted in the Central Region, which is at the southern part of Ghana where people hear less about CSM epidemics and less training is done on the disease which could contribute to inadequate knowledge (GHS, 2019).

The consequence for the low knowledge could be low case detection of neonatal tetanus and CSM in the communities (Denaxas, Asselbergs & Moore, 2016). Hayden *et al.* (2013) posited that lack of knowledge delayed management of cases. A case of neonatal tetanus as well as a CSM in our setting is described as an outbreak that need prompt investigation and response (GHS 2019). In a situation, where CBSVs could lack knowledge to detect them, there could be outbreaks in the communities that may go unnoticed. This means that people may die without any report given to the health workers for action (Hamalaw *et al.*, 2022).

In Ghana, a study carried out in Ashanti Region on health outcomes in the communities and health facilities observed that records on infant deaths and birth in the communities were more than infant deaths and birth recorded in the health facilities (Kyei-Faried, Appiah-Denkyira, Brenya, Akuamoa-Boateng & Visser, 2006). Another study carried out by Merali *et al.*, (2020) revealed that a substantial proportion of cases of Vaccine Preventable Diseases reported at the health facilities were reported by the CBSVs in the communities. Outbreaks will occur unnoticed when CBSVs lack knowledge to detect and report diseases and events in the communities which could be dangerous in our part of the world where access to health care is a problem (McGowan *et al.*, 2022).

Another significant implication of inadequate knowledge on priority diseases is the late detection of cases (GHS, 2017). These diseases or events may occur in the community but the CBSVs may not have the knowledge to

detect them early enough and report to the health authorities. Neonatal tetanus is a disease that affects children during their first 28 days usually within the first 7 days. The child who was crying and sucking within the first 2 days may gradually stop crying and sucking and become stiff. If this continue by the sixth day the child may die (Nakubulwa *et al.,* 2022). Mothers, care-takers and CBSVs become aware when the child is in the 6th day of the condition when complications have already set in and it is too late to reverse them (WHO, 2019).

Misdiagnosis is one of the serious consequences that could result in a situation of inadequate knowledge on priority diseases and events Ma *et al.,* (2017). In the first few weeks, the child learns how to suck and may not be sucking consistently. Thus, people mistake a child affected by neonatal tetanus as if it is learning how to suck and may not report on that as early as possible (GHS, 2019). In a similar instance people misdiagnose CSM as malaria. Early symptoms of CSM mimic malaria where there is fever and headache, thus, CBSVs and clinicians suspect and start treating malaria and so may not report at the early stages (Njuguna *et al.*, 2022). In a survey conducted on Buruli ulcer in Ghana, several of these cases were initially diagnosed by clinicians and managed as cellulitis, these increased the transmission rate as well as the complication of the disease within the first few months in the community (Ahorlu *et al.*, 2018).

One of the vital consequences which could result when knowledge level of CBSVs is low on priority disease and event is ineffective communication (Kok *et al.,* 2015). When volunteers do not know about the diseases or events, they will not talk about them. Mohammed *et al*. (2022) posited that people hardly talk about things they have inadequate information about. Thus, when

CBSVs have inadequate information on CSM and neonatal Tetanus they will hardly talk about them in their communities. One of the key activities of CBSVs is to educate the community members on the priority disease and events, when they have low knowledge on them, they may deliver diluted messages to the community. A similar incidence happened when cripples of age more than 15 years were suspected be AFP during a mass case search in a community. A diluted message was given to the community hence they thought anybody who could not walk had poliomyelitis (Mbaeyi *et al.*, 2018).

Furthermore, low knowledge affects CBSVs interest in the surveillance work. According to Heward-Mills *et al.*, (2018), when an individual lacks knowledge on a phenomenon his interest gradually diminishes, which affects the effectiveness of his performance. Many CBSVs have lost interest in the surveillance work because they have inadequate knowledge on the work they do, especially on the diseases and events they are to report on (Fall *et al.*, 2019). A situation where CBSVs always or sometimes need support to diagnose a priority disease or event then his/her interest to do more will be affected. In a study in a rural part of Nigeria, when community health workers were asked, why they have stop reporting, they indicated that, they have forgotten some of the information on disease and have consequently lost interest in the work (Alo *et al.*, 2022). Community surveillance is concern more about continuously interacting with fellow community members and opinion leaders. When the CBSVs have more knowledge on what they do, they have more confidence in themselves and this ignite their interest to perform well (Chatio *et al.*, 2019).

In the area of adequate knowledge, the study found that, generally, respondents that had adequate knowledge on the case definition of priority

diseases and events in their register were low which falls short when compared with a national target of 80% or more (GHS, 2019). Nonetheless, with the specific priority diseases, CBSVs had a higher knowledge on cholera and measles when compared with the national target. This finding agrees with a study by Otieno *et al.,* (2020) where 53% had adequate knowledge score about cholera, 93% of respondents were aware of cholera and could mention the signs and symptoms.

The implication of the higher knowledge on priority diseases cannot be under estimated. According to Fall *et al.* (2019) high knowledge on priority diseases contributes to increase in case detection which will subsequent break the chain of transmission and reduce the occurrence of epidemics & Acharya, 2019). In addition, high case detection also improves early referrals and prompt case management. According to Johnson *et al.* (2022), improving practices that lead to early case detection saves cost, time and improves management of resources in both routine and epidemic situations. Asegedew *et al.,* (2019) also confirmed that improving case detection reduce deformities and deaths.

Another important implication of high knowledge on priority disease is that it accords the CBSVs the capacity to communicate and interact effectively on communicable diseases and events to the community members (Owusu *et al.*, 2023). CBSVs communicate daily with the community members on health issues including surveillance and the information they provide to the community should be simple, effective and acceptable by the community members (WHO, 2015). In the management of cholera outbreak in the Central Region of Ghana Issahaku *et al.,* (2020) posited that effective and continuous communication are key to the success in control of the outbreak.

Research Question Two: What is the Extent to which CBSVs in the Community Receive Support from the Surveillance Focal Persons in the Central Region?

Focal persons from the health sector and other stakeholders must provide supportive surveillance functions such as training, resources, supervision, communication and coordination to the CBSVs. This research question aimed at finding out from the CBSVs whether they have been receiving support from the focal persons. Further questions were asked to ascertain the impact of the supportive functions on the work of the CBSVs. The data were analysed, using descriptive statistics; frequencies and tables. Tables 3 and 4 presents the result in detail.

Results on supportive surveillance functions received by CBSVs in Table 3 show that 44% (n=395) of the CBSVs indicated there were some coordination between them and focal persons in their communities but 56% (n=503) stated that there was no coordination in their community. The results further indicated that 69% (n=620) of the CBSVs have had communication with the higher levels on the surveillance work. Nevertheless, about 31% (n=278) of the CBSVs have had no interaction for the past one year. Also, as shown in Table 3, about 47% (n=422) of CBSVs received supervision from the higher level but 53% (n=476) said they did not receive any supervision in their communities. In addition, only 37% (n=332) of the CBSVs have received some resources from stakeholders however, 63% (n=566) have not received any resources for the past one year. Moreover, in Table 3, 52% (n=467) of the CBSVs indicated that they have had surveillance training in the past one year while 48% (n=431) said they have not had training in the past one year.

Table 3: Supportive Surveillance Functions Received by CBSVs from the Facility Focal Persons (n=898)

Supportive Function	Frequency	Percentage
Coordination		
Yes	395	44
No	503	56
Communication		
Yes	620	69
No	278	31
Supervision		
Yes	422	47
No	476	53
Resources		
Yes	332	37
No	566	63
Training		
Yes	467	52
No	431	48

Source: Field Data (2023)

Results on the impact of supportive functions on CBSVS work in Table 4 show that about 65% (n=257) of the CBSVs ranked that the coordination by the focal person has had a higher impact on their work, 13% (n=51) stated a very high impacts, 19% (n=75) mentioned low impact and 3% (n=12) indicated a very low impact. About 70% (n=434) of the CBSVS indicated that the communication efforts from the focal persons had a higher impact on their work, 17% (n=105) of the CBSVs stated very high, 10% (n=62) stated low and 3% (n=19) said the impact was very low. On supervision, the CBSVs ranked the impact of the supervision on their work as high 70% (n=295), very high 12% (n=51), low 15% (n=63) and very low 3% (n=13). In Table 4, CBSVs further stated that the resources have had impact on their work, 63% (n=209) stated a high impact, 9% (n=30) stated as very high, 19% (n=63) stated impact as low and 9% (n=30) stated as very low. On training about 73% (n=341) of the participants declared that the trainings had higher impact on their surveillances

work, 20% (n=93) mentioned of very high impact 6% (n=28) stated of low impact and 1% (n=5) mentioned very low impact.

Table 4: Influence of Supportive Functions on CBSVs Work

Supportive Functions	Frequency	Percentage
Coordination	**(n=395)**	
Very High	51	13
High	257	65
Low	75	19
Very Low	12	3
Communication (n=620)	**(n=620)**	
Very High	105	17
High	434	70
Low	62	10
Very Low	19	3
Supervision	**(n=422)**	
Very High	51	12
High	295	70
Low	63	15
Very Low	13	3
Resources	**(n=332)**	
Very High	30	9
High	209	63
Low	63	19
Very Low	30	9
Training	**(n=467)**	
Very High	93	20
High	341	73
Low	28	6
Very Low	5	1

Source: Field Data (2023)

CBSVs reported that they have received inadequate supportive supervision from the focal persons from the higher levels. This is because all the supportive surveillance functions recorded below the 80% target set for the national surveillance system. It could be observed that coordination of CBSVs activities was low. That is, 56% of the communities did not have co-ordination committees in their communities that met and reviewed issues on surveillance. This implies that community participation and ownership of surveillance activities in these communities could be jeopardized (Ezenyeaku *et al.*, 2020).

Issues on outbreaks may not be discussed at all or may be done very late (Ohene *et al.*, 2016). This finding is in line with a study conducted by Alo *et al.*(2020) which indicated that poor community engagements and inadequate reviews or coordination meetings affected the performance of the CHPS programme in the communities. In another study by Hamalaw *et al.*, (2022), it was also ascertained that lack of coordination prolonged outbreaks and affected effective and timely distribution of resources. Generally, participants appreciated the impact of coordination on their work in the communities however, lack of resources and time may be some of the constraints to effective coordination.

Findings from this study further shows that 44% of the CBSVS had coordination committees in place that met averagely 6 times within the year. This may suggest that the committees met to discuss challenges in the surveillance system affecting the communities and address them on time. In this case, resources could be mobilised and distributed efficiently and roles could be assigned to members to work and improve performance (Bordier *et al.*, 2021). Kant & Krishnan (2010) posited that continuous interaction of members on issues that borders on a community is a sign of commitment. Mremi *et al.*(2021) in their study also indicated that including reviews of surveillance activities on their programmes was a very good monitoring system to identify challenges, share experiences and chart a way forward to improving surveillance. The study revealed that 65% CBSVs described the impact of coordination on their work as high, the impact of coordination on surveillance work was well appreciated by the CBSVs. However, generally, coordination of CBSVs activities in the communities need serious attention.

Another remarkable finding is that about 69% of the CBSVs received communication from the higher levels. This confirms the recommendation made by Ernest that continuous and timely communication ensures early detection and response on priority conditions (Ernest *et al.*, 2018). It also indicated a positive move on community-based surveillance system in the Central Region. Although this does not meet the national objective of 80% or more (GHS, 2019), communication level of 69% suggests that there could be timely communications of alerts and outbreaks between CBSVs and stakeholders. Schnackenberg and Tomlinson (2016), acknowledged that balanced, open and transparent communication is the foundation of both public and international trust among stakeholder. It was also established by WHO (2017) that effective communication prevents misconception and overreaction on surveillance information. The 69% level of communication is consistent with the study by Hamalaw *et al.*, (2022) which posited that 66% level of communication within the Health facility level increased uptake of health services and improved health outcomes.

Further interaction with the CBSVs in this study revealed that most of the communication is made between the CBSVs and health workers (94%). Information from health workers is mostly described by the public as authentic, and could be seen as reliable. Therefore it will be used by the CBSVs for their work to the benefit of the community members (Hamalaw *et al.*, 2022). This also means that reports and challenges of CBSVs could be received early and appropriate actions taken as early as possible. Hou (2014) stated that when a new update is first received from a health authority through community leaders, the community has higher confidence in acting on that. This study revealed that

the main channel was through face to face (50%) and the use of mobile phones (46%). The rest (4%) were through WhatsApp and messaging. The number of times communication occurred was averagely 7 times within a year.

Nevertheless, the study revealed that about 31% of the CBSVs have not had any interactions with the higher levels for the past one year. This situation could affect the work of the CBSVs negatively, especially in a situation where more than 54% of the CBSVs always or sometimes needed support in order to detect a priority disease or event. In Sierra Leone, Njuguna *et al.*, (2022) indicated a communication rate of 37% within selected health facilities when he monitored surveillance response on Ebola. Mandyata *et al.* (2017) on disease surveillance indicated that lack of integrated information on surveillance could make participants under estimate the severity and risk of an events. Messaging and WhatsApp although is widely used by CBSVs as seen in this study could be encouraged in use for information dissemination (Ernest *et al.*, 2018).

According to Njuguna *et al.* (2022), supervision boost the confidence of the supervisee. Constant supportive supervision improves performance. Findings from Table 3 in this study indicated that only 47% of the CBSVs had supervision from the higher level. Compared to the national standards of (80%), this could be described as very low (GHS, 2019). These CBSVs could be orientated through interactions with their supervisors to improve on their core and quality surveillance functions. A systematic review conducted by McGowan *et al.* (2022) on factors contributing to the progress in surveillance, indicated a strong supportive supervision as one of the key drivers but explained that low supervision rate could affect case detection and reporting which could lead to outbreaks. The findings are consistent with a study in Khartoum State

that recorded 42% and 47% supervision rate at the community and facility level surveillance respectively (Sahal, 2011).

However, this study revealed that 53% of the CBSVs did not receive any supervision for the past one year. The implication is late reporting and possible undetected outbreaks and vital events such as infants and maternal mortalities that are usually treated by communities as part of life (Avortri *et al.*, 2019). This findings is consistent with Crigler, Gergen and Perry (2014), who noticed poor and inadequate supervision as one of the constraints to the work of the Community Health Workers. Seventy percent of the CBSVs that had supervision indicated a higher impact of the supervision on their work as indicated in Table 4. This is a great call for continuous supervision by all stakeholders.

Provision of resources for surveillance work at any level must be adequate and consistent (MOH Republic of Uganda, 2021). Material and financial resources compliment the efforts of the human resource to improve performance (WHO, 2019). The findings from this study in Table 3, indicated that only 37% of the CBSVs were provided with some resources for the past one year. Resources that were mostly provided were reporting forms, T-shirts and registers. Resource provision in support of surveillance has always been very low. In assessment of the response to cholera outbreak in two districts in Ghana, Ohene *et al.,* (2016) indicated that in addition to long term resources such as water *etc* and adequate supply of resources such as drugs for management of cases also provided a sound basis to improve performance. The findings agree with a study conducted by McGowan *et al.* (2022), which

indicated that adequate materials resources positively affected the CBSVs system.

Inadequate supply of resources has significant consequences on health outcomes. It could increase morbidities and mortalities (WHO, 2022). The findings indicated that about 63% of the CBSVs reported that they have not had any resource from the higher levels for the past one year. The most indicated reasons for the poor supply of resources were inadequate funds and support from the higher levels and this is consistent with the findings of previous study conducted in Northern Ghana by Adokiya, *et al.*, (2015) which indicated that low resource laboratory equipment and materials affected the surveillance system. In a situation where about 63% of the CBSVs did not receive any resources for the past year, the consequence could be very disastrous. For instance lack of identifiers such as T-shirts and Identity cards for CBSVs could put them at risk of being humiliated by strangers in the community (GHS, 2021). Resources have always been a major challenge in surveillance work. However, stakeholder collaboration has been very effective in addressing challenges on resources (Bordier *et al.*, 2021).

When community health workers are trained and provided with enough skills to work, they often show greater productivity and higher quality of work-output (Geldsetzer *et al.*, 2017). The results in Table 3 indicated that about 52% of the CBSVs reported that they have had some training on disease surveillance in the past one year. Further investigations detailed that these trainings were provided mostly by health workers at the district level, usually less than one week. The implications of an effective training cannot be underestimated. Javanparast *et al.* (2018) posited that if community health workers are given

proper training, the responsibility of supervision is lessened. CBSVs will need lesser supervision to detect and report priority diseases and events when they are trained. In the same study, it was observed that the morale of employees increases with proper training and this improves cooperation and loyalty at the work place. Although the findings are consistent with a cross sectional survey organised by Hamalaw *et al.*, (2022) which reported that 63% of facility staff were trained on surveillance, they are all less than the 80% or more standard set in the IDSR Technical guidelines (GHS, 2019).

Inadequate training for employees leads to poor job performance and increased level of work-related stress (Saleem, Malik & Qureshi, 2021). About 48% of the CBSVs responded that they have not had any training on surveillance which is consistent with a study by Saleh, Malik and Qureshi (2021), of which weak supportive surveillance functions such as training was a constraint to surveillance performance. This situation is unacceptable, especially in a situation where about 54% of CBSVs always and sometimes need help to identify some priority diseases. CBSVs could forget signs and symptoms, detect and report diseases very late and may not be able to educate the community members on preventive measure to combat the priority diseases and events (McGowan *et al.*, 2022). Low AFP detection in Kenya was attributed to poor knowledge of CBSVs on the disease (Tesfaye *et al.*, 2020). In addition, poor management of cholera cases in two districts in Ghana was due to lack of knowledge of CBSVs (Ohene *et al.*, 2016).

Research Question Three: What is the extent of the Performance of CBSVs on the Core and Quality Surveillance Functions in the Communities in the Central Region?

CBSVs perform core and quality surveillance functions in the communities to support the entire surveillance structure in the health industry (Guerra *et al.*, 2019). Research question three aimed at establishing the extent to which the CBSVs performed on core and quality surveillance functions in the community. Surveillance core functions are mainly the key activities that are carried out by the CBSVs in the communities to prevent outbreaks while the quality surveillance functions mainly measure how efficient the core functions are carried out. The surveillance core functions that were considered in this research were: case detection, case registration and reporting. The rest are epidemic preparedness, response and control and feedback. Some of the key quality functions studied under this research were timeliness of reporting, completeness of reporting, usefulness of report, acceptability, flexibility and simplicity of reporting. The data were analysed using descriptive statistics-frequencies.

Case detection is a major core function of the CBSVs and in Table 5, the result indicated that only 22% (n = 201) of the CBSVS had detected a priority disease or event for the past one year but, 78% (n= 697) did not detect any case. In the case of reporting, 16% (n= 146) have submitted reports but 84% (n= 752) did not submit any report to the higher level in the past one year. The study further assessed performance on preparedness, response to outbreak and provision of feedback. Preparedness plans were available in some of the communities, 32% (n=288) had plans but 68% (n=610) had no plans for epidemics. There were committees to respond to outbreaks in 31% (n= 280) of

the communities while 69% (n= 618) of the communities had no committees in place to respond to outbreaks. Provision of feedback to communities by CBSVs were done by 90% (n= 810) of the CBSVs while 10% (n=88) did not provide any feedback to the communities. For case of registration, 19% (n= 174) of the CBSVs had their cases correctly filled in the registers and 81% (n=494) did not fill correctly as shown in Table 5.

Table 5: Performance of CBSVs on Core Surveillance functions (n=898)

Core Functions	Frequency	Percentage
Detection of Priority Diseases		
Yes	201	22
No	697	78
Reporting to the higher level		
Yes	146	16
No	752	84
Availability of Epidemic Preparedness		
Yes	288	32
No	610	68
Committee to Respond to Outbreak		
Yes	280	31
No	618	69
Provision of feedback to Community		
Yes	810	90
No	88	19
Registration of Cases		
Yes	174	19
No	724	81

Source: Field Data (2023)

On the quality surveillance functions, Table 6 shows that 21% (n=189) of the CBSVs had high completeness rate of 80% or more while, 79% (n= 709) of the CBSVs had low completeness rates of less than 80%. With respect to timeliness of reporting, 20% (n= 180) of the CBSVs reported priority diseases on time while 80% (n= 718) did not report on time.

Table 6: Performance of CBSVs on Quality Surveillance Functions (n=898)

Quality Functions	Frequency	Percentage
Completeness		
80% and above	189	21
Below 80%	709	79
Timeliness		
80% and above	180	20
Below 80%	718	80

Source: Field Data (2023)

Table 7 presents the results on quality functions and indicates that most CBSVs ranked high for usefulness 41% (n= 368), acceptability 46% (n= 413), flexibility 44% (n=260) and simplicity 48% (n= 431) of reporting using the CBSVs register. The next top ranking was in the low category, CBSVs ranked low for usefulness 34% (n= 305), acceptability 31% (n= 278), flexibility 33% (n= 296) and simplicity 32% (n= 287) of reporting using the CBSVs register. For very low category, the rankings were as follow: usefulness 20% (n=120), acceptability 16% (n= 114), flexibility 17% (n= 153) and simplicity 13% (n= 117) of reporting using the CBSVs register. The least rankings were in the very high categories, usefulness 5% (n=45), acceptability 7% (n=63), flexibility 6% (n=54) and simplicity 7% (n= 63) of reporting.

Table 7: Ranking the Extent at which the Surveillance Quality Function has been Beneficial (n=898)

Quality Functions	Frequency	Percentage
Usefulness		
Very High	45	5
High	368	41
Low	305	34
Very Low	180	20
Acceptability		
Very High	63	7
High	413	46
Low	278	31
Very Low	144	16

Table 7 continued

Flexibility		
Very High	54	6
High	395	44
Low	296	33
Very Low	153	17
Simplicity		
Very High	63	7
High	431	48
Low	287	32
Very Low	117	13

Source: Field Data (2023)

The performance of CBSVs in all the core surveillance functions in this study could be described as very low when compared with the national target of 80% or more as stipulated by (GHS, 2019). With the exception of provision of feedback that recorded 90%, the rest of the core functions recorded below 50%. The low performance on the core surveillance functions is not surprising. This is because, in this research, the supportive surveillance functions received by the CBSVs from surveillance focal persons were also described as low. In a situation whereby as high as 48% and 47% of the CBSVs have not received any form of surveillance training and supervision respectively, core surveillance functions could be affected (Ng'etichi *et al.*, 2021). The findings in this study on the core surveillance functions are agreeable to an assessment done by Saleh *et al.*, (2021) where performance of IDSR core surveillance functions were also described as suboptimal at the Primary Health Care level in Zanzibar, Tanzania.

The implications of low performance on core surveillance functions cannot be underestimated. In effect, there could be a high transmission rate, delayed responses and difficulty in tracking outbreaks since carriers of the diseases are not detected, treated and contact traced (Li *et al.*, 2020). The consequences of low case reporting could also be enormous. A study on impact

of COVID-19 on tuberculosis indicated that low reporting of COVID-19 cases led to misconception of the severity of the disease leading to lack of urgency in taking preventive measures (Ozdemir, Oztomurcuk & Oruc, 2022).

According to Tao *et al.*, (2021), low performance on the core functions will delayed responses and could result in high morbidities and mortalities of cases. In a situation where 69% of CBSVs they had no committees, that is, a team in the community that sits to plan to respond to outbreaks. Management of outbreaks may lack detailed information for decision making which could influence provision of key resources to manage cases when there is no committee. Provision of feedback has been good. Taha (2022) suggested that excellence feedbacks have been noted to facilitate trainees' performance and confidence. Poor feedbacks from CBSVs to the communities may affect ownership and sustainability of the Community-based surveillance system (WHO, 2019).

Quality surveillance of the CBSVs was investigated in Tables 6 and 7 provide the details. Completeness of reporting by CBSVs was assessed by standards as a proportion CBSVs who had completely filled 80% of their registers and documented completely reports submitted to the next higher level (GHS, 2019). In this research, completeness of reporting was found to be very low. Only 21% of the CBSVs with registers had completely filled their registers and documented reports submitted. The low completeness of reporting rate could be attributed to the low CBSVs understanding and interest on the variables in the registers. It could also be attributed to the low educational background of the CBSVs since about 65% of the CBSVs in this research had JHS/MSLC and below hence may find it difficult to fill the registers and low

supervision. This findings contradict with a study by Ezenyeaku *et al.,* (2020) in Anambra State where CBSVs recorded above 80% completeness and timeliness as compared with 21% completeness in this study. Low completeness rate could contribute to under reporting and difficulty in linking up cases and contact tracing (Kante *et al.*, 2023).

CBSVs report is considered to be timely when they identify a case and report that case within 24 hours. Reports submitted after 24 hours are described as late submission. As per the standards set in the IDSR Technical Guidelines, the proportion of CBSVs who achieved 80% and above the timelines is said to have higher rate and those below 80% are said to have low submission rates. In this study the CBSVs recorded a timeliness rate of 20% which is far below the standard of 80% or more. These findings are also in opposed with a study by Ezenyeaku *et al.,* (2020) in Nigeria that recorded 82% timeliness rate. This high reporting rate could be attributed to the high supervision and training of above 80% in the state at that time compared to that of below 50% in the Central Region of Ghana. Late reporting of CBSVs in the Central Region is a sign of weak surveillance system which can lead to a potential outbreaks (Ohene *et al.*, 2016).

Further quality surveillance variables such as usefulness, acceptability, flexibility and simplicity were assessed to determine how they have affected the CBSVs work in terms of the use of the registers and the nature of the surveillance system. Table 7 provides the details of the results. The findings from the study indicated that a little over 50% of the CBSVs stated that the quality surveillance variables have had a higher impact on their surveillance work, except usefulness that recorded 46%. It indicated that the register has not

be very useful in the CBSVs work. The report is also low since a careful study of the results show that over 40% of the CBSVs described the quality surveillance impact as low. This means the CBSVs find the use of the register and the surveillance system to be unacceptable, rigid and complex which need to be investigated. This finding contradicts with the study by Alemu *et al.* (2019) in Ethiopia where most of the quality surveillance variables recorded over 80%. It could be due to the fact that the study in Ethiopia was based on district public health surveillance performance, where focal persons are more enlightened. At the community level, the situation could be different and this need urgent attention.

Research Question Four: What are the Differences in Performance between CBSVs in Urban and Rural Areas and those of Coastal and Forest Areas in Terms of their Core Surveillance Functions in the Central Region?

Research question four tried to determine the differences in performance between CBSVs in developmental areas (urban and rural areas) and ecological communities (coastal and forest communities) in terms of their core surveillance functions in the Central Region. The *Chi-squared test* was used to determine the relationship of CBSVs' performances in case detection, registration, reporting and outbreak preparedness. The rest are outbreak response and feedback on diseases and events in the forest-coastal and rural-urban communities. *Bivariate logistic regression* was further used to ascertain the association of the dependent variables that are influenced by developmental status (urban and rural areas). These statistical tools were used because the data had two independent variables which were correlated with more than two dependent variables (Fraenkel, *et al.* 2015).

The results from the analysis of the differences in performance on CBSVs core functions in the rural and urban communities are shown in Table 8. The findings on the overall performance results in the urban and rural communities have also been presented in Table 9. Table 10 presents the results in the coastal and forest communities while Table 11 also provides the overall performance results. Results of the binary logistic regression for the association between significant independent variables and developmental status (urban and rural) are also presented in Table 12.

Regarding the case reporting, from Table 8, the results showed that, largely, 84% (n= 752) did not report on any priority diseases or events for the past one year in the rural and urban communities. Nevertheless, 16% (n= 146) of the CBSVs reported on some priority diseases and events. The report further indicates that in the rural communities 85% (n=687) did not report on any priority disease or condition. However, 15% (n= 118) reported on some diseases and events. In the urban communities, 70% (n= 65) of the participants reported no conditions but 30% (n = 28) reported on some cases of priority disease and events. It was revealed that there was a significant difference in reporting between the rural and urban communities [X^2 =*14.6148* (*df* =1), *P* =<0.001].

Community members need feedback in order to be alert to prevent themselves from contracting infectious diseases and management of events. The results from the study are shown in Table 8, that generally, only 10% (n= 88) did not provide any feedback to the community members on priority diseases and events but as much as 90% (n= 810) provided feedback to the community members. In the rural communities as low as 8% (n= 68) did not provide any feedbacks to the communities for the past year. However, as high as 92% (n=

737) provided some feedbacks to the community members. The result further indicated that in the urban communities 22% (n= 20) did not provide any feedback to the community members meanwhile 78% (n= 73) provided feedback to the community members. There was a statistically significant difference in providing feedback between rural and urban communities, [X^2 *=16.08224* (*df* =1), *P* =< 0.001]

Generally, from Table 8 the results indicated that in the developmental segment (rural and urban), 78% (n=697) of the CBSVs did not detect any priority disease or condition for the past year. Only 22% (n=201) of the CBSVs detected some cases of priority diseases and events in the rural and urban communities. Specifically, in the rural communities the situation was similar, 78% (n=630) did not detect any priority condition however only 22% (n=175) detected some cases. For case detection in the urban communities 72% (n=67) of the CBSV did not detect any case but 28% (n=26) detected some cases. There was no significant difference in case detection between CBSVs in rural and urban communities: [X^2 *=1.8553,* (*df* =1), *P* = 0.173].

For case registration, the results, as seen in Table 8, indicated that as high as 81% (n=724) did not fill the registers very well in the rural and urban communities. Only 19% (n=174) did fill them correctly. Explicitly in the rural communities, 80% (n= 648) did not fill the register very well. However, 20% (n=157) filled the register correctly. Registration in the urban areas revealed that 82% (n= 76) did not fill the registers very well but 18% (n= 17) were able to fill the registers correctly. The differences between the rural and urban areas in term of case reporting was not significant: [X^2 *=0.0799,* (*df* =1), *P* = 0.777].

Outbreak preparedness is key in disease control. It shows how best an emergency situation could be addressed. The results from the study indicated that 68% (n= 610) of the CBSVs had no plans to prevent outbreaks of priority diseases. Significantly 32% (n= 288) had some plans to address future outbreaks of priority diseases and events. In the rural communities the results indicated a comparable situation, about 68% (n= 550) had no preparedness plan but 32% (n= 255) had plans in place. The results in the urban communities also show that 65% (n= 60) of the CBSVs in the communities had no preparedness plans, while 35% (n= 33) had some plans. There were no significant differences between CBSVs in the rural and urban areas as far as availability of preparedness plan is concerned [X^2 =*0.5546*, (*df* =1), *P* = 0.456].

Participating in an outbreak gives the CBSVs the ability to have the experience to act confidently as they work and report on their activities. The finding in the study indicated that 69% (n= 618) had not participated in responding to any outbreak in the past one year, while 31% (n= 280) had participated in an outbreak response. In the rural communities, 69% (n= 557) had not participated in any outbreak response in the past one year. However, 31% (n= 248) had participated in responding to an outbreak. Results in the urban communities further show that 66% (n= 61) had not been part in managing outbreaks for the past one year but 34% (n= 32) have had an experience in responding to an outbreak. There was no statistically significant difference in responding to an outbreak between CBSVs in rural and urban communities [X^2 *=0.5038,* (*df* =1), *P* = 0.478].

Table 8: Performance of CBSVS in the Rural and Urban Areas (Developmental Status) as against Core Surveillance Functions

Core Functions	Rural	Urban	Total	X^2	*df*	P-value[a]
Detection						
No	630 (78.3)	67 (72.04)	697 (77.62)	1.8553	1	0.173
Yes	175 (21.7)	26 (27.96)	201 (22.38)			
Registration						
No	648 (80.5)	76 (81.72)	724 (80.62)	0.0799	1	0.777
Yes	157 (19.25)	17 (18.28)	174 (19.38)			
Reporting						
No	687 (85.34)	65 (69.8)	752 (83.74)	14.6148	1	<0.001*
Yes	118 (14.66)	28 (30.11)	146 (16.26)			
Outbreak preparedness						
No	550 (68.32)	60 (64.52)	610 (67.93)	0.5546	1	0.456
Yes	255 (31.68)	33 (35.48)	288 (32.07)			
Outbreak Response						
No	557 (69.19)	61 (65.59)	618 (68.82)	0.5038	1	0.478
Yes	248 (30.81)	32 (34.41)	280 (31.18)			
Feedback	Rural	Urban	Total			
No	68 (8.45)	20 (21.51)	88 (9.8)	16.0824	1	<0.001*
Yes	737 (91.55)	73 (78.49)	810 (90.2)			

Source: Field Data (2023) P-value: *p < 0.05; [a] Chi-squared test (chi²)

In Table 9, the overall performance on the core functions of CBSVs in the rural and urban communities were assessed based on excellent, good, average and poor. The results indicated that about 78% (n= 700) performed poorly, 13% (n= 116) recorded an average performance, 7% (n= 62) performed good and only 2% (n= 20) had an excellent performance. The results further indicated that, in specific terms, in the rural communities, the results showed that 78% (n= 631) had poor performance, 13% (n= 101) had average performance, 7% (n= 55) had good performance and 2% (n= 18) had an excellent performance. Performance in the urban communities indicated that

about 74% (n= 69) performed poorly, 16% (n= 15) performed averagely, and 8% (n = 7) had good performance but only 2% (n= 2) had an excellent performance. There was no significant difference between rural and urban communities in the performance of their core functions, [X^2 =1.0772, (df =3) = P = 0.783].

Table 9: Overall Performance Core Functions of CBSV in the Rural and Urban Areas in the Central Region

Overall Performance	Rural	Urban	Total	X^2	df	P-value[a]
Excellent	18 (2.24)	2 (2.15)	20 (2.23)	1.0772	3	0.783
Good	55 (6.83)	7 (7.53)	62 (6.9)			
Average	101 (12.55)	15 (16.13)	116 (12.92)			
Poor	631 (78.39)	69 (74.19)	700 (77.95)			

P-value: *p < 0.05; [a] Chi-squared test (chi²)

Source: Field Data (2023)

The research further examined the ecological status, that is coastal and the forest communities, and tried to determine whether there were differences in performance of the core surveillance functions between CBSVs in coastal and forest communities. Table 10 presents that for case detection, (the summary of both coastal and forest). On case registration, the study ascertained how well the CBSVs have been able to fill the CBSVs register. From Table 10, the summary of case registration in the forest and coastal communities indicated that about 81% (n= 724) did not fill the register appropriately while 19% (n= 174) was able to do proper registration in the register. Precisely in the coastal communities, about 86% (140) did not fill the register very well but 14% (n= 23) were able to do proper registration. In the forest communities, 79% (n= 584) did not do proper registration however, 21% (n= 151) was able to do proper registration. There was near significant difference between CBSVs in the

coastal and forest communities in terms of their case registration, [X^2 =*3.5351*, (*df* =1), *P* = 0.006].

Considering case detection about 78% (n= 697) did not detect any priority disease or events but 22% (n= 201) detected some cases. Specifically, in the coastal communities about 74% (n= 120) detected no case. However, 26% (n= 43) detected some priority diseases and events. The study further shows that in the forest communities similarly about 78% (n= 557) did not detect any case but 22% (n= 158) detected some priority diseases and events. There was no significant difference in cases detected between coastal and forest communities, [X^2 =*1.8316*, (*df* =1), *P* = 0.176].

Reporting on priority diseases gives the evidence for the health officials to act swiftly to prevent outbreaks. Generally, in Table 10, the study shows that near 84% (n= 752) had not reported any case or event for the past year. Nevertheless, about 16% (n =14) did report some priority diseases and events to the next level. Explicitly in the coastal communities 80% (n= 130) did not report any priority disease or events but about 20% (n= 33) had reported some priority disease or events to the next level. The results further indicated that about 85% (n= 622) in the forest communities had not report any priority disease or event however, 15% (n=113) had reported some priority disease and events. The study found out no significant difference in reporting between coastal and forest communities, [X^2 =*2.3252*, (*df* =1), *P* = 0.127].

The ability to prepare for an epidemic shows how swiftly emergency circumstances could be dealt with should they happen. A summary of the coastal and forest communities indicated that 68% (n= 610) of the CBSVs had no plans to prevent outbreaks of priority diseases. Significantly, 32% (n= 288)

had some plans to address future outbreaks of priority diseases and events. Considering the coastal communities, the results indicated about 69% (n= 113) had no preparedness plan but 31% (n= 50) had plans in place. The results in the forest communities also showed that 68% (n= 497) of the CBSVs in the communities had no preparedness plans, while 32% (n= 238) had some plans in place. There was no significant difference between CBSVs in the coastal and forest communities as far as availability of outbreak preparedness plan is concerned [X^2 =*0.1783*, (*df* =1), *P* = 0.673].

When CBSVs participate in an outbreak investigation and control of diseases it gives them ability to have the experience and to act confidently and also report. The finding in the study in Table 10 indicated that in the coastal and forest communities together, 69% (n= 618) had not participated in responding to any outbreak in the past one year, while 31% (n= 280) had participated in an outbreak response. In the coastal communities, 67% (n= 109) had not participated in any outbreak response in the past one year however, 33% (n= 54) had participated in responding to an outbreak. Results in the forest communities further show that 69% (n= 509) had not been part in managing outbreaks for the past one year but 31% (n= 226) have had an experience in responding to an outbreak. There was no significant difference in responding to an outbreak between CBSVs in rural and urban communities [X^2 = *0.3523*, (*df* =1), *P* = 0.553].

CBSVs need to provide constant feedback on health information to community members in order to equip them to be alert to prevent themselves from contracting infectious diseases and support in the management of events. The results from the study indicated that in the coastal and forest communities,

generally, from Table 10 only 10% (n= 88) did not provide any feedback to the community members on priority diseases and events but as much as 90% (n= 810) provided feedback to the community members. In the coastal communities as low as 7% (n= 11) did not provide any feedback to the communities for the past year. However, as high as 93% (n= 152) provided some feedbacks to the community members. The result further indicated that in the forest communities 10% (n= 77) did not provide any feedback to the community members meanwhile 90% (n= 658) provided feedback to the community members. There was no significant difference in providing feedback between coastal and forest communities, [X^2 =*2.0974*, (*df* =1), *P* = 0.148].

Table 10: Differences in the Performance of CBSVs in the Coastal and Forest Areas as against the Surveillance Core Functions Ecological Status

Core Functions	Coastal	Forest	Total	X^2	*df*	P-value[a]
Detection						
No	120 (73.62)	577 (78.5)	697 (77.62)	1.8316	1	0.176
Yes	43 (26.38)	158 (21.5)	201 (22.38)			
Registration						
No	140 (85.89)	584 (79.46)	724 (80.62)	3.5351	1	0.060*
Yes	23 (14.11)	151 (20.54)	174 (19.38)			
Reporting						
No	130 (79.75)	622 (84.62)	752 (83.74)	2.3252	1	0.127
Yes	33 (20.25)	113 (15.37)	146 (16.26)			
Outbreak Preparedness						
No	113 (69.33)	497 (67.62)	610 (67.93)	0.1783	1	0.673
Yes	50 (30.67)	238 (32.38)	288 (32.07)			
Outbreak Response						
No	109 (66.87)	509 (69.25)	618 (68.82)	0.3523	1	0.553
Yes	54 (33.13)	226 (30.75)	280 (31.18)			
Feedback						
No	11 (6.75)	77 (10.48)	88 (9.8)	2.0974	1	0.148
Yes	152 (93.25)	658 (89.52)	810 (90.2)			

P-value: *p < 0.05; [a] Chi-squared test (chi2)

Source: Field Data (2023)

In Table 11**,** the total performance on the core functions of CBSVs in the coastal and forest communities were evaluated based on excellent, good, average and poor. The results indicated that about 78% (n= 700) performed poorly, 13% (n= 116) recorded an average performance, 7% (n= 62) performed good and only 2% (n= 20) had an excellent performance. The results further indicated that, in specific terms, in the coastal communities the results stated that 78% (n= 127) had poor performance, 13% (n= 21) had average performance, 6% (n= 9) had good performance and 4% (n= 6) had an excellent performance. Performance in the forest communities also indicated that about 78% (n= 573) performed poorly, 13% (n= 95) performed averagely, and 7% (n =53) had good performance but only 2% (n= 14) had an excellent performance. There was no significant difference between coastal and forest communities in the performance of their core functions [X^2 =*2.4416*, (*df* =1), *P* = 0.486].

Table 11: Overall Performance on Core Functions of CBSVs in the Coastal and Forest Communities

Overall Performance	Coastal	Forest	Total	X^2	*df*	P-value[a]
Excellent	6 (3.68)	14 (1.9)	20 (2.23)	2.4416	3	
Good	9 (5.52)	53 (7.21)	62 (6.9)			
Average	21 (12.88)	95 (12.93)	116 (12.92)			0.486
Poor	127 (77.91)	573 (77.96)	700 (77.95)			

Source: Field Data (2023)

The table 12 displays the bivariate analysis of the differences in the performance of the CBSVs in the rural and urban communities. It was found that, the dependent variables (reporting and feedback) were highly influenced by the independent variables (urban and rural) in the study. It showed that at the

bivariate level, there was a significant association (p<0.05) between the developmental status (urban and rural) with case reporting and providing feedback on case investigation to the community.

From the analysis, CBSVs residing and operating within urban areas had 2.5 times higher odds of reporting at least one case than their counterparts residing in the rural areas (COR 2.51, 95% CI 1.545 - 4.070, B 0.919, Wald 13.741, P<0.001). On the other hand, the odds of providing feedback of case or investigation into the community or individuals was 0.3 time lower among CBSV's residing in urban areas compared to those in rural areas (COR 0.33, 95% CI 0.194 - 0.586, B -1.087, Wald 14.973, P<0.001). However, no significant association was observed when the composite performance of CBSV's core functions was compared with the developmental status.

Table 12: Binary Logistic Regression for the Association Between Significant Independent Variables and Developmental Status (Rural and Urban)

Variables/Categories	Crude Odds Ratio (95% CI)	B	Wald	p-value
Case Reporting				
No	ref			
Yes	2.508 (1.545 - 4.070)	0.919	13.741	<0.001
Feedback				
No	Ref			
Yes	0.337 (0.194 - 0.586)	-1.087	14.973	<0.001
CBSV overall performance				
Poor	Ref			
Average	1.358 (0.748 - 2.466)	0.305	1.006	0.315
Good	1.164 (0.510 - 2.656)	0.149	0.125	0.718
Excellent	1.016 (0.231 - 4.472)	0.016	0.001	0.983

P-value: *p<0.05; COR: Crude Odds Ratio; 95% CI: 95% Confidence Interval; ref: Reference group

Source: Field Data (2023)

Generally, total case detection was very low in the developmental status (rural and urban community) and ecological (forest and coastal) sections. The findings indicated that only 22% of the CBSVs were able to detect priority diseases and events in rural and urban communities as an overall total, the specifics differences are discussed in the subsequent paragraphs. The situation in the ecological (coastal and forest) zones was not different. Similarly, the coastal and forest communities also recorded 22% case detection. The implications of the low-case detection could be described in two ways, either CBSVs searched for the priority disease but do not identify cases or they do not do any intensive case search (Ma *et al.,* 2017). The latter could be very dangerous because there could be severe outbreaks due to some unseen cumulative cases and events, or cases and events may be detected very late where complications might have set in, which may result in high morbidities and mortalities (Kweku *et al.,* 2020b). Low-case detection has generally been affecting the CBSVs programme (WHO, 2019).

Case detection in the rural communities could be described as slightly lower (22%) as compared to the urban communities (28%). The finding is indicative that the urban communities detect more cases than the rural communities. The findings are consistent with a systematic review conducted by McGowan and team. The review indicated that volunteers' ability to detect cases could be reduced at any level of operation due to several factors including lack of trainings, transport facilities, supervision and inadequate provision of resources (McGowan *et al.,* 2022). The slightly higher case detection in the urban communities could be attributed to the fact that CBSVs in the urban communities usually have closer supervision (Rubenstein *et al.,* 2021).

The case detection rate in the coastal and forest communities were also described as low. The detection rate of 26% in the coastal communities is described as higher than that of the forest communities 22%. The IDSR Technical Guidelines posited that coastal communities in Ghana are well noted for having a lot of priority diseases and events because they serve as routes that foreigners use to enter the country. The community based surveillance systems in the coastal areas are also sometimes describe as sub-optimal hence surveillance interventions are not swift to nip outbreaks in the bud (Ohene *et al.*, 2016). Moreover, the endemicity of diseases and pathogens are very high and that could contribute to their reporting rates (Miller & Hagan, 2017). There were no significant differences in performance between rural, urban and forest, coastal communities in terms of case detection.

Continuous registration of priority diseases and events is vital in public health surveillance (Ernest *et al.*, 2018). The finding again reveals that a total of about 19% of the CBSVs in the rural and urban communities registered some priority diseases and events in the past one year. The CBSVs in the coastal and forest communities had similar performance showing only 19% doing some registration. This is consistent with a cross sectional study by Ministry of Health (2017) where facility-based case registration was higher than that of the community. The performance on case registration is very low because in various communities in the Central Region, several priority diseases and events such as deaths, births *etc.* occurred that must be registered in the CBSVs register for followed up by the nurses but these activities are sometimes not done completely due to low supervision. The implication is that all the childhood births and deaths and other conditions that occurred were not captured and this

could affect future decision making. Thus clients' vital information and outcome of their treatment will be missed (Groseclose & Buckeridge, 2017).

Rural and urban communities have different characteristics. However, the findings indicated that the registration rate for the rural and urban communities in the past one year was 19% and 18% respectively, which could be described as poor performance. Poor registration rates in rural and urban communities occurred for various reasons: scattered nature of the terrain in the rural communities in Assin North and population density in the urban communities in Cape Coast in the Central Region cannot be under estimated (GHS, 2021). Low vaccination coverages and low birth registrations are some of the consequences of low case registration. Moreover, proper registration of cases improve contact tracing and management of priority disease and events (Ohene *et al.,* 2016).

Maintaining appropriate records in the coastal and forest communities is necessary to improve disease surveillance. In the coastal communities, the findings revealed that only 14% of the CBSVs were able to do proper registration of diseases and events while in the forest zone about 21% did proper registration. In the coastal communities, control of movement of people during epidemics is difficult while in the forest communities missed opportunities due to scattered nature of the people, affects performance in health outcomes (Ng'etich *et al.,* 2021). Low registration of cases in the coastal communities is consistent with a study conducted by Ohene *et al.,* (2016) which indicated that case registration during outbreak in two coastal districts in Ghana need to be improved.

Priority diseases and events must be identified and reported on for prompt action. In this study, the finding showed that, overall, only 16% of CBSVs were able to report some cases of priority diseases and events in rural and urban communities. The same percentage was recorded in the coastal and forest communities in the past one year. This could be described as low because in this same study about 22% of the CBSVs detected some priority diseases and events. Thus, it could be deduced that there were gaps in reporting. This is conflicting with a previous study by (Team *et al.*, 2016) in Sierra Leone where 129 volunteers were trained from 23 cholera treatment Centres on case definition of cholera and reported about 7280 cases of cholera. Though the volunteers were trained, resourced and monitored, the reporting rate was quite encouraging. The consequences of low case reporting could result in late case diagnosis where the disease will be seen in a complicated state (Camacho *et al.*, 2018).

CBSVs reporting on priority diseases in rural and urban communities in the Central Region is generally very low. The finding clearly depicted that in the rural communities, only 14% of the CBSVs reported some priority disease or events, while the CBSVs in the urban recorded 30%. Although in both communities the reporting situation are very low, the urban reporting is much higher than the rural communities. This is consistent with a cross sectional study on digital technology which indicated that reporting in urban communities are facilitated to present more cases than rural improved technology (Ernest *et al.*, 2018). The reason for low reporting in the rural areas could apparently be non-adherence of clients to referrals. When the CBSVs refer cases to the health facilities they do not go due to distance to the health facilities (Kweku *et al.*,

2020b). This study reveals that there are significant differences between reporting in rural and urban communities in the Central Region of Ghana.

The coastal and forest communities reporting status were also seen as very low. The report indicated that 20% of the CBSVs in the coastal communities reported priority diseases or events and in the forest communities 15% of the CBSVs did report priority disease and events. The implication of poor reporting in both coastal and forest communities could be delayed administration of interventions to control outbreaks (Jan, 2022). However, high reporting could provide supporting evidence of presence of the disease to ensure effective mobilisation of resources to prevent or manage cases (Mandyata *et al.*, 2017). Strengthening community-based disease surveillance and reporting was critical to the control and prevention of Covid-19 disease in Ghana (CDC, 2022).

Outbreak preparedness plan must be available at all levels of surveillance and at the community level. The plan must be done by the community health committee in partnership with the community opinion leaders. From Table 8 the study revealed that, overall, in both rural and urban communities only 32% of CBSVs had a preparedness plan in place. The situation in the coastal and forest communities was also 32%. Availability of a preparedness plan is a key surveillance step to respond to outbreaks (Mandyata *et al.*, 2017). According to Gilmore *et al.*, (2020), having in place a comprehensive outbreak preparedness plan puts the facility at an advantageous position to deal with future possible outbreaks. Absence of preparedness plans in most of the communities put the Central Region in a dangerous state where communities could be overwhelmed with any epidemics. The lack of a

preparedness plan recorded in the Central Region is in agreement with situation where the public Health system in Guinea, Liberia and Sierra Leone were overwhelmed during the Ebola outbreaks due to lack of plans at peripheries of the surveillance system (Gilmore *et al.*, 2020).

Specifically, in the rural and urban communities, the findings were 32% and 35% respectively. This means that in each of the areas over 60% of the communities have no outbreak preparedness plans which put the entire community at risk of any outbreaks or disasters. These findings are in line with a cross sectional study conducted by Norman, Aikins, Binka & Nyarko (2012), which posited that about 64% of the nation's hospitals were not adequately prepared for large road traffic accidents and do not possess emergency preparedness plans. According to McNabb (2023), an emergency plan should clearly state what might happened and what could be done to mitigate it. The presence of an emergency preparedness plans which included anticipatory actions in the Philippines aided in predicting the occurrence of typhoons and helped in minimizing its effects on populations in the rural and urban areas. This also helped in financial, human and material resources management during emergencies (Houston, 2021).

The coastal and forest communities had 31% and 32% respectively as far as the availability of emergency preparedness plan is concern. The findings reveal a challenging and prevailing situation in our communities in the Central Region. This also agrees with a situation in Pakistan, where there was absence of disaster plans which necessitated the training of 150 volunteers to build their capacity in disaster preparedness (Mehwish, 2018). The consequences of these findings on the communities in the coastal and forest areas are similar.

According to Houston (2021), lack of a disaster preparedness plan could lead to delayed interventions to address outbreaks and support to victims. Furthermore, cost implications of an outbreak or disaster always overwhelms the victims and the country as a whole when plans to mitigate or reduce the impact of the disasters are not in place.

The overall total for CBSVs' ability to participate in responding to outbreaks in rural and urban and coastal and forest were both 31% respectively. CBSVS have the basic knowledge and ability to support health workers in responding to outbreaks and emergencies. The findings indicate that about 69% of the CBSVs have not been part in controlling any outbreak in the past one year. Low case detection could contribute to this because the more you detect cases the more you would be part in managing them (Adokiya *et al.*, 2015). However, CBSVs could be invited to participate in managing conditions in other communities in order to gain more experience (McGowan *et al.*, 2022). This is in line with an assessment on knowledge attitude and practice on cholera in Kenya where CBSVs lack experiences to respond to outbreaks (Orimbo *et al.*, 2020).

The findings must be consistent within the developmental status. The rural community recorded 31%, while the urban communities had 34%. CBSVs in the urban communities had a slightly higher exposure than that of the rural communities. The reason for the slightly higher exposure in urban communities could be attributed to the fact that there were also slightly higher case detections in the urban communities than those of the rural communities. CBSVs exposure to respond to outbreaks is known to be higher in urban than rural communities as posited in a study on digital surveillance and communication strategies in

Africa (Ernest *et al.,* 2018). The findings in this research indicate low exposure to outbreak response in both rural and urban communities and continuous non exposure of CBSVs may result in lack of skills to address emergencies should they occur (McGowan *et al.,* 2022).

The finding on outbreak response in ecological areas was revealed for coastal and forest communities. The findings for both coastal 33% and forest 31% were low coverages as compared with the standards where CBSVs are to obtain 80% or more of all their core functions in surveillance activities (GHS, 2019). This confirms the low performance on core functions. The coastal communities had a slightly higher response than that of the forest communities which could also be attributed to the fact that they had higher case detection than that of the forest communities. The low exposure to managing outbreaks in both coastal and forest communities could lead to inadequate confidence to act in response to outbreaks in future (Groseclose & Buckeridge, 2017). Supervisors could provide continuous orientation as they interact with CBSVs on the job to ensure that they are exposed to current prevailing disease conditions and events and their response (Njuguna *et al.,* 2022).

The CBSVs are the liaison officers between the community and the health sector. When surveillance reports are discussed with the CBSVs, they must provide feedback to the community for implementation. In this study CBSVs were asked whether they have reported to the community for the past one year and the response was encouraging. Table 8 indicates that about 90% of the CBSVs had provided feedback to the communities in both the developmental (rural and urban) and the ecological status respectively. CBSVs communication to the communities was commendable in this study which is

inconsistent with an assessment done by Ohene *et al.* (2016) which indicated that poor communication between CBSVs and the health authorities and the communities on cholera, affected early intervention and response to cholera outbreak. This study is in line with a study on the utilisation of CBSVs for Buruli Ulcer case detection in Nigeria which posited that a higher case detection of cases was partly due to effective case search and feedback by Community Health Volunteers to stakeholders (Alo *et al.,* 2022).

The feedback situation in the rural and urban communities specifically, were 92% and 78% respectively. Table 8 provides the details of the analysis. The findings indicate a higher feedback rate in the rural communities than the urban communities in the Central Region. However, a study on the evaluation of surveillance by (Adokiya *et al.*, 2015) revealed that low priority for surveillance, rare supervision and missing feedback are some of the key challenges across the surveillance system in the Northern Ghana. Regular feedback and sharing of information among relevant stakeholders contributed in a successful surveillance system in Rwanda (Fall *et al.*, 2019). There was a significant difference in provision of feedback between CBSVs in rural communities and that of the urban communities.

Series of feedback on surveillance activities in the coastal and forest communities are very important because of the sea transportation system and seafoods consumption that make the place endemic with certain diseases (Ng'etich *et al.*, 2021). The findings depict that in the coastal communities about 93% of the CBSVs provided feedback to the communities while the forest communities recorded 90%. The higher feedback reporting rate is commendable in this research and is consistent with a systematic review results on drivers for

success of CBSVs work conducted by (McGowan *et al.*, 2022) which indicated that feedback provided to communities contributed to the success of the CBSVs work. The situation on feedback was also very low in certain areas in Ghana which necessitated the international organization on migration to support in the training of volunteers for some boarder districts in Ghana (IOM, 2018).

At the bivariate analysis level, the findings of the study indicated that there was a significant association between the developmental status (rural and urban) with case reporting and providing feedback on case investigation communities. Further analysis at the multivariate level, using logistics regression results revealed that CBSVs working in the urban communities had 2.5 times higher odds of reporting at least one case than that of their counterparts residing in the rural areas. These findings are in consistent with a study by Newmyer *et al.* (2022) which indicated a high reporting rate of STIs in urban communities in Chicago.

The study by Newmyer and team indicated that the main promoting factor of the transmission rate in Urban Chicago was social connectedness (Newmyer *et al.*, 2022). The implication is that the intense interaction of the people in the urban communities promoted social interconnection, and that may influence sexual relationships and STIs transmission. Similarly, in the Central Region, the CBSVs in the urban areas have the higher possibility of reporting more priority diseases than the rural communities, which may be due to several factors such as population density, improved transportation and use of communication devices (Kok *et al.*, 2015).

On the other hand, the odds of providing feedbacks to communities was 0.3 times lower among CBSVs residing in urban areas compared to those in

rural areas (see Table 12). This is inconsistent with a study by Phalkey *et al.*, (2013) on the assessment of core and support surveillance function in Maharashtra, India, which indicated a poor feedback at the primary health care level which is the rural communities than in the districts and national level which are normally described as urban. The use of technology could facilitate provision of feedbacks and communication in the urban areas than in the rural areas (Ernest *et al.*, 2018). However, the study agrees with Kante *et al.*, (2023) which revealed that mortality surveillance feedback and reporting are more likely to occur in the rural areas than that of the urban areas. The consequences of low provision of surveillance feedback in urban communities are high transmission of priority disease and poor preparedness to respond to pandemics (Aborode, *et al.*, 2021). At the bivariate level, the study indicated that there was no significant association between the ecological status (forest and coastal) and CBSVs core functions.

Research Question Five: How does the Performance of the Surveillance Focal Persons at the Districts, Sub-districts and CHPS Levels on Supportive Surveillance Functions Affect CBSVs Core Functions in the Central Region?

The aim of this research question was to find out whether surveillance focal persons at the districts, sub-district and CHPS levels have been providing supportive surveillance functions to the CBSVs and to what extent do they think it has impacted the CBSVs work. Below are the structures, provision of supportive surveillance functions and their impact on CBSVs work.

In order to answer this research question, focal persons were asked if they had provided supportive functions to the CBSVs, and if they have, they were asked to rank how the supportive functions provided have affected the work of the CBSVs on the basis of very low, low, high and very high. The

analysis was done using frequencies and the results were presented Table 13 as follows: 20% (n= 95) of the focal persons provided training for CBSVs but 80% (n= 382) did not provide any training. The result shows that 35% (n= 167) of the focal persons offered some resources to the CBSVs however, 65% (n= 310) did not provide any resources to the CBSVs. Further, 22% (n= 104) of the focal persons provided supervision but 78% (n=373) provided no supervision. On communication, 55% (n= 262) of the focal persons provided communication, nonetheless, 45% (n=215) did not communicate to the CBSVs. Moreover, 37% (n= 176) provided effective coordination to the CBSVs but 63% (n= 301) did not provide coordination to the CBSVs.

Table 13: Provision of Supportive Functions by Surveillance Focal Persons to CBSVs (N=477)

Supportive Function	Frequency	Percentage
Coordination		
Yes	176	37
No	301	63
Communication		
Yes	262	55
No	215	45
Supervision		
Yes	104	22
No	373	78
Resources		
Yes	167	35
No	310	65
Training		
Yes	95	20
No	382	80

Source: Field Data (2023)

The results on the impact of the supportive surveillance to CBSVs was presented on Table 14**.** Most Focal persons indicated that the supportive functions have had high impact on the CBSVs work. The high category training was 80% (n= 76), Resources 50% (n= 83), Supervision 60% (n= 62),

Communication 69% (n=180) and coordination 65% (n=114). The next significant finding is on the low impact category, that is Training 14% (n= 13), Resources 31% (n=53), Supervision 30% (n=32), Communication 21% (n= 55) and coordination 26% (n=46). The very high impact category also recorded the following: Training 6% (n=6), Resources 8% (n=18), Supervision 10% (n=10) Communication 8% (n=21) and Coordination 3% (n=5). At the very low impact category, Training had 0% (n= 0), Resources 11% (n= 16), Supervision 0% (n= 0), Communication 2% (n = 6) and Coordination 6% (n= 11).

Table 14: Influence of FP Supportive Functions on CBSVs work

Supportive Functions	Frequency	Percentage
Coordination	**(n=176)**	
Very High	5	3
High	114	65
Low	46	26
Very Low	11	6
Communication	**(n=262)**	
Very High	21	8
High	180	69
Low	55	21
Very Low	6	2
Supervision	**(n=104)**	
Very High	10	10
High	62	60
Low	32	30
Very Low	0	0
Resources	**(n=167)**	
Very High	18	8
High	83	50
Low	53	31
Very Low	16	11
Training	**(n=95)**	
Very High	6	6
High	76	80
Low	13	14
Very Low	0	0

Source: Field Data (2023)

The provision of supportive functions by surveillance focal persons to CBSVs was studied in this research. The findings showed that only 37% of the focal persons stated that they had a committee (that is a local surveillance team) in place that meets to discuss surveillance issues. Over 63% had no such committees. This could be described as very low when compared with the national target of 80% or more in coordination. The study also revealed that, of the 37% availability of committees, the average number of times the committees have met was twice in the past year with the maximum being 6 times. It was observed that most of the committees were found to be active at the district levels where they described their impact on CBSVs work as high, but low at the lower facilities. These findings are consistent with the research done by Saleh *et al.*, (2021) which indicated poor coordination at the lower levels of the surveillance structures. In a situation where most of facilities are recording weak coordination, surveillance performance will generally be very poor and events and outbreaks can pass undetected (WHO, 2019).

Open communication is very vital in public health surveillance. In this study, the findings revealed that about 55% of the focal persons reported to have communicated to the CBSVs in the past 3 months which is far below the National target of 80%. However, it is the highest among all the supportive function indicators and focal persons describe the communication impact on CBSVs work as high. The study indicated that the mode of communication has mostly been face-to-face at the CHPS levels but at the sub-district and district levels, face to face and the use of mobile phones have mostly been combined. The average number of times communication occurred within 3 months was 3 time, a maximum of 12 times and minimum of once. These findings are in

agreement with the systematic review conducted by (Kok *et al.*, 2015) which found out that poor communication affect quality of care and recommended to health authorities to improve trainings and spell out clear communication lines between levels to improve performance.

Supervision by focal persons to CBSVs in this study was found to be very low. Information gathered indicated that only 23% of the respondents had a supervision schedule for CBSVs and Table 13 indicated that only 22% of the Focal Persons had supervise CBSV in the past 3 months. Averagely the number of time supervision was done is three times in the 3 months. Although respondent reported of their supervision having a higher impact on CBSVs work, near 80% had not done any supervision, which is highly undesirable compared with the national target of 80% or more. According to WHO (2020), supportive supervision should be regular and seek to ensure what system works instead of fault finding to improve outbreak management. Irregular supervision has been consistent in many studies hence (Avortri, *et al.*, 2019; Njuguna *et al.*, 2022) suggested that good knowledge of managers on what constitute supportive supervision and its benefits must be emphasised.

The continuous supply of relevant resources is key to effective disease surveillance system. However, in this study only 35% of the focal persons indicated to have provided some resources to the CBSVs. Thus, resource provision could also be described as very low and a key reason could be poor planning since about 80% of the focal person had no budget line for CBSVs activities in their plans. Also, inadequate funds were one of the key reasons mentioned. These findings are consistent with the study done by Hamalaw *et al.*, (2022) in Kurdistan Region of Iraq, which they subsequently recommended

for careful plan and budgets on surveillance activities. Although resources were inadequate, focal persons reported of supplying some resources such as registers, credits cards, T-Shirts, Soaps and Cash to CBSVs in an average number of two times in the past one year and reported that these have had a high impact on CBSVs work.

It is known that CBSVs are not able to detect and report priority diseases and events prompt for quick response (WHO, 2015). Some of the reasons could be inconsistent trainings which have resulted in low level of CBSVs knowledge on the priority diseases and events. In this study, the finding shows that about 80% of the focal persons have not provided any surveillance training to CBSVs in the past year. It was also established that 89% of the focal persons had no CBSVs training manual and a schedule for training CBSVs. These results are inconsistent with a study conducted among health workers in Uganda by Masiira *et al.,* (2019) but very consistent with a study by Hamalaw *et al.,* (2022) in Iraq where only 11.1% of the CBSVs had received training at the community level. CBSVs awareness on priority diseases and events are key to improving community's health. Continuous orientation and supervision of CBSVs is the way forward for improving CBSVs knowledge on health programmes (Fall *et al.,* 2019). Geldsetzer *et al.* (2017) posited that CHW training increase motivation and is linked to their knowledge and performance. However, inconsistent training leads to poor compliance, frustration, and poor execution of health activities (Merali, *et al.,* 2020).

Research Question Six: What do Opinion Leaders Perceive to be Factors Affecting the Implementation of CBSVs Activities in the Central Region?

This question was aimed at finding out what opinion leaders perceived as factors affecting implementation of the work of CBSVs. Basically, the study

tried to find out what opinion leaders perceived to make the work of CBSVs progressing and what is making it retrogress. Twenty-two opinion leaders were interviewed and content analysis was employed to analyse responses thematically.

Progressing Factors to CBSVs Work

The perceptions of opinion leaders on what factors made the CBSVs work progress in the communities were sought. The key factors that emerged as making the CBSVs work progressing after various sub themes had been considered were as follows: continuous involvement of CBSVs on health programmes, good character of CBSVs, provision of incentive and motivation and prompt response to outbreaks by health authorities.

Continuous involvements of CBSVs in health programmes

CBSVs must be made active, they must be involved in the health work in their community. An opinion leader commented as follows on what makes community-based surveillance in the community work, he said:

> *When it is time for the onchocerciasis drug distribution, he goes from house to house in all the surrounding villages to share the onchocerciasis drugs and this keeps him active to even search for other diseases. Even the mosquito net that was shared, he beat the gong-gong for the people to come for the nets* (58-year-old farmer).

Liu *et al.* (2021) concluded that active community surveillance contributed to the effective control of COVID-19 outbreak in Pudoug, Shanghai. When the CBSVs are actively involved in the community health problem it boosts their moral to work harder. A 40-year-old Assemblyman hinted:

> *When it's time for sharing Oncho tablets and we asked that everybody should come to the Community Health Compound to take the drugs, people will not get time to come, some will even not hear, but when he goes to their houses in the early morning and in the evenings and explain things to them, they take it. Then he becomes happy when he gets more people taking the drugs.*

An opinion leader said that he sees the nurse and the CBSV working together as a team, giving health information to the community and that is making a positive impact on the CBSVs' work. This is described as team work. For instance, a 53-year-old opinion leader who is a farmer said:

> *When it is time for weighing, you will see the CBSV and the nurse together at the Community Information Centre giving out information to the community about the services that would be provided. The nurse cannot do all, gathering the women in the community is a difficult work and the CBSV does that to help the nurse to work.*

In another instance, an opinion leader mentioned that the health worker teams up with the CBSVs to follow up cases in the community and that reduces cost and time which facilitate the work of the CBSV. He stated as follows:

> *The nurses and the CBSVs work together to help the people in the community. Sometimes the nurse will call the volunteer and inform him to follow up a pregnant woman and give her feedback about her condition* (58-year-old electrician).

Team work improves performance. Omole and Adebayo (2019), in their study on team work and epidemic control among health workers, observed that the

success of epidemic control depends on well-organised team work which provides quality and reliable health information for action.

Continuous involvement of the CBSVs through capacity building CBSVs improves CBSVs work. Surveillance focal persons must be orientated on strategies to combat epidemics. An opinion leader mentioned how important training improve reporting:

> *There was a time when they forget a lot of things that were thought and so they stopped reporting. But when they called them and trained them and also discuss their challenges, they started identifying cases. Orientation is good and makes the work progress* (57-year-old farmer).

Eaneff *et al.*, (2022) explained that the WHO and other partners are jointly expected to provide effective budgets that aimed at training high quality staff for surveillance work. When the focal persons are trained, they then get the confidence to work to identify cases and provide feedback. One of the opinion leaders made the following comments:

> *When there is a programme at the district, the CBSVs will go on behalf of the community and come and brief the community. So far, the CBSV is working. He is doing his God giving portion to help his community* (53-year-old farmer)

Good character of the CBSVs

Open communication and respect for one another's view improves efficiency at the work environment. An opinion leader explained that:

> *The CBSVs are in the community and they know all the conners in the community. So, any health issue that will come up in the*

> *community they will go and tell the nurse. She is free with the adolescents and they feel free to tell her their problems, they know she will not disclose it to anybody. So, it all depends on your character- your character will make the work progress or retrogress. when you disclose people's sickness to the community, when they are sick, they will be in their rooms and die than coming to tell you, and that will affect the work* (55-year-old farmer).

Effective contact tracing is built on trust and respect (McGowan *et al.*, 2022). The opinion leader continued to indicate that:

> *In addition, respect of the volunteer is also helping the work to go on, when people see that you don't communicate well, you insult people with a little provocation, especially when you are tired then they will not open up and discuss their sicknesses or health problems with you. The CBSV is matured and has children and handles the people well so they always support her to work. When they fear that you can insult them at any time, they will not get near you* (66-year-old farmer).

Provision of Incentives Motivations and Incentives

Although CBSVs' work is a voluntary one, a little motivation in a consistent manner will improve outcomes of surveillance in the community. An opinion leader explicitly stated that:

> *There could be some motivation from the facility, though we have no designated amount for volunteers but if facilities decide to give the volunteer a token once a while, he becomes happy and continue to work. Also, the fact that you involve him in the work is a motivation.*

> *I remember when the district officer came here, he visited the volunteer and he was seated at the front of the vehicle and they went round the community and he was very happy* (62-year-old retiree).

Another key incentive that facilitates the work of the CBSVs is when they are recognised as part of the health system. A 37- year-old Mason explained that:

> *when nurses get near the CBSVs, it helps them to feel belong to the health system. When any health personnel from anywhere comes to the community, the CBSV is the first person they sometimes see before even going to the chief and that gives him the vim to also be part of the work.*

It also improves the CBSVs work when the community or the health sector show concern and recognise the CBSVs as important. They become more satisfied with the work. For instance, an opinion leader commented as follows:

> *For priority at the facility, I can testify, when he is sick or his children are sick there is no problem at all. The nurses know his family although he sometimes pays, they serve them early enough and give them as much attention they deserve* (66-year-old farmer).

Response to Outbreaks by Health Authorities

Commitment by the health workers to take prompt action on issues that are reported by the CBSVs have also sustained the CBSVs work. This factor shows the seriousness of both the health worker and the CBSVs. A 38-year-old farmer indicated that:

> *Prompt response by health workers when a case is reported: we all feel good when he reports a case and within some few hours the health workers follow-up and take action. It makes the community*

sees that you are working and they give you their maximum co-operation.

A 40-year-old-Assemblyman also commented that the CBSV has been: *"reporting births of children and educating mothers on the need to attend clinic. He also reports any disease that he sees to the nurses and the nurses prepare to educate community members about the diseases".*

Retrogressing Factors to the Work of CBSVs

The researcher attempted to find out the views of opinion leaders on why the CBSVs work is not progressing. According to the opinion leaders, the CBSVs' work is declining due to the following five factors: inadequate motivation and support, conflicts between CBSVs and nurses, ageing CBSVs, frequent travels of CBSVs and late response to outbreaks by health authorities.

Inadequate Motivation and Support

Community based surveillance is key to the implementation of IDSR (WHO Regional Office for Africa, 2017) However, due to limited resources and other factors, CBSVs are not adequately motivated to work. According to Afari-Asiedu *et al.*, (2018) organisations that engage CBSVs must find innovative ways to reward them either in kind or in cash. Motivation plays a role in the CBSVs work and in this study, CBSVs lamented extensively on this theme. A 55-year-old farmer remarked as follows when asked the constraints to the CBSVs work:

The CBSVs don't usually talk to me about constraints. However, as you know in Ghana when somebody is working, he looks forward to getting something. But here is the case CBSVs are not paid.

Sometimes as they work you could see that they are tired and need some refreshment, if I have money, I give and they will continue the work and do more but if I don't have, I encourage them and that also means you cannot force them too much which sometimes affect performance.

In another interview with the opinion leaders, one of them spoke about how sometimes some of the CBSVs become demotivated. He described the situation as follows:

Sometimes they do NIDs that we think there could be some motivation. They will work for say 5 days but when the money comes, it will be 45 Ghana cedis and when you add the transportation, feeding etc that he has incurred, you will see that he did not get anything, he rather spent his own money. When it happens like that, they become demotivated and that affect their subsequent work (62-year-old farmer).

Further, an opinion leader commented on motivation as:

For the past 22 years the CBSV has worked with the nurses as a volunteer in this community. He has a lot of children, if he gets one of them to work in the health sector, he would love it but there is nothing like that. I don't know if you can help, when someone sees that when you work hard with the health people your child or your family member can benefit in one way or the other, people will be motivated to join the CBSV work (58-year-old Electrician).

One of the old opinion leaders also stated that when CBSVs work for a long time they should be motivated, he mentions that:

> *CBSVs in the communities are not many and one person will work aaaah for so many years. Before a CBSV gets something unless he has done that tedious work and at the end of the day, he will be given 50 Ghana, 60 Ghana. If you look at it, it's a cheat but if you have love for the community, you will do it* (62-year-old farmer).

Another form of motivation is recognition. Community recognition, social prestige and preferential treatment at health facilities were some of the factors that have motivated volunteers to stay and continue the surveillance work (Afari-Asiedu *et al.*, 2018). An opinion leader commented that:

> *If you don't look for the CBSVs when you come to work in the community for any health program it demoralises them. Also, I have observed that when there is a health problem or a work to be done, and you look for the CBSV to do the work but when there is no problem and you come to the community you do your work and leave without even saying good bye, it negatively affects the relationship between the volunteer and the health work so the work will not go on* (37-year-old Mason).

According to Nurjono *et al.*, (2020), functional facility health care system with community support are enough to improve health programmes. Improvement in community support and other organisation in the community play a crucial role. However, mobilisation becomes difficult when you lack the community's support. A 66-year-old farmer described the situation as follows:

> *When there is a programme that you need community's co-operation, you will talk aaaah, they will not mind you, even this COVID 19 vaccination we are giving, he has talked aaaah and by the grace of God they are vaccinating small, small. When the community members fail to cooperate, it makes the work difficult for the CBSVs.*

Individuals and groups in the communities could all bring their hands on deck to ensure the general well-being of the community. McNabb (2023) concluded that multi-sectoral collaboration improves disaster management however, lack of it is a hindrance to most programmes. A middle age farmer expresses his opinion as follows:

> *When it's time for weighing, mothers don't get the place prepared; The CBSV will have to carry chairs from the palace to get the place, for the care-givers to use and carry them back when the nurses are closed so sometimes it becomes hard* (44-year-old farmer).

The nature of the CBSVs work is such that you must always be mobile, however most of the CBSVs have no personal means of transport (Kok *et al.*, 2015). In describing the factors hindering the progress of CBSVs work, an opinion leader made the following remarks:

> *He is a volunteer who serves other people in different settlements, when they call for a meeting, and he does not get somebody's bicycle he has to pay 10 Ghana to the meeting place and pay 10 Ghana in return. If he tells the community they will not mind him. Sometimes, he has to walk and this make transportation and communication very difficult* (44-year-old farmer).

In times of epidemics and service provision in the community, transport is an important means that facilitate swift response. This is in relation to both facility and community-based surveillance. In a study, Chatio *et al.* (2019) also posited that inadequate transport and other incentives like rain coat are some of the factors that affected volunteers performance.

Community support in the selection of volunteers is also a challenge. CBSVs must be trusted and gainfully employed so that the community members can openly discuss their problems with them, but in some of the communities few people who are readily available for the volunteer work do not have these characteristics (Afari-Asiedu *et al.*, 2018) . A 40-year-old Assemblyman who is a leader has this to say:

> *It is difficult to get people to work as CBSVs this is because when you mention it, most people do not want to do it. Although, we know that the work is a volunteer work and there is no pay, we convince them to work but sometimes it become so hard that you have to support with money and if you do not provide, they may not continue and that becomes a problem.*

It is evident that for one way or the other, CBSVs need motivated in cash or kind as they work. GHS (2017) explains that motivation and incentives provide a sound basis for sustainability of community base surveillance system.

Inadequate capacity building as motivation retards the progress of CBSVs work. CBSVs deal with a lot of diseases and events at the same time. They also work on other programmes for other agencies. Hence it is very expedient to give orientation on their core activities in the communities. Njuguna *et al.* (2022) suggested that lack of capacity building and scaling up

event-based surveillance affects public health surveillance. In course of the study, an opinion leader commented as follows:

> *Irregular training of volunteers could also affect the work of the volunteer. I don't even remember the time the CBSV were given orientation* (62-year-old retiree).

Conflict between CBSVs and Nurses

All forms of conflicts that occur in the community affect the general health outcome and well-being of the populace. Mohammed *et al.* (2022) concluded in their study that, worsening armed conflicts in Nigeria could escalate the occurrence of epidemic prone diseases such as Guinea worm in the country. Personal conflict, sometimes, due to tiredness and pressure from the work on the part of both nurses and other health related staff affected performance of clinicians (Jong, 2015). In this study, an opinion leader made the following remarks when he was describing some of the factors affecting the work of the CBSVs work:

> *Another problem is nurses that are not in good terms with their CBSVs. We all know that we are not perfect. When your nurse offends you, you forgive, you don't have to base on this and say you have stopped the work. And as well, when your CBSV offend you, you don't also say you will not talk to him. Although you are being paid as a nurse, there are certain jobs the nurse cannot do them alone, the CBSVs must support otherwise it will affect your work and your reports. So, conflicts affect the work negatively***.** (56-year-old farmer)

This report is in agreement with a study by Mohammed *et al.* (2022) by which indicated that conflicts among health care professionals affected general productivity and quality of health care.

Frequent Travels Leading to Inadequate CBSVs

Many of the CBSVs have children and other responsibilities. Some of them also are in their youthful age, who are in search of gainful employment. In view of this, CBSVs travel very often in search for jobs. A respondent made the following remarks when comment on how movement of the volunteers in the community affects the CBSVs work:

> *Frequent travels also affect the work. Sometime the dedicated CBSVs travel to other places for jobs. When it happens like that and you don't get a replacement it becomes a problem. Those available also refuse because it is not attractive* (62-year-old retiree).

Mremi *et al.* (2021) posited that CBSVs may not serve without salaries-especially when they are multi-tasked. In another instance inadequate CBSVs is also a problem. A respondents stated that:

> *There are few CBSVs in the communities. This community is big we have only one volunteer, it is not feasible for him to go to all the houses within 4 days and sometimes they give him 3 days to work in the whole community. He will by all means not complete the work, especially when he has to revisit a house, he will not go, the place is becoming big let us get additional volunteers to help* (58-year-old farmer).

Ageing of CBSVs

Age affects performance. A study on effects of demographic factors on employees performance reveals that age and education have a great impact on

an employee performance (Amegayibor, 2021). A respondent expressed concern about how ageing among some of the volunteers is affecting the surveillance activities in the communities. He remarked:

> *The last factor could also be the fact that the CBSVs are aging. Many of those doing the CBSVs work are aging. Though there is nothing substantial for them as they work but sometimes, they don't want to leave the work for the younger ones, and because they are old, they cannot also do active work.* (62-year-Herbalist).

Late Response after Reporting a Case

One of the core duties of the CBSVs is to identify and report priority disease for action. However, in some cases CBSVs will report a case or two to the health authorities and they will not get any response from them. According to Hamalaw *et al.,* (2022) prompt response are critical in prevention of outbreaks. In this study a respondent lamented that:

> *When health workers do not respond to CBSVs calls after they had reported a case, they become fixed and do not know what to do. Next time round, when they suspect a case, they turn to relax* (37-year-old Mason).

Prompt response is crucial because it could lead to reduction of morbidities and mortalities in a community

The opinion leaders stated that continuous involvement of CBSVs in health programmes is one of the reasons that has sustained the CBSVs' work. According to the opinion leaders, consistent involvement of the CBSVs in health programmes improve capacity building, facilitate team work and improve collaboration. These findings is consistent with a study by Yuan, et al.

(2021) on community involvement in COVID-19 prevention and control. They stated that involving communities in public health activities improves social, economic and demographic inequalities. The result is also in agreement with Mishra *et al.,* (2022) which concluded that maternal and child care improved tremendously when community participation in public health programmes were strengthened. However, poor community mobilisation and participation has affected sustainability of health programmes in the community (Gilmore *et al., 2020*).

The character of the CBSVs was considered by the opinion leaders as another key reason why the CBSVs work is progressing. Helping relationships facilitate change (Tarkang, 2022). When the CBSVs have good a character, the work improves. This result is in agreement with a study by Plianbangchang (2018) which posited that community leaders think community health workers should have interpersonal qualities such as being friendly, respectful and non-judgemental. Kroese *et al.,* (2021) also revealed that having a positive attitude with the community members and patients enable them to communicate freely and contribute to discussions. The consequences of having a CBSV with a bad character could be very devastating. There will always be conflicts and misunderstanding between the health worker and the community health worker (Jones *et al.,* 2021).

Another key factor that was mentioned by opinion leaders was provision incentives and motivation to the CBSVs. According to the opinion leaders, provision of maximum recognition, exemptions, trainings and cash have also helped to support the CBSVs work. This finding is consonant with the research by Kare, Gujo & Yote (2021) which posited that community health workers

who receive stimulation, recognition and supportive supervision from management were more satisfied with their jobs. Kweku *et al.* (2020b) also concluded in their study that community volunteers should be giving the necessary support to make their work attractive and improve their performance. Lack of incentives, recognition and consistent training negatively affect volunteerism in the communities.

The community opinion leaders remarked that when health workers act promptly and follow up on cases reported from the communities to the health facilities, they become highly motivated. An opinion leader explained as follows:

> *We feel good when he reports a case and within some few hours the health workers follow up and take action. The community members see that he is working and they give him their maximum cooperation.*

This is in support with the study by Gilmore *et al.*, (2020) which recommended that countries world-wide are encouraged to assess existing communities with structures and use them to improve covid 19 prevention and control. However, delay in response and poor preparation on outbreak investigations affect public health surveillance (Kuehne *et al.*, 2019).

Aging of CBSVs was mentioned as a factor which can promote or affect the CBSVs work. The role of the CBSVs calls for an active person who can be very mobile and responsible (Owusu *et al.*, 2023). Findings of this research confirm that about one third of the CBSVs were more than 50 years. Also, more than half of the opinion leaders are more than 50 years which is an indication of a challenge that could contribute to the poor performance of the CBSVs. This findings agree with the work of Amegayibor (2021) which concluded that age

of employees affect their performances. Hence, employers must consider age in their recruitment of staff.

Respondents further revealed that frequent travels of active CBSVs from the villages to bigger towns in search for greener pastures also affect the surveillance work in the community. The opinion leaders reported that the movement of the CBSVs create a huge gap. This finding is consistent with the study by Afari-Asiedu *et al.* (2018) which indicated the gap becomes wider when the CBSV plays multiple roles such as a volunteer, CHC member and an elder in the community. Although frequent travel of CBSVs could promote social understanding, acquisition and sharing of knowledge and enhanced global network, the immediate gap created, affect the surveillance system in the area (Johnson *et al.*, 2022)

Continuous involvement of CBSVs in health programmes, character and attitude of CBSVs, provision of incentives and motivation and prompt and prompt response were mention as positive factors that are promoting the CBSVs work. The reverse of these factors had negative implications on the CBSVs work. Ageing volunteers and frequent travels of volunteers were mentioned as retrogressive factors. The converse such as working with relatively younger volunteers and traveling to places of excellent performance to learn more and share experiences improves the surveillance system.

Chapter Summary

In this chapter, data obtained during the study was analysed and presented in detailed. The findings have also been discussed in relation to the literature. The study revealed that CBSVs knowledge on priority diseases was generally low, especially, on neonatal tetanus and cerebrospinal meningitis.

Over 50% of the CBSVs had not received any support on resources, coordination, and supervision for the past 1 year. The extent of performance of CBSVs on the core and quality surveillance functions in the communities was also very low. All the indicators recorded below 80%. There was a significant difference in performance in coastal and forest areas with respect to reporting and response and control. Rural and urban areas recorded no significant difference in any of the core functions. Performance of the surveillance focal persons at the districts, sub-districts and CHPS levels on supportive surveillance functions had a higher impact on CBSVs core functions, except for resources and training. Opinion leaders perceived good teamwork, continuous motivation, self-sacrifice, capacity building and quick response of health staff after the CBSVs report case are progressive factors. However, some of the retrogressive factors are inadequate motivation, poor recognition, inadequate transport facilities, conflicts between CBSVs and nurses and lack of training.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The purpose of this study was to evaluate the CBS system in the Central Region of Ghana. Specifically, the study sought to find out the knowledge level of the CBSVs on case definitions of priority diseases and health events and their performance on the core and quality of surveillance functions in the communities, explored the extent to which the surveillance focal persons at district, sub-district and CHPS levels perform their supportive surveillance functions to the CBSVs system and ascertain the perception of opinion leaders on CBSVs activities. This chapter presents the summary and main findings of the study, the conclusions drawn from the findings and recommendations for further research.

Summary

This study was purposely carried out to evaluate the Community-based Disease Surveillance systems in the Central Region of Ghana. Specifically, it sought to determine the knowledge level of CBSVs on the case definitions of priority diseases and vital health events in the Community Volunteer Registers**;** describe the extent to which CBSVs in the community receive support from the surveillance focal persons in the Central Region; and establish performance of CBSVs on the core and quality surveillance functions in the communities in the Central Region. Other objectives were to state the differences in performance between CBSVs in coastal and forest areas and those of urban and rural areas in terms of their core surveillance functions in the Central Region; explain the performance of the surveillance focal persons at the districts, sub-districts, and CHPS levels on supportive surveillance functions affect CBSVs core functions

in the Central Region; and describe what opinion leaders in the CHPS compounds perceive to be factors affecting the implementation of CBSVs activities in the Central Region.

The study was conducted in all the 22 districts in the region which covered about 1381 communities. 898 CBSVs, 477 facility focal persons and 22 opinion leaders were involved in the study. The main instruments used were the questionnaires and an interview guide. The data collected were analysed using SPSS version 21, Stata version 17 and Microsoft Excel. Each research question was analysed based on the nature of the data and the assumptions that must be considered and presented in tables and charts.

Findings

This section presents the main findings of the study. The study found out that:

1. Generally, CBSVs have low knowledge about priority diseases and events, thus, significant number of CBSVs need help before they can identify a priority disease, especially Neonatal tetanus and Cerebrospinal meningitis (CSM)
2. CBSVs received support from the Surveillance Focal Persons on communication, training, resources, coordination and supervision for the past one year. However, the support received were described as very low with resources, coordination and supervision recording the lowest. Nevertheless, CBSVs stated that, the support has had high impact on their work.
3. The extent of performance of CBSVs on the core and quality surveillance functions in the communities were very low. All the indicators for the core and quality surveillance functions recorded below

the national standards of 80%. But CBSVs stated that the quality functions have been highly useful to their work.

4. CBSVs residing and operating within urban areas were more likely to report cases than their counterparts residing in rural areas. However, in provision of feedback, CBSVs in the rural areas were found to be providing feedback than those in the urban areas. No significant difference was observed when the overall performance of CBSV's core functions was compared with the developmental status (rural and urban). Also, there was no observed significant difference in performance of core functions of CBSVs in the Coastal and forest areas. Further, no significant difference was found with the overall performance of CBSV's core functions when compared with the ecological zones (forest and coastal).
5. Performance of the surveillance focal persons at the districts, sub-districts and CHPS levels on supportive surveillance functions to CBSVs was generally very low, with communication recording a little higher than other supportive functions. Nevertheless, Most Focal persons indicated that the little supportive functions provided have had high impact on the CBSVs work.
6. Opinion leaders perceived continuous involvement of CBSVs on health programme, good character of CBSVs, provision of motivation and incentives to CBSVs and prompt response to calls by health authorities when a case is reported were some of the reasons why CBSVs work is progressing. However, some of the retrogressive factors identified were inadequate motivation and support, conflicts between CBSVs and

nurses, frequent travel of CBSVs, ageing CBSVs and late response to calls by health authorities after a case is reported by the CBSVs.

Conclusions

It can be concluded from the findings that CBSVs have low knowledge level of priority diseases and other health events. This can result in late detection or misdiagnosis of priority diseases and events which can consequently lead to frequent outbreaks, high morbidities, complications and mortalities in the Region. Insufficient support received by CBSVs could affect CBSVs performance on their core functions. The study further concludes that low performance of CBSVs on their core and quality functions could lead to late case detection and reporting. There is also inadequate support from the focal persons to the CBSVs which may influence their passion and skills to work. The effect of this is the weak surveillance system which has may have resulted to the differences in reporting and provision of feedbacks in the rural and urban communities in the region which can consequently result in poor compliance and community participation in health programmes. Moreover, the study has concluded that opinion leaders perceived active involvement of CBSVs in health programmes and provision of motivation to CBSVs' are the reasons why CBSVs work is progressing. Nevertheless, inadequate motivation to CBSVs, conflicts between CBSVs and nurses, late response to call from health authorities and ageing of CBSVs were perceived factors that work against the development of the CBSVs system and should be examined and addressed to improve performance.

Recommendations

The following recommendations are made based on the findings and conclusions of the study:

District Assemblies and DHMTs should build the capacity of Community Health Officers (CHO) in the CHPs zones on priority disease detection and control to equip them with the relevant skills to also train and manage the CBSVs activities efficiently. DHMTs should also establish a common electronic communication platform where health information can be shared for CBSVS to learn and share experiences. Community Health Management Committees should organise quarterly CBSVs activities review meetings at the Community Health Compound to discuss priority health problems and performance.

DHMTs should decentralised supervision of CBSVs to the CHPS level, and CHOs could be given the mandate to perform the supportive surveillance on CBSVs and report on monthly basis to the higher levels. DHMT should train CHOs in innovative ways to mobilise resources to manage CBSVs activities at the community level to ensure sustainability. Also, DHMTs should identify and train more CHOs and assign them to CHPS compounds to coordinate CBSVs activities.

CHOs should support CBSVs to conduct periodic health education and case search on priority diseases and events in the communities to improve case detection, feedback and reporting. In addition, the DHMTs should establish sustainable ways to continuously provide CBSVs with CBSVs registers and ensure their use. Community Health Committees should be oriented on priority diseases and events and the need for the CHPS zone to have an epidemic

preparedness plan and the need to prepare to respond to outbreaks. National, Regional Surveillance Units and DHMTs must prepare and adopt simplified electronic CBSVs reporting tool for reporting on priority diseases to improve timelines and completeness of reporting. This will also improve acceptability, usefulness of surveillance data at the community level.

The DHMT should collaborate with relevant stakeholders to monitor and channel more support to improve CBSVs performance on case reporting in the rural areas and in provision of feedback on surveillance in the urban communities.

DHMTs should establish a functional coordination committee at the district level to be responsible for all CBSVs activities. This committee will be responsible to plan, budget, implement and evaluate the core, supportive and the quality surveillance functions. Ghana Health Service and the Ministry of Health should develop a policy to regulate the activities of the CBSVs.

Stakeholders such as Ghana Health Service and Ministry of Health and health partners must continuously support opinion leaders and build their capacity to improve on motivation of CBSVs, sustain community participation, good teamwork in response to outbreaks and self-sacrifice to support community health programmes.

Suggestion for Further Studies

The study has examined the knowledge level of CBSVs on priority diseases and events in the Central Region. However, future studies could look at training need assessment for health staff in the management of the CBSVs programme in the region. Training needs assessment for CBSVs in these contemporary times is also paramount. Researchers could also study the reasons

for the differences in reporting and case control activities in rural and urban and forest and coastal areas. Further studies could be conducted to examine the nature of conflicts between health staff and CBSVs in the communities.

REFERENCES

Abaka-Quansah, J. & Ofei, V. (2009). *Public health nursing in Ghana*. Accra, Ghana: Adonai Publication.

Aboagye, S. Y., Asare, P., Otchere, I. D., Koka, E., Ekow Mensah, G., Yirenya-Tawiah, D., & Yeboah-Manu, D. (2017). Environmental and behavioral drivers of buruli ulcer disease in selected communities along the densu river basin of Ghana: A case-control study. *American Journal of Tropical Medicine and Hygiene*, *96*(5), 1076–1083. https://doi.org/10.4269/ajtmh.16-0749

Aborode, A. T., Hasan, M. M., Jain, S., Okereke, M., Adedeji, O. J., Karra-Aly, A., & Fasawe, A. S. (2021). Impact of poor disease surveillance system on COVID-19 response in Africa: Time to rethink and rebuilt. *Clinical Epidemiology and Global Health*, *12*(7),1-3. https://doi.org/10.1016/j.cegh.2021.100841

Adegbenro, C., Olowookere, S., Fehintola, F., Adegbenro, P., & Orioke, O. (2019). Knowledge about and preventive practices against neonatal tetanus among young Nigerian women. *Tzu Chi Medical Journal*, *31*(3), 154–157. https://doi.org/10.4103/tcmj.tcmj_55_18

Addo, E. C., Atinga, R. A., Addo-Lartey, A., & Asante, K. P. (2018). Enhancing community-based surveillance through routine collection of qualitative data: A case study from rural Ghana. *BMC Public Health*, *18*(1), 1015. https://doi:10.1186/s12889-018-5908-8

Adokiya, M. N., Awoonor-williams, J. K., Barau, I. Y., & Beiersmann, C. (2015). Evaluation of the integrated disease surveillance and response system for infectious diseases control in northern Ghana. *BMC Health Service Research, 15*(75), 1–11. https://doi.org/10.1186/s12889-015-1397-y

Afari-Asiedu, S., Asante, K. P., Senah, K., Abdulai, M. A., Afranie, S., Mahama, E., & Owusu-Agyei, S. (2018). Volunteering for health services in the middle part of Ghana: In whose interest? *International Journal of Health Policy and Management, 7*(9), 836–846. https://doi.org/10.15171/ijhpm.2018.38

Ahorlu, C. S. K., Okyere, D., & Ampadu, E. (2018). Implementing active community-based surveillance-response system for Buruli ulcer early case detection and management in Ghana. *PLoS Neglected Tropical Diseases, 12*(9), 1–12. https://doi.org/10.1371/journal.pntd.0006776

Aikhomu, S. E., Brieger, W. R., & Kale, O. O. (2000). Acceptance and use of communal filtration units in guinea worm eradication. *Tropical Medicine and International Health, 5*(1), 47–52. https://doi.org/10.1046/j.1365-3156.2000.00510.x

Al-awadi, A. R., Al-kuhlani, A., Breman, J. G., Doumbo, O., Eberhard, M. L., Guiguemde, R. T., & Nadim, A. (2014). Guinea worm (dracunculiasis) eradication: Update on progress and endgame challenges. *Transactions of the Royal Society of Tropical Medicine and Hygiene, 108*(5), 249–251. https://doi.org /10.1093/trstmh/tru039

Al-zoqari, F. A., Alyafei, A., Omar, S. R., Selim, N. A., & Singh, R. (2020). Knowledge & awareness of measles among foreign workers screened for

employment in Qatar. *Journal of Community Medicine & Public Health*, *4*(2), 1-9. https://doi.org/10.29011/2577-2228.100085

Alemu, T., Gutema, H., Legesse, S., Nigussie, T., Yenew, Y., & Gashe, K. (2019). Evaluation of public health surveillance system performance in Dangila district, Northwest Ethiopia: A concurrent embedded mixed quantitative/qualitative facility-based cross-sectional study. *BMC Public Health*, *19*(1), 1–9. https://doi.org/10.1186/s12889-019-7724-y

Alo, C., Okedo-Alex, I. N., Akamike, I. C., Agu, A. P., Okeke, I. M., Amuzie, C. I., & Alo, N. C. (2022). Utilising community volunteers can increase the detection and referral of Buruli ulcer cases in endemic communities in Southeast, Nigeria. *Tropical Diseases, Travel Medicine and Vaccines*, *8*(1), 1–7. https://doi.org/10.1186/s40794-022-00181-7

Amegayibor, G. K. (2021). The effect of demographic factors on employees' performance: A case of an owner-manager manufacturing firm. *Annals of Human Resource Management Research*, *1*(2), 127–143. https://doi.org/10.35912/ahrmr.v1i2.853

Annabelle, P. (2019). *How to set a community based monitoring system in seven steps*. Nairobi: Akvo East Africa Partners. Retrieved from https://datajourney.akvo.org/blog/how-to-set-up-a-community-based-monitoring-system-in-seven-steps.

Asegedew, B., Tessema, F., Perry, H. B., & Bisrat, F. (2019). The CORE group polio project's community volunteers and polio eradication in Ethiopia: Self-reports of their activities, knowledge, and contributions. *American Journal of Tropical Medicine and Hygiene*, *101*(4), 45–51. https://doi.org/10.4269/ajtmh.18-1000.

Avortri, G. S., Nabukalu, J. B., & Nabyonga-Orem, J. (2019). Supportive supervision to improve service delivery in low-income countries: Is there a conceptual problem or a strategy problem? *BMJ Global Health*, *4*(9), 1-6. https://doi.org/10.1136/bmjgh-2018-001151

Aziz, S., Mahmood, M., & Rehman, Z. (2018). Implementation of CIPP Model for quality evaluation at school level: A case study. *Journal of Education and Educational Development*, *5*(1), 189. https://doi.org/10. 22555/joeed. v5i1.1553

Baah, D. B. (2018). Changing rainfall patterns in Ghana : Implication for Small scale farming. *Journal of Geography*, *5*(4), 1–13.

Baldwin, K., & Raffler, P. (2019). *Traditional leaders, service delivery, and electoral accountability. Decentralized governance and accountability: academic research and the future of donor programming*. Pretoria. Yale University. https://doi.org/10.1017/9781108615594.004

Ballard, M., Westgate, C., Alban, R., Choudhury, N., Adamjee, R., Schwarz, R., & Schechter, J. (2021). Compensation models for community health workers: Comparison of legal frameworks across five countries. *Journal of Global Health*, *11*(1), 1–10. https://doi.org/10.7189/jogh.11.04010

Barry, M. A., Arinal, F., Talla, C., Hedible, B. G., Sarr, F. D., Ba, I. O., & Vray, M. (2021). Performance of case definitions and clinical predictors for influenza surveillance among patients followed in a rural cohort in Senegal. *BMC Infectious Diseases*, *21*(1), 1–11. https://doi.org/10. 1186/s12879-020-05724-x

Bhopal, S. R. (2016). *Concept of epidemiology: Integrating the ideas, thories, principles and methods of epidemiology* (3rd ed.). New York, USA: Oxford University Press Inc.

Binka, F. N., Bawah, A. A., Phillips, J. F., Hodgson, A., Adjuik, M., MacLeod, B., & Deming, M. S. (2007). Rapid achievement of the child survival millennium development goal: Evidence from the Navrongo experiment in Northern Ghana. Tropical Medicine & International Health, 12(5), 578-593. http://doi: 10.1111/j.1365-3156.2007. 01831.x

Bordier, M., Goutard, F. L., Antoine-Moussiaux, N., Pham-Duc, P., Lailler, R., & Binot, A. (2021). Engaging stakeholders in the design of one health surveillance systems: A participatory approach. *Frontiers in Veterinary Science*, *8*(5), 1-25. https://doi.org/10.3389/fvets.202 1.646458

Camacho, A., Bouhenia, M., Alyusfi, R., Alkohlani, A., Naji, M. A. M., & Luquero, F. J. (2018). Cholera epidemic in Yemen, 2016–18: An analysis of surveillance data. *The Lancet Global Health*, *6*(6), 680–690. https://doi.org/10.101 6/S2214-109X(18)30230-4

Centre for Disease Control and Prevention (2022). *Centre for Disease Control impact in Ghana.* Accra, Ghana: Global Health. Retrieved from https://www.c dc.gov/globalhealth/countries/ghana/.

Chatio, S., Welaga, P., Tabong, P. T. N., & Akweongo, P. (2019). Factors influencing performance of community-based health volunteers' activities in the Kassena-Nankana Districts of Northern Ghana. *PLoS ONE*, *14*(2), 1–12. https://doi.org/10.1371/journal.pone.0212166

Chiolero, A. (2020). Post-modern epidemiology: Back to the populations. *Epidemiologia*, *1*(1), 2–4. https://doi.org/10.3390/epide miologia1010002

Chi, G. (2020) *Migration and social network: New insight from novel data.* (Doctoral Thesis, University of California. Berkeley). https://escholarship.org/uc/item/6rs5n7jq#author.

Choi, B. C. K. (2012). The past, present, and future of pubic health surveillance. *Hindawi Publishing Corporation, 2012*(1), 1-26. http://dx.dio.org/10.6064/2012/875253.

Cobigo, V., Martin, L., & Mcheimech, R. (2016). Understanding community. *Canadian Journal of Disability Studies, 5*(4), 181. https://doi.org/10.15353/cjds.v5i4.318

Codjoe, S. N. A., & Nabie, V. A. (2014). Climate change and cerebrospinal meningitis in the Ghanaian meningitis belt. *International Journal of Environmental Research and Public Health, 11*(7), 6923–6939. https://doi.org/10.3390/ijerph110706923.

Crigler, L., Gergen, J., & Perry, H. (2014). *Supervision of community health workers*. Washinton DC: USAID/MCHIP. http://www.mchip.net/node/2140.

De Liddo, A., & Concilio, G. (2017). Making decision in open communities: collective actions in the public realm. *Group Decision and Negotiation, 26*(5), 847–856. https://doi.org/10.1007/s10726-017-9543-9.

Denaxas, S. C., Asselbergs, F. W., & Moore, J. H. (2016). The tip of the iceberg: challenges of accessing hospital electronic health record data for biological data mining. *BioData Mining, 9*(1), 1–4. https://doi.org /10.1186/s13040-016-0109-1

Eaneff, S., Graeden, E., McClelland, A., & Katz, R. (2022). Investing in global health security: Estimating cost requirements for country-level capacity

building. *PLOS Global Public Health*, *2*(12), 1-14. https://doi.org/10.1371/journal.pgph.0000880

Elger, J. (2007). *Theory of Performance*. Faculty Development Series, University of Idaho. Idaho. Pacific Crest. Retrieve from https://www.webpages.uidaho.edu/ele/scholars/results/workshops/facilitators_institute/theory%20of%20Performance.pdf.

Ekore, J. O., & Attah, T. (2007). Influence of sex-role expectations on perceived work performance among employees in multinational corporations in Nigeria. *Journal of Social Sciences*, *14*(2), 161–162. https://doi.org/10.1080/09718923.2007.11978367.

Eritja, R., Delacour-Estrella, S., Ruiz-Arrondo, I., González, M. A., Barceló, C., García-Pérez, A. L., & Bartumeus, F. (2021). At the tip of an iceberg: Citizen science and active surveillance collaborating to broaden the known distribution of Aedes japonicus in Spain. *Parasites and Vectors*, *14*(1), 1–13. https://doi. org/10.1186/s13071-021-04874-4

Ernest, T., Shang, X., Xin-Yu, F., & Zhou, X. N. (2018). Digital surveillance and communication strategies to infectious diseases of poverty control and elimination in Africa. *Journal of Infectious Diseases and Epidemiology*, *4*(3), 1–13. https://doi.org/10.23937/2474-3658/1510056

Esmer, S., & Şen, G. (2021). Ice berg theory in enterpreneurship: The different factors affecting an investment decision. *The International New Issues in Social Sciences*, *5*(5), 231–250. issn: 2149-4266, e-issn: 2645- 9140.

Ezenyeaku, C. A., Nnebue, C. C., Nwabueze, S. A., Ezenyeaku, C. C., Udedibia, I. N., Iloghalu, I. C., & Emelumadu, O. F. (2020). Completeness of reporting in the community-based disease surveillance and notification

system in Anambra State, Nigeria. *American Journal of Public Health Research*, *8*(3), 77–86. https://doi.org/10.12691/ajbr-8-2-2

Fadilah, T. (2019). The influence of educational background and work experience on employees performance at PT. Three Cast Indonesia. *Atlantic Press.377*(1),187–191. https://doi.org/10.2991/icaess-19.2019.35.

Fall, I. S., Rajatonirina, S., Yahaya, A. A., Zabulon, Y., Nsubuga, P., Nanyunja, M., & Talisuna, A. O. (2019). Integrated Disease Surveillance and Response (IDSR) strategy: Current status, challenges and perspectives for the future in Africa. *BMJ Global Health*, *4*(4), 1–11. https://doi.org/ 10.1136/bmjgh-2019-001427

Feurer, M. (2013). *Land use systems in Ghana's Central Region and their potential for Rreducing Emmision from defarestation and forest degration and enhancing carbon REDD.* (Unpublished master's dissertation. Bern University of Applied Sciences). Swizerland. Retrieved from https:// www.itto.int/files/itto_project_db_input/3046/Technical/RED-PD093-12Rev.3(F)_Progress-Report%2031-Jan-2014%20Annex3-Landuse-System-Potential-REDD-Ghana.pdf?v=1393834370.

Fraenkel, J. R., Wallen, N.E., Hyun, H. H. (2015). *How to Design and Evaluate Research in Education* (9th Ed.). New York, USA: McGraw- Hill Education.

Gao, K., Wang, L., Liu, T., & Zhao, H. (2022). Management executive power and corporate green innovation- Empirical evidence from China's state-owned manufacturing sector. *Technology in Society*, *70*(12), 1-17. 102043. https://doi.org/10.1016/j.techsoc.2022.102043

Geldsetzer, P., De Neve, J. W., Boudreaux, C., Bärnighausen, T., & Bossert, T. J. (2017). Improving the performance of community health workers in Swaziland: Findings from a qualitative study. *Human Resources for Health*, *15*(1), 1–9. https://doi.org/10.1186/s12960-017-0236-x

Ghana health service. (2005). *Community-based health planning and serviices (CHPS) policy document*. Accra, Ghana: Ghana Health Service. https://www.moh.gov.gh/wp-content/uploads/2016/02/CHPS-Operational-Policy-2005.pdf

Ghana Health Service. (2002). *Integrated disease surveillance and response technical guidelines for Ghana (IDSR)*. Accra, Ghana: Ghana Health Service.

Ghana Health Service. (2015). *Central regional annual report.* Cape Coast, Ghana: Ghana Health Service.

Ghana Health Service. (2017a). *Community register for vital health events in Ghana.* Accra, Ghana: Japan International Cooperationon Agency (JICA).

Ghana Health Service. (2017b). *Guidelines for community based surveillance system pilot in Ghana*. Accra, Ghana: United State Agency for International Development (USAID) funded project of Quality Health Partners

Ghana Health Service. (2018). *Annual report for central region*. Cape Coast, Ghana: Ghana Health Service.

Ghana Health Service. (2019). *Integrated disease surveillance and response (IDSR) technical guidelines*. Accra, Ghana: Ghana Health Service.

Ghana Health Service. (2021). *Annual report for central region*. Cape Coast, Ghana: Ghana Healh Service.

Ghana Health Service. (2023). *Annual report for central region*. Cape Coast, Ghana: Ghana Healh Service.

Ghana Statistical Service. (2010). 2010 *Population and housing census report*. Accra, Ghana: Ghana Statistical Service. https://doi.org/ 10.1007/978-1-349-81511-1_56

Ghana Statistical Service. (2014). *Demographic and health survey.* Accra, Ghana. Ghana Statistical Service.

Ghana Statistical Service. (2021). *Ghana Population and Housing Census Report.* Accra, Ghana: Ghana Statistical Service.

Gilmore, B., Ndejjo, R., Tchetchia, A., De Claro, V., Mago, E., Diallo, A. A., Lopes, C., & Bhattacharyya, S. (2020). Community engagement for COVID-19 prevention and control: A rapid evidence synthesis. *BMJ Global Health, 5*(10), 1–11. https://doi.org/10 .1136/bmjgh-2020-003188

Goodman, A. L., Masuet-Aumatell, C., Halbert, J., & Zuckerman, J. N. (2014). Awareness of meningococcal disease among travelers from the United Kingdom to the meningitis belt in Africa. *American Journal of Tropical Medicine and Hygiene*, *91*(2), 281–286. https://doi.org/1 0.4269/ajtmh.13-0763

Grinza, E., & Rycx, F. (2021). The impact of sickness absenteeism on productivity: New evidence from Belgian matched panel data. *SSRN Electronic Journal*, *11543*, 1-5. https://doi.org/10.2 139/ssrn.3185238

Groseclose, S. L., & Buckeridge, D. L. (2017). *Public health surveillance systems: Recent advances in their use and evaluation.* Atlanta, Georgia: Centre for Disease Control and Prevention. https://doi.org/ 10.1146/annurev-publhealth-031816-044348.

Guerra, J., & Acharya, P. (2019). Community-based surveillance : A scoping review. *PLoS ONE*, 14(4), 1-25. e0215278. https://doi.org/10.1371/journal.pone.0215278

Guerra, J., Bayugo, Y., Acharya, P., Adjabeng, M., Barnadas, C., Bellizzi, S., & Cognat, S. (2019). A definition for community-based surveillance and a way forward: Results of the who global technical meeting, France, 26 to 28 June, 2018. *Eurosurveillance*, *24*(2), 1-5. https://doi.org/10.2807/1560-7917.ES.2019.24.2.1800681

Gyamfi, A. B. A., & Adjei, B. (2013). Child welfare clinic attendance among children 24-59 months in Assin North Municipality, Ghana. *International Journal for Innovation Education and Research*, *1*(4), 59–68. https://doi.org/10.31686/ijier.vol1.iss4.126

Haider, S. (2009). The organizational knowledge iceberg: An empirical investigation. *Knowledge and Process Management*, *16*(2), 74–84. https://doi.org/10.1002/kpm.326

Hamalaw, S. A., Bayati, A. H., Babakir-Mina, M., Benvenuto, D., Fabris, S., Guarino, M., & Ciccozzi, M. (2022). Assessment of core and support functions of the communicable disease surveillance system in the Kurdistan Region of Iraq. *Journal of Medical Virology*, *94*(2), 469–479. https://doi.org/10.1002/jmv.27288

Hayden, M. H., Dalaba, M., Awine, T., Akweongo, P., Nyaaba, G., Anaseba, D., & Pandya, R. (2013). Knowledge, attitudes, and practices related to meningitis in northern Ghana. *American Journal of Tropical Medicine and Hygiene*, *89*(2), 265–270. https://doi.org/10.4269/ajtmh.12-0515.

Heward-Mills, N. L., Atuhaire, C., Spoors, C., Pemunta, N. V., Priebe, G., & Cumber, S. N. (2018). The role of faith leaders in influencing health behaviour: A qualitative exploration on the views of black African christians in Leeds, United Kingdom. *Pan African Medical Journal*, *30(*1), 1–9. https://doi.org/10.11604/pamj.2018.30.199.15656

Heymann, D. L. (2021). Successful smallpox eradication: What can we learn to control COVID-19? *Journal of Travel Medicine*, *27*(4), 1–3. https://doi.org/10.1093/JTM/TAAA090

Hou, S. I. (2014). Health education: Theoretical concepts, effective strategies and core ompetencies. *Health Promotion Practice, 15*(5), 619-621. https://doi.org/10.1177/1524839914538045+

Houston, S. (2021). *Impact-based Forcasting for Typhoons in Philippines.* Philippines: Prevention Web. Retrieved from https://www.preventionweb .net/news/ impact-based-forecasting-typhoons-philippines

International Fedration of Red Cross and Red Cross Cresent. (2016). *Emergency appeal final report Sierra Leone : Cholera outbreak. Saving Life, Changing Minds.* Sierra leone. International Federation of Red Cross .file: http:///C:/Users/New%20User/Downloads/MDRSL003fr%20(3).pdf.

International Organisation of Migration (IOM). (2018). *Ghana trains CBSVs to prevent spread of diseases accross borders.* Accra, Ghana: *Prevention Web.* Retrieved from https://www.preventionweb.net/news/iom-ghana-trains-community-based-surveillance-volunteers-prevent-spread-diseases-across.

Ismayl, G., Barqawi, H. J., Harous, A., Balchi, M., AbuZahra, D., AlMazrouei, G., & Elzini, T. (2020). Evaluation of knowledge of the United Arab

Emirates population on measles and its control, following a nationwide campaign. *Avicenna Journal of Medicine*, *10*(1), 35–40. https://doi.org/ 10.4103/ajm.ajm_56_19

Issahaku, G. R., Asiedu-Bekoe, F., Kwashie, S., Broni, F., Boateng, P., Alomatu, H., & Kenu, E. (2020). Protracted cholera outbreak in the Central Region, Ghana, 2016. *Ghana Medical Journal*, *54*(2), 45–52. https://doi.org/ 10.4314/GMJ.V54I2S.8

Jan, C. A. (2022). *Disease surveillance will benefit from mobile technology , but digital solutions must be integrated in health systems.* Philipines: Miobile for Development. Retrived from https://www.gsma.com/ mobilefordevelopment/blog/disease-surveillance-will-benefit-from-mobile-technology/.

Javanparast, S., Windle, A., Freeman, T., & Baum, F. (2018). Community health worker programs to improve healthcare access and equity: Are they only relevant to low-and middle-income countries? *International Journal of Health Policy and Management*, *7*(10), 943–954. https://doi.org/ 10.15171/ijhpm.2018.53

Jennings, V., & Bamkole, O. (2019). The relationship between social cohesion and urban green space: An avenue for health promotion. *International Journal of Environmental Research and Public Health*, *16*(3), 1-14. https://doi.org/10.3390/ijerph16030452

Jeyarajasekar, T., & Sivakumar, M. (2019). Iceberg metaphor- A tool for healthcare quality management systemic structure. *International Journal of Management Studies*, *6*(7), 118. https://doi.org/10.18843/ijms/v6i 1(7)/15

Johnson, L. J., Schopp, L. H., Waggie, F., & Frantz, J. M. (2022). Challenges experienced by community health workers and their motivation to attend a self-management programme. *African Journal of Primary Health Care and Family Medicine, 14*(1), 1–9. https://doi.org/10.4102/phcfm.v14i1.2911

Jones, T. M., Schulte, A., Ramanathan, S., Assefa, M., Rebala, S., & Maddox, P. J. (2021). Evaluating the association of state regulation of community health workers on adoption of standard roles, skills, and qualities by employers in select states: a mixed methods study. *Human Resources for Health, 19*(1), 1–16. https://doi.org/10.1186/s12960-021-00684-y

Jong, K. M. D. (2015). *Registered nurses' perceptions of community health workers*. (Doctoral project, St. Catherine University). Sophia. Retrieved from https://sophia.stkate.edu/cgi/viewcontent.cgi?article=1063&context=dnp_projects.

Kallay, R., & Eggers, C. (2021). Assessment of the integrated disease surveillance and response system implementation in North Kivu, Democratic Republic of the Congo following a major Ebola outbreak, *Research Square, 2021*(1), 1–22.

Kant, L., & Krishnan, S. K. (2010). Information and communication technology in disease surveillance, India: A case study. *BMC Public Health, 10*(1), 1–4. https://doi.org/10.1186/1471-2458-10-S1-S11

Kante, A. M., Mulungo, A., Ibraimo, M., Akum, A., Titus, N., Adriano, A., & Amouzou, A. (2023). Completeness and factors affecting community workers' reporting of births and deaths in the countrywide mortality surveillance for action in Mozambique. *The American Journal of Tropical*

Medicine and Hygiene, *108*(5), 29–39. Retrieved from https://doi.org/10.4269/ajtmh.22-0537

Kare, A. P., Gujo, A. B., & Yote, N. Y. (2021). Job satisfaction level and associated factors among rural health extension workers of Sidama Region, Southern Ethiopia. *Health Services Research and Managerial Epidemiology*, *8*(1), 1–7. https://doi.org/10.1177/23333 928211051832

Kok, M. C., Dieleman, M., Taegtmeyer, M., Broerse, J. E. W., Kane, S. S., Ormel, H., & De Koning, K. A. M. (2015). Which intervention design factors influence performance of community health workers in low- and middle-income countries? A systematic review. *Health Policy and Planning*, *30*(9), 1207–1227. https://doi.org/10.1093/heapol/czu126.

Kroese, K., Ofori, B. A., Abdulai, D. R., Monahan, M., Prah, A., & Tabiri, S. (2021). Community engagement and involvement in Ghana: Conversations with community stakeholders to inform surgical research. *Research Involvement and Engagement*, *7*(1), 1–12. https://doi. org/10.1186/s40900-021-00270-5

Kuehne, A., Keating, P., Polonsky, J., Haskew, C., Schenkel, K., Le Polain De Waroux, O., & Ratnayake, R. (2019). Event-based surveillance at health facility and community level in low-income and middle-income countries: A systematic review. *BMJ Global Health*, *4*(6), 1–15. https://doi.org/10.1136/bmjgh-2019-001878

Kweku, M., Amu, H., Awolu, A., Adjuik, M., Ayanore, M. A., Manu, E., & Gyapong, J. O. (2020a). Community-based health planning and services plus programme in Ghana: A qualitative study with stakeholders in two Systems Learning Districts on improving the implementation of primary

health care. *PLoS ONE*, *15*(1), 1–24. https://doi.org/10. 1371/journal.pone. 0226808

Kweku, M., Manu, E., Amu, H., Aku, F. Y., Adjuik, M., Tarkang, E. E., & Gyapong, J. O. (2020b). Volunteer responsibilities , motivations and challenges in implementation of the community-based health planning and services (CHPS) initiative in Ghana : Qualitative evidence from two systems learning districts of the CHPS + project. *6*(1), 1–13. *BMC Health Service Research.* http://dio. org/10.1186/s12913-020-05348-6

Kyei-Faried, S., Appiah-Denkyira, E., Brenya, D., Akuamoa-Boateng, A., & Visser, L. (2006). The role of community-based surveillance in *Ghana Medical Journal*, *40*(1), 26–30.

Last, J. M., & Adelaide, D. P. (2013). The iceberg: "Completing the clinical picture" in general practice. 1963. *International Journal of Epidemiology*, *42*(6), 1608–1613. https://doi.org/10.1093/ije/dyt113

Li, F., Liu, S., Zhang, F., & Huang, H. (2022). Moderating effects of self-efficacy and time pressure on the relationship between employee aging and work, performance. *Psychology Research and Behavior Management*, *15*(4), 1043–1054. https://doi.org/10.2147/PRBM. S359624

Li, R., Pei, S., Chen, B., Song, Y., Zhang, T., Yang, W., & Shaman, J. (2020). Substantial undocumented infection facilitates the rapid dissemination of novel coronavirus (SARS-CoV-2). *Science*, *368*(6490), 489–493. https:// doi.org/10.1126/science.abb3221.

Liu, H., Ye, C., Wang, Y., Zhu, W., Shen, Y., Xue, C., & Zhou, Y. (2021). The effectiveness of active surveillance measures for COVID-19 cases in Pudong new area Shanghai, China, 2020. *Journal of Medical Virology*, *93*(5), 2918–2924. https://doi.org/10.1002/jmv.26805

Liyew, A. M., & Ayalew, H. G. (2021). Individual and community-level determinants of poor tetanus toxoid immunization among pregnant women in Ethiopia using data from 2016 Ethiopian demographic and health survey; Multilevel analysis. *Archives of Public Health*, *79*(1), 1–10. https://doi.org/10.1186/s13690-021-00622-3

Ma, Y., Kim, H., Cho, Y., Lee, J., Degley, J. K., Adam, A. G., & Cha, S. (2017). Effects of community health volunteers on infectious diseases of children under five in Volta Region, Ghana: Study protocol for a cluster randomized controlled trial. *BMC Public Health*, *17*(1), 1–10. https://doi.org/10.1186/s12889-016-3991-z

Maes, E. F., & Zimicki, S. (2000). *An evaluation of community-based disease surveillance in the Northern Region of Ghana*. Accra, Ghana: Semantic Scholar. Retrieved from https://www.semanticscholar.org/paper/An-evaluation-of-community-based-surveillance-in-of-Ef Zimicki/16c6c4257ab07ba6b145c486d838ad57b65b4c00?sort=relevance

Makova, N. C., Muchekeza, M., Govha, E., Juru, T. P., Gombe, N. T., Omondi, M., & Tshimanga, M. (2022). Evaluation of the measles case-based surveillance system in Kwekwe city, 2017-2020: A descriptive cross-sectional study. *Pan African Medical Journal*, *42*(1), 2017–2020. https://doi.org/10.11604/pamj.2022.42.113.31373

Mandyata, C. B., Olowski, L. K., & Mutale, W. (2017). Challenges of implementing the integrated disease surveillance and response strategy in Zambia: A health worker perspective. *BMC Public Health*, *17*(1), 1–12. https://doi.org/10.1186/s12889-017-4791-9

Masiira, B., Nakiire, L., Kihembo, C., Katushabe, E., Natseri, N., Nabukenya, I., & Nsubuga, P. (2019). Evaluation of integrated disease surveillance and response (IDSR) core and support functions after the revitalisation of IDSR in Uganda from 2012 to 2016. *BMC Public Health*, *19*(1), 1–12. https://doi.org/10.1186/s12889-018-6336-2

Mbaeyi, C., Mohamed, A., Owino, B. O., Mengistu, K. F., Ehrhardt, D., & Elsayed, E. A. (2018). Strengthening acute flaccid paralysis surveillance through the village polio volunteers program in Somalia. *Clinical Infectious Diseases*, *67*(6), 941–946. https://doi.org /10.1093/cid/ciy180

McAteer, A., Elliott, A. M., & Hannaford, P. C. (2011). Ascertaining the size of the symptom iceberg in a UK-wide community-based survey. *British Journal of General Practice*, *61*(582), 1–11. https://doi.org/10.3399/ bjgp11X548910

McGowan, C. R., Takahashi, E., Romig, L., Bertram, K., Kadir, A., Cummings, R., & Cardinal, L. J. (2022). Community-based surveillance of infectious diseases: A systematic review of drivers of success. *BMJ Global Health*, *7*(8), 1–13. https://doi.org/10.1136/bmjgh-2022-009934

McNabb, D. E. (2023). *Disaster management policies and practices: Multi sector collaboration in emergencies and disasters.* USA. Routledge Taylor and Francis Group. https://www.routledge.com/Disaster-Management-Policies-and-Practices-Multi-Sector-Collaboration-in/McNabb-

Swenson/p/book/9781032315591

Mehanna, A., Ali, M. H., & Kharboush, I. (2020). Knowledge and health beliefs of reproductive-age women in Alexandria about tetanus toxoid immunization. *Journal of the Egyptian Public Health Association*, *95*(1), 1-14. https://doi.org/10.1186/s42506-020-00049-8

Mehwish, M. (2018). *Enhancing Disaster Preparedness in Coastal Communities*. USA. Mangrove for the Future. Retrieved from: https://www. fao.org/fileadmin/ templates/rap/files/meetings/2016/161220_13_MFF_presentation.pdf

Merali, S., Asiedu-bekoe, F., Clara, A., Adjabeng, M., Baffoenyarko, I., Frimpong, J. A., & Id, S. A. B. (2020). Community-based surveillance advances the Global Health Security Agenda in Ghana. *PLoS ONE, 15*(8) 1–13. https://doi.org/ 10.1371/journal.pone.0237320

Mertler, C. A., Vennatta, R. A., LaVenia, N. K., (2021). *Advance and multivariate statistical methods: Practical application and interpretations.* NewYork: Routledge. https://doi. org/10.4324/9781003047223

Miller, M., & Hagan, E. (2017). Integrated biological-behavioural surveillance in pandemic-threat warning systems. *Bulletin of the World Health Organization*, *95*(1), 62–68. https://doi.org/10.2471/BLT.16.175984

Ministry of Health (2017). *Improving Routine Immunization Service Delivery to Urban Poor in Ghana: Results of Situational Analysis Areas Sampled*. Accra, Ghana. Received from https://www.jsi.com/resource/improving-routine-immunization-service-delivery-to-urban-poor-in-kyrgyzstan-

results-of-situational-analysis/

Ministry of Local Government (2023). *Ghana district: A resource based for all local assemblies in Ghana*. Accra: Ghana. Retrieved from https://www. ghana districts.com

Mishra, A., Singh, A. K., Parida, S. P., Pradhan, S. K., & Nair, J. (2022). Understanding community participation in rural health care: A participatory learning and action approach. *Frontiers in Public Health, 10*(6), 1–11. https://doi.org/10.3389/fpubh.2022. 860792

Mohammed, E. N. A., Onavbavba, G., Wilson, D. O. M., & Adigwe, O. P. (2022). Understanding the nature and sources of conflict among healthcare professionals in Nigeria: A qualitative study. *Journal of Multidisciplinary Healthcare*, *15*(9), 1979–1995. https://doi.org/10.2147/J MDH.S374201

Mohammed, Y., Zainu, S. M., Manga, M. M., Jimoh, A. K., Egbe, E. O., Abubakar, J., & Egah, D. Z. (2022). Guinea worm eradication: the need for sustained surveillance using One Health approach amidst COVID-19 pandemic and worsening armed conflicts in Nigeria. *Pan African Medical Journal One Health*, *8*(1), 1–8. https://doi.org/10.11604/pamj-oh.2022 .8.19.36319

MOH Republic of Uganda (2021). *National echnical guidelines for integrated disease surveillance and response,* (3rd ed.). Uganda. MOH Uganda. Retrieved from https://www.afro.who.int/sites/default/files/2021-09/2_ Uganda%203rd%20IDSR%20Tech%20Guideline_PrintVersion_10Sep20 21.pdf

Monney, K. A. & Darkwa, B. K. (2014). Prospects and potentials of Kakum conservation area, Ghana. *Journal of Ecology and the Natural*

Environment, *6*(5), 140–153. https://doi.org/10.58 97/jene2013.0431m

Mora, G., Rasouli, A., & Ba, F. (2021). How is t he icebe erg of CO OVID-19 ? Results from a rapid literature review. *Medical Journal of the Isalmic Republic of Iran. 35*(77), 1-9.

Mremi, I. R., George, J., Rumisha, S. F., Sindato, C., Kimera, S. I., & Mboera, L. E. G. (2021). Twenty years of integrated disease surveillance and response in Sub-Saharan Africa: challenges and opportunities for effective management of infectious disease epidemics. *One Health Outlook*, *3*(1), 1-26. https://doi.org/10.1186/s42522-021-00052-9

Mremi, I. R., Sindato, C., Kishamawe, C., Rumisha, S. F., Kimera, S. I., & Mboera, L. E. G. (2022). Improving disease surveillance data analysis, interpretation, and use at the district level in Tanzania. *Global Health Action*, *15*(1), 1-12. https://doi.org/10.1080/16549716.20 22.2090100

Muzondo, M., Shamu, A., Shambira, G., Gombe, N. T., Juru, T. P., & Tshimanga, M. (2018). Evaluation of the acute flaccid paralysis (AFP) surveillance system in Mwenezi district, Masvingo, 2018: A descriptive study. *BMC Research Notes*, *11*(1), 1–5. https://doi.org /10.1186/s13104-018-3981-6

Nakubulwa, C., Opio, E., Alekat, G. S., Kibetenga, M., & Alaroker, F. O. E. (2022). Neonatal tetanus with good outcomes at a regional referral hospital in Eastern Uganda: A case report. *Journal of Medical Case Reports*, *16*(1), 1–5. https://doi.org/10.1186/s13256-022-03255-4

Naug, D., Collins, F., & States, U. (2020). Impacts of COVID-19 on agricultural and food systems worldwide and on progress to the sustainable development goals. *Social Behaviour Disease Transmition and Network*, *2*(4), 801-806.

Newmyer, L., Evans, M., & Graif, C. (2022). Socially connected neighborhoods and the spread of sexually transmitted infections. *Demography*, *59*(4), 1299–1323. https://doi.org/10. 1215/00703370-10054898.

Ng'etich, A. K. S., Voyi, K., & Mutero, C. M. (2021a). Evaluation of health surveillance system attributes: the case of neglected tropical diseases in Kenya. *BMC Public Health, 21*(1), 1–15. https://doi.org/ 10.1186/s12889-021-10443-2

Ng'etichi, A. K. S., Voyi, K., Kirinyet, R. C., & Mutero, C. M. (2021b). A systematic review on improving implementation of the revitalised integrated disease surveillance and response system in the African region: A health workers' perspective. *PLoS ONE, 16*(3), 1-31. https:// doi.org/ 10.1371/journal.pone. Abdelrahim 0248998

Ningi, A. I., Shuaib, F., Ibrahim, L. M., Saleh, J. E. A., , K., Bello, I. M., & Nsubuga, P. (2018). Polio eradication in Nigeria: Evaluation of the quality of acute flaccid paralysis surveillance documentation in Bauchi state, 2016. *BMC Public Health, 18*(4), 1-144. https://doi.org/10.1186/s12889-018-6185-z

Njuguna, C., Vandi, M., Squire, J. S., Kanu, J. S., Gachari, W., Liyosi, E., & Fall, I. S. (2022). Innovative approach to monitor performance of integrated disease surveillance and response after the Ebola outbreak in Sierra Leone: Lessons from the field. *BMC Health Services Research, 22*(1), 1–10. https://doi. org/10.1186/s12913-022-08627-6

Norman, I. D., Aikins, M., Binka, F. N., & Nyarko, K. M. (2012). Hospital all-risk emergency preparedness in Ghana. *Ghana Medical Journal*, *46*(1), 34–42.

Novita, W. S., Clara, A., & Dewi, S. (2023). Employee performance impact on communication and work environment. *East Asian Journal of Multidisciplinary Research*, *2*(1), 301–308. https://doi.org/10.55927/eajmr.v2i1.2610.

Nsubuga, P., White, M. E., Thacker, S. B., Anderson, M. a., Blount, S. B., Broome, C. V., & Trostle, M. (2006). *Public Health Surveillance: A Tool for Targeting and Monitoring Interventions.* Washinton DC. National Library of Medicine. Retrived from http://www.ncbi.nlm.nih.gov/books/NBK11770/pdf/ch53.pdf

Nukunya. (2007) *Tradittion and change in Ghana: An introduction to sociology*. Accra, Ghana*:* University Press.

Nurjono, M., Shrestha, P., Ang, I. Y. H., Shiraz, F., Eh, K. X., Toh, S. A. E. S., & Vrijhoef, H. J. M. (2020). Shifting care from hospital to community, a strategy to integrate care in Singapore: Process evaluation of implementation fidelity. *BMC Health Services Research*, *20*(1), 1–16. https://doi.org/10.1186/s12913-020-05263-w

Odoom, J. K., Afia, N., Ntim, A., Sarkodie, B., Addo, J., Minta-asare, K., & Adjabeng, M. (2014). Evaluation of AFP surveillance indicators in polio-free Ghana, 2009-2013. *BMC Public Health*, *14*(687), 1–8. http://www.biomed central.com/1471-2458/14/687

Ogah, J. K. (2013). *Decision making in the research process: Companion to students and beginning researchers.* Accra, Ghana: Adwinsa Publications.

Ohene, S. A., Klenyuie, W., & Sarpeh, M. (2016). Assessment of the response to cholera outbreaks in two districts in Ghana. *Infectious Diseases of Poverty*, *5*(1), 1–11. https://doi.org/10.1186/s40249-016-0192-z

Olkowski, S., Stoddard, S., Halsey, E., Morrisson, A., Barker, C., & Scott, T. (2016). *Sentinel versus passive surveillance for measuring changes in dengue incidence: Evidence from three concurrent surveillance systems in Iquitos,* Peru. BioRxiv. Retrieved from https://www.biorxiv.org/content/10.1101/040220v1.

Omole, M. S., & Adebayo, T. T. (2019). Teamwork and epidemic control among health workers in local government areas of Osun State, Nigeria. *Library Philosophy and Practice*, 1(5), 1-6.

Orimbo, E. O., Oyugi, E., Dulacha, D., Obonyo, M., Hussein, A., Githuku, J., & Gura, Z. (2020). Knowledge, attitude and practices on cholera in an arid county, Kenya, 2018: A mixed-methods approach. *PLoS ONE*, *15*(2), 1–14. https://doi.org/10.1371/journal. pone.0229437

Otieno, E., Id, O., Oyugi, E., Dulacha, D., Obonyo, M., Hussein, A., Githuku, J., & Gura, Z. (2020). Knowledge , attitude and practices on cholera in an arid county , Kenya , 2018 : A mixed- methods approach. *PLoS ONE*, *428*(1), 1–14. https://doi.org/10.13 71/journal. pone.0229437

Owusu-Agyei, S., Awini, E., Anto, F., Mensah-Afful, T., Adjuik, M., Hodgson, A., & Binka, F. N. (2019). Assessing malaria control in the Kassena-Nankana district of northern Ghana through repeated surveys using the RBM tools. Malaria Journal, 18(1), 191. http:// doi:10.1186/s12936-019-7

Owusu, L., Tuwor, R. D., Ackam, N., Loglo, A., Agbavor, B., Agbanyo, A., & Phillips, R. O. (2023). Role and capacity needs of community based surveillance volunteers in the integrated management of skin neglected tropical diseases (skin NTDs): A qualitative study from central Ghana.

BMC Public Health, *23*(1), 1–12. https://doi.org/10.1186/s12889-023-16015-w

Ozdemir, S., Oztomurcuk, D., & Oruc, M. A. (2022). Impact of the COVID-19 pandemic on tuberculosis patients and tuberculosis control programs in Turkey, review and analysis. *Archives of Public Health*, *80*(1), 1–8. https://doi.org/10.1186/s13690-022-01007

Palmié, M., Parida, V., Mader, A., & Wincent, J. (2023). Clarifying the scaling concept: A review, definition, and measure of scaling performance and an elaborate agenda for future research. *Journal of Business Research*, *158*(1), 1-15. https://doi.org/10.1016/j.jbusres.2022.113630

Phalkey, R. K., Shukla, S., Shardul, S., Ashtekar, N., Valsa, S., Awate, P., & Marx, M. (2013). Assessment of the core and support functions of the Integrated Disease Surveillance system in Maharashtra, India. *BMC Public Health*, *13*(1), 1. https://doi.org/10.1186/1471-2458-13-575

Plianbangchang, S. (2018). International leadership for the control of disease outbreaks relating to "One Health." *Journal of Health Research*, *32*(2), 106–111. Retrived from https://doi.org/10.1108/JHR-12-2017-011

Raghupathi, V., & Raghupathi, W. (2020). The influence of education on health: An empirical assessment of OECD countries for the period 1995-2015. *Archives of Public Health*, *78*(1), 1–18. https://doi. org/10.1186/s13690-020-00402-5.

Reintjes, R., Thelen, M., Reiche, R., & Csohán, Á. (2007). Benchmarking national surveillance systems: A new tool for the comparison of communicable disease surveillance and control in Europe. *European Journal of Public Health*, *17*(4), 375–380. https://doi.org/10.1093/eurpub/ckl256

Rogers, A. (2014). *The base of the iceberg. Informal learning and its impact on formal and non-formal learning*. Berlin, Toronto: Barbara Budrich Publishers. https://doi.org/10.3224/84740632

Rubenstein, B. L., Roy, S. L., Unterwegner, K., Yerian, S., Weiss, A., Zirimwabagabo, H., & Guagliardo, S. A. J. (2021). Community-based guinea worm surveillance in chad: Evaluating a system at the intersection of human and animal disease. *PLoS Neglected Tropical Diseases*, *15*(3), 1–17. https://doi.org/10.1371/journal.pntd.0009285

Sahal, N. H. (2011). *Assessment of Communicable Diseases Surveillance System in Khartoum State, Sudan*. (Doctoral Thesis, University of Southern Denmark). Retrieved from https://www.semanticscholar.org/paper/Assessment-of-Communicable-Diseases-Surveillance-in-Sahal/c75e5379a2c4d84969694c0ef34f957e5497e927

Saleem, F., Malik, M. I., & Qureshi, S. S. (2021). Work stress hampering employee performance during COVID-19: Is safety culture needed? *Frontiers in Psychology*, *12*(8), 1–13. https://doi.org/10.3389/fpsyg.2021.655839

Saleh, F., Kitau, J., Konradsen, F., Mboera, L. E. G., & Schiøler, K. L. (2021). Assessment of the core and support functions of the integrated disease surveillance and response system in Zanzibar, Tanzania, *BMC Public*

Health, 21(278), 1-12. https//dio.org/10.1186/s12889-021-10758-0

Samaras, L., Sicilia, M. A., & García-Barriocanal, E. (2021). Predicting epidemics using search engine data: A comparative study on measles in the largest countries of Europe. *BMC Public Health*, *21*(1), 1–14. https://doi.org/10.1186/s12889-020-10106-8

Santiyadnya, N. (2021). The effectiveness of CIPP model's implementation in secondary school. *Journal of Physics: Conference Series*, *1810*(1), 1-5. https://doi.org/10.1088/1742-6596/1810/1/012071

Schnackenberg, A. K., & Tomlinson, E. C. (2016). Organizational transparency: A new perspective on managing trust in organization-stakeholder relationships. In *Journal of Management, 42*(7), 1-56. https://doi.org/10.1177/0149206314525202

Sebit Ebead, S. M. (2016). Knowledge, attitude and practice towards Guinea worm among the resident's of Juba county in Central Equatoria State. *Texila International Journal of Public Health 4*(4), 488–519. https://doi.org/10.21522/tijph.2013.04.04.art043

Seidu, H. D. (2016). *Challenges of chiefs in the socio-economic development of the Dorimon traditional area of the Upper West Region*. (Master of Philosophy Thesis, University of Development Studies, Ghana) Retrieved from http://udsspace.uds.edu.gh/bitstream/123456789/1422/1/AN%20 examination%20of%20chieftancy%20institutions.pdf

Senyonjo, L., Downs, P., Schmidt, E., Bailey, R., & Blanchet, K. (2021). Lessons learned for surveillance strategies for trachoma elimination as a public health problem, from the evaluation of approaches utilised by guinea worm and onchocerciasis programmes: A literature review. *PLoS*

Neglected Tropical Diseases, *15*(1), 1–20. https://doi.org/ 10.1371/journal.pntd.0009082

Shorten, A., & Smith, J. (2017). Mixed methods research: Expanding the evidence base. *Evidence-Based Nursing*, *20*(3), 74–75. https://doi.org/ 10.1136/eb-2017-102699

Siegel, F. R. (2020). *Disease protection in sea coast (and Inland) cities: Problems in dense populations with shantytowns/slums*. Switzerland: *Pub Med Central*. https://doi.org/10.1007/978-3-030-22669-5_6

Silenou, B. C., Nyirenda, J. L. Z., Zaghloul, A., Lange, B., Doerrbecker, J., Schenkel, K., & Krause, G. (2021). Availability and suitability of digital health tools in Africa for pandemic control: Scoping ceview and Cluster analysis. *JMIR Public Health and Surveillance*, *7*(12), 1-21. https://doi.org/10.2196/30106

Solnes, M. A., van Pelt, S., de Bruin, W., & Shields-Zeeman, L. (2019). Mobilizing community action to improve maternal health in a rural district in Tanzania: lessons learned from two years of community group activities. *Global Health Action*, *12*(1), 1-16. https://doi.org/10.1080/16549716.2019.1621590.

Stolka, K. B., Ngoyi, B. F., Grimes, K. E. L., Hemingway-Foday, J. J., Lubula, L., Nzanzu Magazani, A., & Macdonald, P. D. M. (2018). Assessing the surveillance system for priority zoonotic diseases in the Democratic Republic of the Congo, 2017. *Health Security*, *16*(1), 44–53. https://doi.org/10.1 089/hs.2018.00 60

Stufflebeam, D. L. (2007). *CIPP evaluation model checklist (2nd ed.)*. USA: Western Michigan University Education Centre. Retrieved from

https://scholar.google.com/scholar?q=Stufflebeam,+D.+L.+(2007).+CIPP+evaluation+model+checklist+(2nd+ed.&hl=en&as_sdt=0&as_vis=1&oi=scholart

Taha, A. (2022). Feedback in an epidemic? *Cureus*, *14*(2), 12–16. https://doi.org/10.7759/cureus.22008

Tarkang, E. E. (2022). *Operationalisation of behioural science theories: A research guide for health promotion practitioners and students in Africa*. Tema, Ghana: Youprint Ghana Limited.

Tao, Y., Probert, W. J. M., Shea, K., Runge, M. C., Lafferty, K., Tildesley, M., & Ferrari, M. (2021). Causes of delayed outbreak responses and their impacts on epidemic spread. *Journal of the Royal Society Interface*, *18*(176), 1-9. https://doi.org/10.1098/rsif.2020.0933

Tesfaye, B., Sowe, A., Kisangau, N., Ogange, J., Ntoburi, S., Nekar, I., & Onuekwusi, I. (2020). An epidemiological analysis of acute flaccid paralysis (AFP) surveillance in Kenya, 2016 to 2018. *BMC Infectious Diseases*, *20*(1), 1–11. https://doi.org/10.1186/s12879-020-05319-6

Tokmak, H. S., Baturay, H. M., & Fadde, P. (2013). Applying the context, input, process, product evaluation model for evaluation, research, and redesign of an online master's program. *International Review of Research in Open and Distance Learning*, *14*(3), 273–293. https://doi.org/10.19173/irrodl.v14i3.1485

Uchendu, O., Ige, O., & Adeyera, O. (2019). Knowledge and home treatment of measles infection by caregivers of children under five in a low-income urban community, Nigeria. *African Journal of Primary Health Care and Family Medicine*, *11*(1), 1–13. https://doi.org/10.4102/ phcfm.v11i1.1744

WHO. (2019). *Integrated diseases surveillance and response (IDSR) technical guidelines booklet 2*. Brazaville, Republic of Congo: https://creativecommons.org/licenses/by-nc-sa/3.0/igo

WHO Africa Region (2019). *Integrated diseases surveillance and response (IDSR) technical guidelines booklet 4*. Brazaville, Republic of Congo: https://creativecommons.org/licenses/by-nc-sa/3.0/igo

WHO Africa Region (2019). *Integrated diseases surveillance and response (IDSR) technical guidelines booklet 5*. Brazaville, Republic of Congo:https:// creativecommons.org/licenses/by-nc-sa/3.0/igo

WHO. (2006). *Communicable disease surveillance and response systems. A guide to planning.* Geneva. World Health Organisation. https://apps. who.int/iris/bitstream/handle/10665/69331/WHO_CDS_EPR_LYO_2006 _2_eng.pdf?sequence=1&isAllowed=y

WHO. (2015). *Integrated diseases surveillance and response in the African Region: Community-based surveillance (CBS) training manual*. WHO Regional Office for Africa. https://www.afro. who.int /sites/default/ files/2017-06/community-based-surveillance_idsr_training-manual.pdf.

WHO. (2016). *Community-based health services: A vital part of universal health coverage*. *SEARO Technical Consultation Seminar,* New Delhi: WHO Regional Office for South Asia. file:///C:/Users/New%20 User/Downloads/UHC-discussion-paper-2016%20(1).pdf

WHO. (2020). *GISRS sentinel surveillance for COVID-19: Frequently asked questions (FAQ)-2-4. How can countries implement sentinel surveillance of COVID-19 using GISRS?* WHO. www.who. int/influenza/surveillance _monitoring/gisrs_covid19_reporting/en/.

WHO. (2020). *Supportive supervision training for mid-level managers (MLM). Module*. WHO. Retrieved from https://apps.who.int/iris/bitstream/handle/10665/337056/9789240015692-eng.pdf

WHO. (2022). *International Health and Regulation*. Geneva. WHO.

WHO Regional Office for Africa. (2017). *Integrated disease surveillance and response (IDSR) Task Force Meeting*. *September*, 7–8. WHO. https://www.afro.who.int/sites/default/files/2017-12/IntegratedDisease Surveillance and Response edited_Final.pdf

WHO. (2014). *Early detection, assessment and response to acute public health events: Implementation of early warning and response with a focus on event-based surveillance.* WHO. www.who.int/about/licensing/ copyright _form/en/index.html%0Ahttps://apps.who.int/iris/handle/10665/112667

WHO. (2022). Public Health Surveillance for COVID-19. *Interim Guidance*, 2(1) 253–278. https://www.who. int/publications/ i/item/who-2019-nCoV-surveillanceguidance-2020.8

WHO & Centers for Disease Control and Prevention. (2010). *Technical guidelines for integrated disease surveillance and response in the African Region, Brazzaville, Republic of Congo and Atlanta*. WHO. https://apps.who.int/iris/handle/10665/204603

Wilson, A. N., Spotswood, N., Hayman, G. S., Vogel, J. P., Narasia, J., Elijah, A., & Homer, C. S. E. (2020). Improving the quality of maternal and newborn care in the Pacific region: A scoping review. *The Lancet Regional Health - Western Pacific*, *3*(1), 1-27. https://doi.org/10.1016/j.lanwpc.2020.100028

Wilterdink, N. & Form, W. (2023) *Social structure*. Encyclopedia Britannica, *7*(8), 1-12.

Wulifan, J. K., Dapilah, F., & Angko, W. (2022). A retrospective evaluation of cerebrospinal meningitis data in Upper West Region, Ghana, 2015-2021. *Pan African Medical Journal One Health*, *8*(1), 2015–2021. https://doi.org/1 0.11604/pamj-oh.2022.8.13.35310

Yuan, M., Lin, H., Wu, H., Yu, M., Tu, J., & Lü, Y. (2021). Community engagement in public health: A bibliometric mapping of global research. *Archives of Public Health*, *79*(1), 1–17. https://doi.org/ 10.1186/s13690-021-00525-3

APPENDICES

APPENDIX 1A: QUESTIONNAIRE FOR CBSVs

UNIVERSITY OF CAPE COAST

COLLEGE OF EDUCATION STUDIES

FACULTY OF SCIENCE AND TECHNOLOGY EDUCATION

DEPARTMENT OF HEALTH, PHYSICAL EDUCATION AND RECREATION

QUESTIONNAIRE FOR CBSVs AS SURVEILLANCE FOCAL PERSONS IN THE COMMUNITY

Dear Valued Respondent,

I am Benjamin Adjei, a Post Graduate student from the Department of Health, Physical Education and Recreation, University of Cape Coast (UCC), Cape Coast. As part of the programme, I am conducting research on **"Evaluation of Community-based Disease Surveillance System in the Central Region of Ghana''** to improve health practices in Ghana and beyond and this study is one of them.

As the CBDSV having oversight responsibilities over surveillance activities in this community, I would be grateful for your comments by responding to the following questions. The information you provide will help the health sector to plan health services. Whatever information you provide will be kept strictly confidential. Your name will not be mentioned anywhere in this research. **Please, completing this questionnaire will take you about 15-45 minutes.**

Participation in this research is voluntary and you can choose not to answer any individual question or all of the questions. However, I hope that you will participate in this research since your views are very important. If you agree to participate in this study, kindly sign and indicate date at the column provided below. For further information you may contact me or my supervisors on the numbers below:

Supervisors: Prof. J. K. Mintah: 0202464739

Dr. Thomas Hormenu: 0244213465

Researcher: Benjamin Adjei: 0273269725

Signature: …… Date: ……

Section A: Background Information on the CBSVs

Kindly read the following questionnaire and provide a response or tick the appropriate responses where necessary.

Questionnaire Code:

No	Question	Responses	Skips
1	Name of District		
2	Name of Sub-district		
3	Name of CHPS zone		
4	Name of Community		
5	Development status	Rural -1 Urban- 2	
6	Ecological status	Coastal-1 Forest- 2	
7	Does the community have a CBSVs	Yes……1 No…….…….. 2	If no Skip to 28
8	Age (in years)	……..	
9	Sex	Male……1 Female……2	
10	Educational level	None……1 Primary…….....2 Middle/JHS…….3 Secondary……4 Diploma…….....5 Degree……6 Others specify……7	
11	Marital Status	Single…….1 Married…….....2 Widowed……...3 Separated……...4 Divorced ……..5	
12	Religion	Christian…….....1 Moslem……..2 Traditionalist……..3 Others (specify)……..4	
13	Occupation	Teacher……1 Farmer……..2 Trader……...3 Health worker……...4 Unemployed…….5 Other (specify)……..6	
14	How long have you worked as CBSV in this community?	Less than 2 years……..1 2-4 years……...2 More than 4years……..3	

Section B: Surveillance Systems Structures/Context

No	Question	Responses	Skips
15	How were you selected to be a CBSV?	Selected by the community……1 Selected by health worker……...2 Selected by self……...3 Selected by an NGO……...4 Others (specify)……...5	
16	How long have you lived in this community (put year)?	……..	
17	Were you trained as a CBSV before you started work?	Yes…….1 No…….2	If no skip to Q 20
18	Which year were you trained (put year)?	…….	
19	Who trained you?	Health worker……..1 NGO…….2 Community……..3 Other (Specify)……4	
20	Do you have a CBSV's register that is being used for this community?	Yes……1 No…….2	
21	Have you been introduced to the community by the community opinion leaders as a CBSV?	Yes……1 No…….2	
22	Do you have a list of case definitions of priority diseases/events as a guide?	Yes……1 No…….2	
23	Do you have a copy of CBSVs monthly reporting summary forms?	Yes……1 No…….2	
24	Have you sent a report to a Health worker/ CHPS compound within the past one year?	Yes……1 No…….2	If yes Skip to Q26
25	If no, why have you not sent a report?	No register ……1 No reporting format……...2 Have not had a case……3 I have stopped work as CBSV…..4	

26	Have you worked with any NGO in this community?	Yes……1 No……..2	
27	Have you met community opinion leaders to discuss health issues for the last one year?	Yes……1 No……..2	
28	If the community has no volunteer, what are the reasons?	Do not know about CBSVs.....1 No one selected before……..2 Volunteer travelled……3 Volunteer go to school……...4 Volunteer go on transfer……5 Volunteer stopped work……....6 Do not know about CBSVs.....7 Volunteer died……...8 Others (specify)……....9	End the questionnaire

Section C: Knowledge on priority disease and events in the CBSVs register

Please read the following instructions before you proceed to respond to the questions

- Tick the appropriate response at the response column.
- If all the signs and symptoms/events are mentioned, score **3- Outstanding**
- Where there is a single criterion/sign/event, score 3 if the criterion/sign/event is mentioned or **0** if it is not met
- If more than half of the signs and symptoms/event are mentioned score **2- Good**
- If half of the signs and symptoms/events are mentioned score **1- Average**
- If less than half of the signs and symptoms are mentioned score **0- Poor**
- **Bolded words or phrase in the statements are the signs and symptoms**

No	Question	Responses	Skips
29	**Could you state the case definition of AFP/Poliomyelitis?** Any person who develops **sudden weakness in the limbs.**	3 2 1 0	
30	**Could you state case definition of Guinea worm?** Any person with **worms emerging from any part of the body.**	3 2 1 0	
31	**Could you state the case definition of Measles?** Any person with **fever** and **rash** is suspected to have	3 2 1 0	
32	**Could you state case definition of Neonatal Tetanus?**	3 2 1 0	

	Any newborn who is able to **suck and cry at birth** and then **after 2 days in unable to suck or feed** and **becomes stiff**		
33	**Could you state case definition of Cholera?** Any person 5years of age or more with lots of **watery diarrhea and sometimes vomiting profusely** as well, in the case of an outbreak **anybody who passes watery/loose stool**	3 2 1 0	
34	**Could you state case definition of Cerebro-spinal meningitis (CSM)?** Any person with **fever** and **neck stiffness**	3 2 1 0	
35	Mention the events that need to be reported within 24 hours to the nearest health facility? **Birth of an infant; Death of an infant; Other deaths Death of a pregnant woman; human illness or death after exposure to animals; any person bitten by dog, cat etc; unexpected large number of children absent from school; any event that cause public anxiety**	3 2 1 0	
	Scores obtained : Total score :	3 2 1 0	

Section D: The extent at which CBSVs receive supportive surveillance function in the community.

No	Question	Responses	Skips
Training			
36	Have you had any training on disease surveillance for the past one year?	Yes……1 No…….2	If no skip to Q. 42
37	If yes to question 36, who trained you?	Health worker……..1 NGO……..2 Community……...3 District Assembly…….4 Other (Specify)…….5	
38	Where were you trained?	District level……...1 Sub-district level……2 CHPS level…….3 Community level……....4 Other specify……..5	
39	How long was the training?	Less than 1 week…….....1 More than 1 week……..2	
40	How many times have you been trained in the past one year?	State number……..	
41	Rank the extent at which the training has improved your work?	Very Low……...1 Low……2 High……3 Very High……...4	
Resources			

42	Have you had any resource (s) from the higher level for the past one year?	Yes……..1 No……...2	If no skip to Q 47
43	If yes to question 42 which of the following resources have been received for the past one year?	Registers…….1 Reporting forms…….2 Cash……3 T-Shirts……...4 ID Cards……5 Soaps……..6 Bicycle……7 Mobile Phones……8 Credit cards……....9 Other (specify)……..10	
44	Who provided the resource (s) to you?	Health worker……1 NGO officer……2 Community leader……..3 Dist. Assembly officer....4 Other (Specify)……...5	
45	How many times have you received resources in the past one year?	State number……..	
46	Rank the extent at which the resources have improved your work?	Very Low……..1 Low……...2 High……..3 Very High……4	

No	Question	Responses	Skips
Supervision			
47	Have you received any supervision from the higher level for the past one year on disease surveillance?	Yes……1 No……..2	If no skip to Q53
48	If yes to question 47 who provided the supervision?	Health worker……1 NGO officer……..2 Community leader…….3 District Assembly officer.....4 Other (Specify)……..5	
49	How many supervisions have you had in the past one year?	State the number……	
50	Has the supervisor (s) signed in the register?	Yes……..1 No……..2	
51	How many times have supervisor (s) signed in the register?	State the number……	

52	Rank the extent supervision has improved your work?	very low……..1 low……..2 High…….....3 very High…….....4	
Communication			
53	Have you received any communication from the higher level for the past one year?	Yes….....1 No…….....2	If no skip to Q.53
54	If yes to question 53 who communicated to you?	Health worker……..1 NGO officer……2 Community leader……..3 District Assembly officer.....4 Other (Specify)……5	
55	How did you receive the communication?	Face-to face……..1 Mobile phone call…….2 Telephone call…….3 Others (specify)……4	
56	How many times have you received communication from the higher level in the past one year?	State number……..	
58	Rank the extent communication has improved your work?	Very low……...1 Low……..2 High……..3 Very High……4	
Coordination			
59	Is there a committee in the community that meets to discuss surveillance issues with you?	Yes……1 No……2	If no skip to Q 62
60	If yes to question 59 how many times has the committee met with you for the past one year?	State numbers……..	
61	Rank the extent coordination has improved your work?	Very Low……....1 Low……2 High……3 Very High……4	

Section E: The extent at which CBSVs perform their core surveillance functions in the community

No	Question	Responses		Skips
Case detection				
62	Does the CBSV have a register?	Yes……1	No……2	
63	Does the CBSV have case definition of priority diseases and events?	Yes……1	No……2	
64	Has the CBSV detected any priority diseases/events for the past one year?	Yes ……1	No……..2	

65	If yes indicate number detected for each of the priority diseases and events?	AFP…… Measles…… Neonatal tetanus…… Guinea worm…… Cerebro-spinal meningitis…… Cholera…… Infant birth…… Infant deaths…… Pregnant woman death…… Older person death……. Others specify……	
Case Registration			
66	Does the CBSV have a register?	Yes…….1 No……2	
67	Has the register been filled correctly? No of portion filled correctly …../…..no of portion filled	80% and above……..High-1 Below 80%.....Low-2	
68	Rank the extent at which you are able to fill and use the register?	Very Low……..1 Low……...2 High……..3 Very High……4	

No	Question	Responses		Skips
Case Confirmation				
69	Has a supervisor clinically confirmed any priority diseases/events you reported in the past one year?	Yes ……1 No……...2		
70	Priority diseases/events If yes indicate number of cases and number confirmed?	Number	confirmed	
	CSM			
	AFP			
	Measles			
	Neonatal tetanus			
	Guinea Worm			
	Cholera			
	Infant births			
	Infant deaths			
	Pregnant women death			
	Older person death			
	Others specify……..			
71	Have any of the above priority diseases been confirmed at the laboratory?	Yes……1 None……2		
72	If yes state cases and number confirmed?	Number	confirmed	
	AFP			
	Measles			
	Neonatal tetanus			
	Guinea Worm			
	Infant births			
	Infant deaths			
	Pregnant women death			

	Older person death			
	Others specify……..			
73	Have you supported a supervisor in the collection of specimen to confirm a disease or event?	Yes……1 No...……2		
No	Question	Responses		Skips
Reporting				
74	Have reports on priority disease and events been submitted to next level in the past one year?	Yes……1 No……..2		
75	If yes, state No of reports submitted……./…….no expected to report to the next level?	80% and above……..High-1 Below 80%.....Low-2		
76	If yes to question 74 indicate number reported for each of the priority diseases and events?	CSM…… AFP…… Measles…… Neonatal tetanus…… Guinea worm…… Cholera…… Infant birth…… Infant deaths…… Pregnant woman death…… Older person death…… Others specify……..		
77	If yes to question 74, state number of reports submitted on time within 24hrs……./…….no expected to reported to the next level?	80% and above……..High-1 Below 80%.....Low-2		
78	Are reporting forms available?	Yes ……1 No……2		
79	Rank the extent at which you are able to fill and use the form?	Very Low……..1 Low……..2 High……..3 Very High……4		
80	Are there line list of priority diseases?	Yes…….1 No……2		
81	Are there infant deaths?	Yes ……1 No……2		
82	If yes where did death occur?	House……1 Health Facility…...2 Prayer Camps…….3 Other specify……..4		
83	Are there pregnant women death?	Yes ……1 No…….2		
84	If yes where did death occur?	House……1 Health Facility…...2 Prayer Camps…….3 Other specify……..4		
85	Are there older persons death?	Yes ……1 No……2		
86	If yes where did death occur?	House……1 Health Facility…...2		

		Prayer Camps…….3 Other specify…….4	
87	Two or more persons dying with similar disease within one week	Yes ……1 No……..2	
88	If yes where did death occur?	House…….1 Health Facility…...2 Prayer Camps…….3 Other specify……..4	
	Data Analysis		
89	Has the total summaries of priority diseases and events been done correctly in the CBSVs register?	Yes…….1 No……..2	
90	Is there any evidence of analysis based on Person, place and time?	Yes…….1 No…….2	
No	Question	Responses	Skips
	Epidemic preparedness		
91	Have you had any outbreak on any of the priority disease and events in the past one year?	Yes……1 No…….2	
92	If yes indicate number reported for particular priority diseases and events?	CSM…… AFP…… Measles…… Neonatal tetanus……. Guinea worm…… Cholera…… Infant birth…… Infant deaths…… Pregnant woman death…… Older person death…… Others specify……	
93	Do you have IE&C materials for education?	Yes……1 No……2	
94	Do you have any source of fund to use to report emergencies?	Yes……1 No…….2	
95	Do you have any plan for outbreaks?	Yes……1 No…….2	
96	Do you collaborate with any local partner in your work?	Yes……1 No…….2	
97	If yes, mention any of the collaborators?	…… ……	
No	Question	Responses	Skips
Response and Control			
98	Do you have any emergency drugs kit?	Yes ……1 No……..…2	

99	Who do you report to first when you suspect a case of priority disease or event?	CHO……..1 Health committee……..2 Sub district officer……3 District officer……..4 Regional officer……5 National officer…….6 Other specify……7	
100	Do you have any committee in place that meets and plan response to outbreak	Yes……..1 No……...2	
101	Have you been part of controlling any outbreak in the past one year?	Yes……1 No……..2	
Feedback			
102	Do you report to the community	Yes……1 No…….2	
103	How many feedbacks have you given to the community for the past one year?	State number(s)……	
104	How many feedbacks have you received from the higher levels	State number(s)……....	
105	Has the feedbacks been beneficial? Rank response?	Very Low……..1 Low……...2 High……..3 Very High……..4	

Section F: Performance of quality functions of the CBSVs

No	Question	Responses	Skips
Completeness			
106	Total no of expected monthly reports and no submitted to the next level. (Number submitted…./….expected in a year)?	80% and above- high-1 Below 80% - Low- 2	
107	Total number of reports in the register and number completely filled (Number completely filled…/….Number of reports)?	80% and above- high-1 Below 80% - Low- 2	
108	Reasons for submitting incomplete reports?	Forms not available… 1 Forms difficult to fill… 2 Forms too many to fill. 3 Other (specify)…… 4	
Timeliness			
109	Total no of expected monthly reports and no submitted to the next level on time (within 24 hrs)……./…expected in a year?	80% and above.....High-1 Below 80%.....Low-2	
110	Reasons for submitting incomplete reports?	Forms not available……1 Forms difficult to fill….2 Forms too many to fill...3 Other (specify)……..4	
Usefulness			
111	Rank the extent at which the data was useful to you for decision making?	Very Low……1 Low…….....2 High…….3 Very High……4	

Acceptability			
112	Rank the extent at which you were willing to use the forms or the data for decision making?	Very Low……...1 Low……...2 High……...3 Very High……..4	
Flexibility			
113	Rank the extent at which you were willing to change and use different forms and data during reporting?	Very Low……..1 Low……..2 High……..3 Very High……..4	
Simplicity			
114	Rank the extent at which the forms and data was simple to work with?	Very Low……1 Low……2 High…….....3 Very High……4	
Motivation and challenges			
115	What has been motivating you to work as a CBSV in this community all these years?	…… …… ……	
116	What will you need as a motivation to help you work more harder	…… …… ……	
117	Mention some of the challenges you face as a CBSV in this community?	…… …… ……	
118	In your view how do you think CBS system can be improved in this community?	…… …… …… ……	

APPENDIX 1B: QUESTIONNAIRES FOR HEALTH STAFF

UNIVERSITY OF CAPE COAST

COLLEGE OF EDUCATION STUDIES

FACULTY OF SCIENCE AND TECHNOLOGY EDUCATION

DEPARTMENT OF HEALTH, PHYSICAL EDUCATION AND RECREATION

CBSVS QUESTIONNAIRE FOR FOCAL PERSONS AT THE DISTRICT, SUB-DISTRICT AND CHPS LEVEL

Dear Valued Respondent,

I am Benjamin Adjei, a Post Graduate student from the Department of Health, Physical Education and Recreation, University of Cape Coast (UCC), Cape Coast. As part of the programme, I am conducting research on **"Evaluation of Community-based Disease Surveillance System (CBDS) in the Central Region of Ghana''** to improve health practices in Ghana and beyond and this study is one of them.

As the district, sub-district and CHPS level surveillance focal persons having oversight responsibilities over activities of CBDSVs, I would be grateful for your comments by responding to the following questions. The information you provide will help the health sector to plan health services. Whatever information you provide will be kept strictly confidential. Your name will not be mentioned anywhere in this research without your permission. **Please, completing this questionnaire will take you about 15.**

Participation in this research is voluntary and you can choose not to answer any individual question or all of the questions. However, I hope that you will participate in this research since your views are very important. If you agree to participate in this study, kindly sign and indicate date at the column provided below. For further information you may contact me or my supervisors on the numbers below:

Supervisors: Prof. J. K. Mintah: 0202464739
Dr. Thomas Hormenu: 0244213465
Researcher: Benjamin Adjei: 0273269725
Signature: …… Date: ……

Section A: Background information on district focal person to CBSVs

Kindly read the following questions and provide response by writing or circle the appropriate responses where necessary.

Questionnaire code: District ( ) Sub-district ( ) CHPS ( )

No	Questions	Responses	Skip
1	Name of District		
2	Name of Sub-district		
3	Name of CHPS zone		
4	Name of Community		
5	Development status	Rural - 1 Urban- 2	
6	Vegetation status	Coastal-1 Forest- 2	
7	Level of Education Completed	Primary…….....1 Middle/JHS…….2 Secondary……3 Diploma……...4 Bachelor ……..…...5 Post Graduate……..6	
8	Category of staff	CHN.....1 SRN.....2 PHN.....3 DCO.....4 Midwife.....5 Others specify.....6	
9	Sex	Male - 1 Female - 2	
10	How long have you worked as a surveillance focal person?	State in years.....	
11	Do you have a copy of the IDSR Technical guidelines?	Yes.....1 No 2	
12	Do you have in stock CBSV registers?	Yes.....1 No 2	
13	When was the last time you made a distribution of CBSVs registers to CBSVs?	Within 1 year.....1 More than 1 year.....2	
14	Do you have in stock CBSV monthly reporting summary forms?	Yes.....1 No 2	
15	Do you have any other reference document on surveillance?	Yes.....1 No 2	
16	Inspect reference document (s) and write name of document?	.....	
17	Do you have a plan of action for strengthening CBSVs activities in the district? (check for an evidence)?	Yes.....1 No.....2	

Section B: Performance of supportive surveillance function by the District Focal Persons to the CBSVs

No	Questions	Responses	Skip
Training			
18	Do you have a CBSV training manual?	Yes.....1 No.....2	
19	Do you have a schedule for training CBSVs?	Yes.....1 No.....2	
20	Have you provided surveillance training to the next lower level for CBSVs in the past one year?	Yes.....1 No.....2	If no skip to Q24
21	If yes to question 20, how many times have you trained CBSV in the past one year?	State number.....	
22	How many of the CBSVs were trained?	No trained……/no expected to be trained …..	
23	Rank the extent at which you think the training has improve the work of CBSVs ?	Very Low……1 Low……2 High……3 Very High……...4	
24	Why have you not been able to provide training to the CBSVs?	Inadequate funds……1 Inadequate time……...2 CBSVs have enough training.....3 Other (specify)……4	
Resource			
25	Do you have a budget line for CBSV activities in you plan?	Yes……1 No……..2	
26	Have you provided any resource (s) to the next lower level on CBSVs activities for the past one year?	Yes……..1 No…….....2	If no skip to 30
27	If yes to question 26, which of the following resources have you provided for the past one year?	Registers……..1 Reporting forms……..2 Cash……3 T-Shirts……....4 ID Cards……5 Soaps…….....6 Bicycle……7 Mobile Phones……8 Credit cards……9 Other (specify)……..10	
28	How many times have you provided resources to the CBSVs in the past one year?	State number…….	
29	Rank the extent at which you think the resource (s) has improve the work of CBSVs?	very low……..1 low……..2 High……3 very High…….....4	

30	Why have you not been able to provide resource to the CBSVs?	Inadequate funds……..1 Inadequate time……2 CBSVs have enough resources... 3 Other (specify)…….4	
No	Questions	Responses	Skip
Supervision			
31	Do you have a supervision schedule for CBSVS?	Yes……..1 No……...2	
32	Have you provided any supervisory visit (s) on CBSVs activities to the next lower level for the past 3 months or past 1 month at CHPS level?	Yes……..1 No……...2	If no to Q32 skip to Q36
33	How if yes to Q32 how many times have you provided supervision to the CBSVs in the past three months?	State number……	
34	How many of the CBSVs were supervised?	No supervised……/no expected to be supervised ……..	
35	Rank the extent at which you think the supervision (s) has improve the work of CBSVs?	Very Low……1 Low……2 High……3 Very High……...4	
36	Why have you not been able to provide supervision to the CBSVs?	Inadequate funds……..1 Inadequate time……2 CBSVs have enough supervision….3 Other (specify)……..4	
Communication			
37	Do you have a communication plan?	Yes……1 No……2	
38	Have communicated to the next lower level on CBSVs activities in the past 3 months?	Yes……1 No…….....2	If no to Q38 skip to Q42
39	If yes to Q38 how many times have you communicated to the next lower level on CBSVs activities in the past 3 months?	State number……..	
40	How did you communicate to the CBSVs?	Face-to face……...1 Mobile phone call……2 Telephone call…..……3 Others (specify)……4	

41	Rank the extent at which you think the communication (s) has improved the work of CBSVs?	Very Low……1 Low……2 High……3 Very High……...4	
42	Why have you not been able to communicate to the CBSVs?	Inadequate funds……..1 Inadequate time……2 CBSVs have enough supervision….3 Other (specify)……..4	
No	Questions	Responses	Skip
Coordination			
43	Is there a committee at this level that meets to discuss CBSVs surveillance issues?	Yes……1 No……2	If no skip to Q46
44	If yes to question Q43 how many times has the committee met to discuss on CBSVs for the past one year?	State numbers……	
45	Rank the extent at which the coordination has improved work of the CBSVs?	Very Low……..1 Low……2 High……3 Very High……4	
46	Have you received any report from the CBSVs in the past one year?	Yes……1 No……2	
47	How do you rate your performance on CBSVs activities in the communities?	Poor- 1 Good - 2 Very good- 3 Excellent - 4	
48	Mention some of the challenges you face as you work with CBSVs?	…… …… …… ……	
49	In your view how do you think CBS system can be improved in your area?	…… …… ……	

APPENDIX 1C: INTERVIEW GUIDE FOR OPINION LEADERS

UNIVERSITY OF CAPE COAST

COLLEGE OF EDUCATION STUDIES

FACULTY OF SCIENCE AND TECHNOLOGY EDUCATION

DEPARTMENT OF HEALTH, PHYSICAL EDUCATION AND RECREATION

INTERVIEW GUIDE FOR OPINION LEADERS IN THE CHPS COMPOUNDS

Dear Valued Respondent,

I am Benjamin Adjei, a Post Graduate student from the Department of Health, Physical Education and Recreation, University of Cape Coast (UCC), Cape Coast. As part of the programme, I am conducting research on **"Evaluation of Community-based Disease Surveillance System in the Central Region of Ghana"** to improve health practices in Ghana and beyond and this study is one of them.

As you are one of the opinion leaders having oversight responsibilities on activities of this CHPS zone, I would be grateful for your valuable comments by answering the following interview questions. The information you provide will help the health sector to plan health services. Whatever information you provide will be kept strictly confidential. Your name will not be mentioned anywhere in this research without your permission. I will like to ask for your permission to record the conversation we are going to have today so that can make reference to it at a later date. This helps us to listen to each other very well. Are you comfortable with that?

Participation in this research is voluntary and you can choose not to answer any individual question or all of the questions. However, I hope that you will participate in this research since your views are very important. If you agree to participate in this study, kindly sign and indicate date at the column provided below. For further information you may contact me or my supervisors on the numbers below:

Supervisors: Prof. J. K. Mintah: 0202464739

Dr. Thomas Hormenu: 0244213465

Researcher: Benjamin Adjei: 0273269725

Signature: …….

Date: ……

SECTION A: Background information on the opinion leader at CHPS Compounds

Kindly read the following questions and tick the appropriate responses where necessary.

Interview code:

No	Questions	Responses
1	Name of District	
2	Name of Sub-district	
3	Name of CHPS zone	
4	Name of Community	
5	Development status	Rural -1 Urban- 2
6	Vegetation status	Coastal-1 Forest- 2
7	Qualification	None ……..1 Primary…….....2 Middle/JHS……. …..3 Secondary……..4 Higher (Post Secondary)……5 Others specify……....6
8	Occupation	Teacher……1 Farmer…….2 Trader…….....3 Health worker……....4 Unemployed……5 Other (specify)……...6
9	Religion	Christian……1 Religion……2 Traditionalist……3 Other (specify)……..4
10	Sex	Male - 1 Female - 2

SECTION B: Key actors/informants interview guide for opinion leaders

What do the opinion leaders in the CHPS compounds perceive to be factors influencing the implementation of CBSVs activities in the Central Region?

1. How long have you been an opinion leader in this community?
2. How long have you been involved in the work of CBSVs?
3. How are you involved in the work of CBSVs Activities? Probe, can you describe any work you have done with or for CBSVs in this community?
4. How were your CBSV selected in this community? Probe, can you please describe the process of how your CBSV (s) were selected

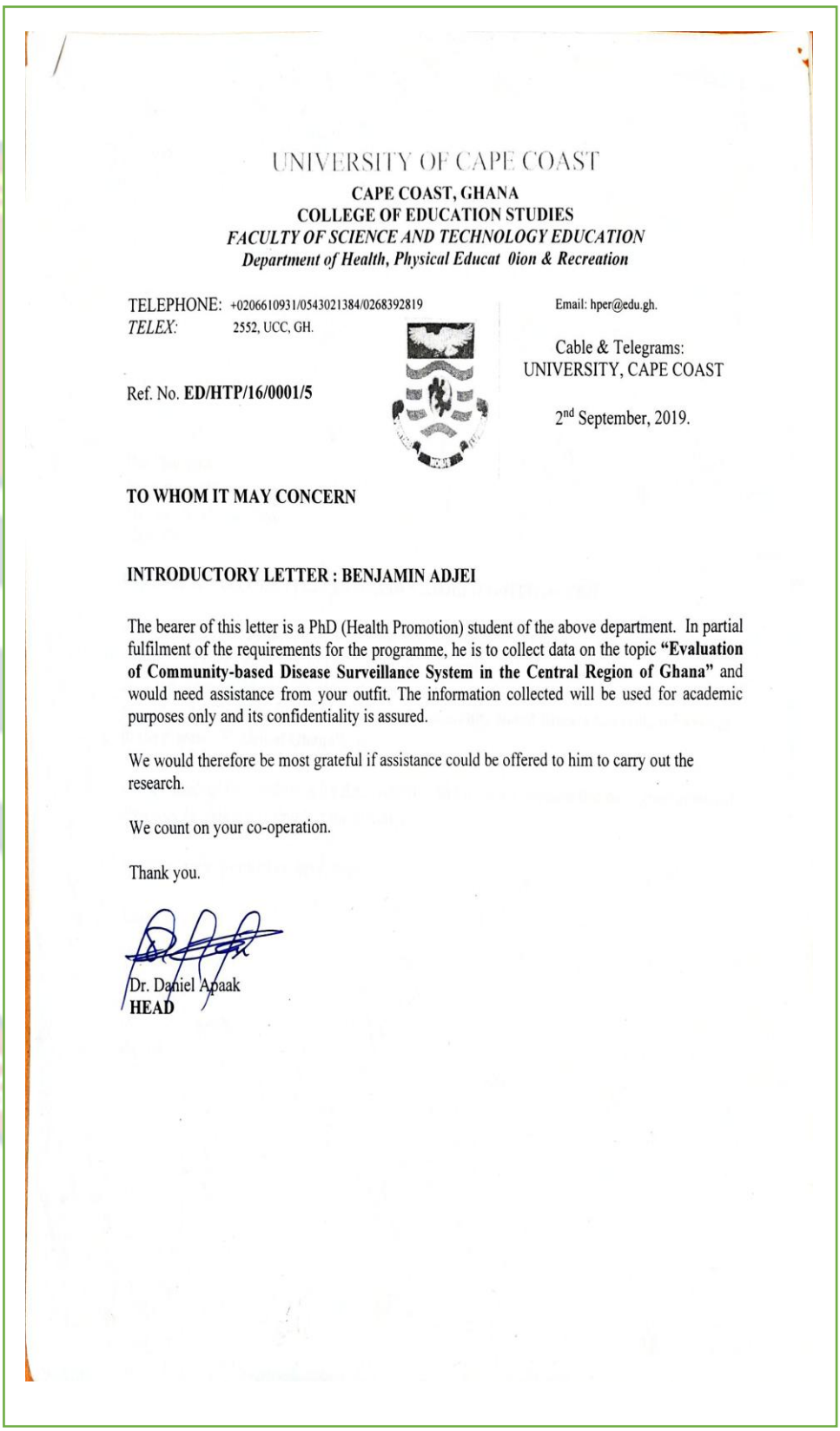
5. Have you had any disease outbreak for the past one year in this community? Yes/No Probe, if yes which diseases and how was the outbreak managed?
6. How do you get feedbacks from the CBSVS?
7. How often do you get feedback from the community?
8. What resources have you provided to support CBSVs activities in this community?
9. What do you think are some of the main reasons why CBSVs activities in this community are progressing? Probe why do you think these reasons are affecting the progress of CBSVs activities
10. What do you think are some of the main reasons why CBSVs activities in this community are **not** progressing? Probe why do you think these reasons are affecting the progress of CBSVs activities?
11. Are the CBSVs activities helping to improve the health the community? Yes/No. If yes probe, what are some of the activities they do to improve the health of the community? How are those activities improving the health of the community? If no probe why are their activities not helping the community?
12. Do you find it difficult getting someone to work as a CBSV in this community? Yes/No. Probe, if yes, why do you think it is difficult getting someone to work as a CBSV?

    If no, why do you think it is so easy getting someone to work as a CBSV in this community?
13. In what ways do you suggest the CBSVs should be motivated

14. What are some of the challenges you think CBSVs encounter in this community?
15. In your view how do you think these challenges could be solved?
16. How do we solve the problem of not getting someone to work as a CBSV?

Thank you

APPENDIX 2A: LETTER OF INTRODUCTION FROM H.P.E.R. DEPARTMENT



UNIVERSITY OF CAPE COAST

CAPE COAST, GHANA
COLLEGE OF EDUCATION STUDIES
FACULTY OF SCIENCE AND TECHNOLOGY EDUCATION
Department of Health, Physical Educat 0ion & Recreation

TELEPHONE: +0206610931/0543021384/0268392819
TELEX: 2552, UCC, GH.

Email: hper@edu.gh.

Cable & Telegrams:
UNIVERSITY, CAPE COAST

Ref. No. **ED/HTP/16/0001/5**

2nd September, 2019.

TO WHOM IT MAY CONCERN

INTRODUCTORY LETTER : BENJAMIN ADJEI

The bearer of this letter is a PhD (Health Promotion) student of the above department. In partial fulfilment of the requirements for the programme, he is to collect data on the topic **"Evaluation of Community-based Disease Surveillance System in the Central Region of Ghana"** and would need assistance from your outfit. The information collected will be used for academic purposes only and its confidentiality is assured.

We would therefore be most grateful if assistance could be offered to him to carry out the research.

We count on your co-operation.

Thank you.

Dr. Daniel Apaak
HEAD

APPENDIX 2B: ETHICAL CLARANCE FROM UCC

UNIVERSITY OF CAPE COAST

INSTITUTIONAL REVIEW BOARD SECRETARIAT

TEL: 0558093143 / 0508878309/ 0244207814
E-MAIL: irb@ucc.edu.gh
OUR REF: UCC/IRB/A/2016/569
YOUR REF:
OMB NO: 0990-0279
IORG #: IORG0009096

C/O Directorate of Research, Innovation and Consultancy

3RD DECEMBER, 2019

Mr. Benjamin Adjei
Department of Health, Physical Education and Recreation
University of Cape Coast.

Dear Mr Adjei,

ETHICAL CLEARANCE – ID (UCCIRB/CES/2019/45)

The University of Cape Coast Institutional Review Board (UCCIRB) has granted **Provisional Approval** for the implementation of your research protocol titled **Evaluation of Community-Based Disease Surveillance System in the Central Region of Ghana.** This approval is valid from 3rd December, 2019 to 2nd December, 2020. You may apply for a renewal subject to submission of all the required documents that will be prescribed by the UCCIRB.

Please note that any modification to the project must be submitted to the UCCIRB for review and approval before its implementation. You are required to submit periodic review of the protocol to the Board and a final full review to the UCCIRB on completion of the research. The UCCIRB may observe or cause to be observed procedures and records of the research during and after implementation.

You are also required to report all serious adverse events related to this study to the UCCIRB within seven days verbally and fourteen days in writing.

Always quote the protocol identification number in all future correspondence with us in relation to this protocol.

Yours faithfully,

Samuel Asiedu Owusu, PhD
UCCIRB Administrator

ADMINISTRATIVE
INSTITUTIONAL REVIEW BOARD
UNIVERSITY OF CAPE COAST

APPENDIX 2C: ETHICAL CLARANCE FROM GHANA HEALTH SERVICE

GHANA HEALTH SERVICE ETHICS REVIEW COMMITTEE

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

Research & Development Division
Ghana Health Service
P. O. Box MB 190
Accra.
GPS Address: GA-050-3303

Tel: +233-0302-960628
Fax + 233-0302-685424
Mob + 233-050-3539896
Email: ethics.research@ghsmail.org

*MyRef. GHS/RDD/ERC/Admin/App*120/121
Your Ref. No.

12th March, 2020

Benjamin Adjei
Department of Health Physical Education and Recreation
University of Cape Coast
Cape Coast

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

GHS-ERC Number	GHS-ERC001/02/20
Project Title	Evaluation of Community-Based Disease Surveillance System in the Central Region of Ghana
Approval Date	12th March, 2020
Expiry Date	11th March, 2021
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

APPENDIX 2D: LETTER OF INTRODUCTION FROM REGIONAL HEALTH DIRECTORATE

In case of reply the number and the date of this letter should be quoted
My Ref. No. CR/C RHD/G 2851 709
Your Ref. No. .....
GHS CORE VALUES:

- INTERGRITY
- INNOVATIVE/EXCELLENCE
- TEAMWORK
- PEOPLE-CENTRED
- PROFESSIONALISM
- DISCIPLINE

GHANA HEALTH SERVICE
Your Health - Our Concern

REGIONAL HEALTH DIRECTORATE
P. O. BOX 63
CAPE COAST
CENTRAL REGION

16TH OCTOBER, 2019

RESEARCH ON EVALUATION ON COMMUNITY BASED SURVEILLANCE SYSTEM IN THE CENTRAL REGION

Central Region has made a lot of gains through the use of Community Based Surveillance System in its Guinea Worm and Polio eradication efforts. However, since its inception, there has not been much documentation on its evaluation to aid planning and improvement of the system.

Mr. Benjamin Adjei and his team has been tasked to lead in a study to evaluate the Community Based Surveillance System in the Central Region.

I will therefore be very grateful if you could give the team the needed support to enable them carry out this important study.

Counting on your usual co-operation in this regard.

Thank you.

DR. ALEXIS NANG-BEIFUBAH
REGIONAL DIRECTOR OF HEALTH SERVICE
CENTRAL REGION

DISTRIBUTION:

- **ALL METRO/MUNICIPAL/DISTRICT DIRECTORS OF HEALTH SERVICE**
- **COMMUNITY LEADERS**

APPENDIX 3A: INFORMED CONSENT FORM FOR CBSVs
INFORMED CONSENT FORM FOR QUESTIONNAIRES-CBSVs

Title: Evaluation of Community-based Disease Surveillance System in the Central Region of Ghana

Investigator: Benjamin Adjei

Address: Department of Health Physical Education and Recreation, University of Cape Coast, Cape Coast. Mobile: 0273269725; Email: benaadjei@yahoo.com

General Information about Research

The objective of the research is to determine the status of the community-based disease surveillance system in the central region of Ghana. The purpose is to describe the status of community-based diseases surveillance system. if you agree to take part in this study, I will administer a questionnaire to you which take approximately 15 minutes to 30 minutes. As a CBSV, an information will be gathered on the background of yourself, your knowledge on priority diseases and events and core surveillance functions and whether you receive supportive supervision from surveillance focal persons from the health sector.

Procedures

As you are one of the Community-based Disease Surveillance Volunteers working in the community, you will be required to provide answers to certain question about yourself and the work you do. The information you provide will help the health sector to plan health services. Whatever information you provide will be kept strictly confidential. Your participation in this research is voluntary and you can choose not to answer any individual question or all of the questions. However, we hope that you will participate in this research since your views are very important

Possible Risks and Discomforts

There will not be any foreseeable risk or discomfort to you. The physical, social and psychological issues that could create discomfort have been eliminated during the construction of the questionnaires and in case of any anxiety qualified counsellor or expert to handle the situation shall be invited to take care of you.

Possible Benefits

As you offer yourself to participate in this study you contribute your quota in the development of the health system in the country as a whole. Your involvement in this study gives you the opportunity to share your ideas and provide recommendations that might be used to improve the health of the community in which you serve

Confidentiality

The questionnaire will be kept very confidential. Only the investigator, the supervisors and the research assistants who are directly involved in this research will have access to this information. We will protect the information to the best of our ability.

Compensation

There will be no compensation package

Voluntary Participation and Right to Leave the Research

Your right to participate and not to participate in this study is fully under your control. You can decide to stop in the course of the study, you have the right to do so without attracting any penalty.

Contacts for Additional Information

As a participant in this research in case you have any pertinent questions about the research or if you feel you have been placed at a risk by any person you may contact: Prof. Joseph K. Mintah, Mobile: 0540499131, email address: jmintah@ucc.edu.gh

Your rights as a Participant

This research has been reviewed and approved by the Institutional Review Board of University of Cape Coast (UCCIRB). If you have any questions about your rights as a research participant you can contact the Administrator at the IRB Office between the hours of 8:00 am and 4:30 p.m. through the phones lines 0558093143/0508878309/0244207814 or email address: irb@ucc.edu.gh.

VOLUNTEER AGREEMENT

The above document describing the benefits, risks and procedures for the research title ***(Evaluation of Community-based Disease Surveillance System in the Central Region of Ghana)*** has been read and explained to me. I have been given an opportunity to have any questions about the research answered to my satisfaction. I agree to participate as a volunteer.

_____ _____

Date Name and signature or mark of volunteer

If volunteers cannot read the form themselves, a witness must sign here:

I was present while the benefits, risks and procedures were read to the volunteer. All questions were

Answered and the volunteer has agreed to take part in the research.

_____ _____

Date Name and signature of witness

I certify that the nature and purpose, the potential benefits, and possible risks associated with participating in this research have been explained to the above individual.

_____ _____

Date Name Signature of Person Who Obtained Consent

APPENDIX 3B INFORMED CONSENT FORM FOR FACILITY FOCAL PERSONS

INFORMED CONSENT FORM FOR QUESTIONNAIRES-SURVEILLANCE FOCAL PERSON

Title: [Evaluation of Community-based Disease Surveillance System in the Central Region of Ghana]

Investigator: Benjamin Adjei

Address: Department of Health Physical Education and Recreation, University of Cape Coast, Cape Coast. Mobile: 0273269725; Email: benaadjei@yahoo. Com.

General Information about Research

The objective of the research is to determine the status of the community-based disease surveillance system in the central region of Ghana. The purpose is to describe the status of community-based diseases surveillance system. if you agree to take part in this study, I will administer a questionnaire to you which take approximately 15 minutes to 30 minutes. As a Surveillance focal person from the CHPS, sub district, district levels you will be given a questionnaire which will solicit information on your background and your efforts in provision of supportive surveillance functions to aid CBDSVs activities.

Procedures

As a focal person in a health facility, you will be required to provide answers to certain question about yourself and the work you do. The questions will be administered by the researcher and other assistants. The information you provide will help the health sector to plan health services. Whatever information you provide will be kept strictly confidential. Your participation in this research is voluntary and you can choose not to answer any individual question or all of the questions. However, we hope that you will participate in this research since your views are very important.

Possible Risks and Discomforts

There will not be any foreseeable risk or discomfort to you. The physical, social and psychological issues that could create discomfort have been eliminated during the construction of the questionnaires and in case of any anxiety qualified counsellor or expert to handle the situation shall be invited to take care of you.

Possible Benefits

As you offer yourself to participate in this study you contribute your quota in the development of the health system in the country as a whole. Your involvement in this study gives you the opportunity to share your ideas and provide recommendations that might be used to improve the health of the community in which you serve

Confidentiality

The questionnaire will be kept very confidential. Only the investigator, the supervisors and the research assistants who are directly involved in this research will have access to this information. We will protect the information to the best of our ability.

Compensation

There will be no compensation package

Voluntary Participation and Right to Leave the Research

Your right to participate and not to participate is fully under your control you can decide to stop in the course of the study if you wish to do so without your legal right as a participant not being affected in any way and without attracting any penalty.

Contacts for Additional Information

As a participant in this research in case you have any pertinent questions about the research or if you feel you have been placed at a risk by any person you may contact: Prof. Joseph K. Mintah, Mobile: 0540499131, email address: jmintah@ucc.edu.gh

Your rights as a Participant

This research has been reviewed and approved by the Institutional Review Board of University of Cape Coast (UCCIRB). If you have any questions about your rights as a research participant you can contact the Administrator at the IRB Office between the hours of 8:00 am and 4:30 p.m. through the phones lines 0558093143/0508878309/0244207814 or email address: irb@ucc.edu.gh.

VOLUNTEER AGREEMENT

The above document describing the benefits, risks and procedures for the research title ***(Evaluation of Community-based Disease Surveillance System in the Central Region of Ghana)*** has been read and explained to me. I have been given an opportunity to have any questions about the research answered to my satisfaction. I agree to participate as a volunteer.

_____ _____

Date Name and signature or mark of volunteer

If volunteers cannot read the form themselves, a witness must sign here:

I was present while the benefits, risks and procedures were read to the volunteer. All questions were Answered and the volunteer has agreed to take part in the research.

_____ _____

Date Name and signature of witness

I certify that the nature and purpose, the potential benefits, and possible risks associated with participating in this research have been explained to the above individual.

_____ _____

Date Name Signature of Person Who Obtained Consent

APPENDIX 3C: INFORMED CONSENT FORM FOR OPINION LEADERS

INFORMED CONSENT FORM FOR KEY INFORMANT INTERVIEW

Title: [Evaluation of Community-based Disease Surveillance System in the Central Region of Ghana]

Investigator: Benjamin Adjei

Address: Department of Health Physical Education and Recreation, University of Cape Coast, Cape Coast. Mobile: 0273269725; Email: benaadjei@yahoo.com

General Information about Research

The objective of the research is to determine the status of the community-based disease surveillance system in the central region of Ghana. The purpose is to describe the status of community-based diseases surveillance system. As an opinion leader in this community, if you agree to take part in this study, you will be interviewed to provide your perception on the activities of the surveillance volunteers in the community. The interview will take approximately 45minutes to one hour.

Procedures

As an opinion leader in the CHPS zone you are one of the key stakeholders in health and I think you have a lot information and experiences on surveillance activities in the communities that you can share to improve health of community. I invite you to take part in the in-depth interview. Benjamin Adjei, John Hammond and Frank Smith will interview you. You will be asked to give a brief background of yourself and then answers some questions on what makes the surveillance system progress or retrogress and offer some recommendations to improve the system. If you grant us permission there will be recordings of the interview by Mr. Frank Smith to enable us provide a comprehensive report to help decision making. You have the power to stop us any time you wish to do so. The information recorded will be kept confidential and except the interviewers will have access to it.

Possible Risks and Discomforts

There will not be any foreseeable risk or discomfort to you. The physical, social and psychological issues that could create discomfort have been eliminated during the construction of the questionnaires and in case of any anxiety qualified counsellor or expert to handle the situation shall be invited to take care of you.

Possible Benefits

As you offer yourself to participate in this study you contribute your quota in the development of the health system in the country as a whole. Your involvement in this study gives you the opportunity to share your ideas and provide

recommendations that might be used to improve the health of the community in which you serve

Confidentiality

Both the audio recordings and the questionnaire will be kept very confidential with password. Only the principal investigator and the supervisor who are directly involved in this research will have access to this information. We will protect the information to the best of our ability and you should be assured that although you may be quoted in research report your name or individual personal characteristics will not be mentioned in any part of this research.

Compensation

There will be no compensation package

Voluntary Participation and Right to Leave the Research

Your right to participate and not to participate is fully under your control you can decide to stop in the course of the study if you wish to do so without your legal right as a participant not being affected in any way and without attracting any penalty.

Contacts for Additional Information

As a participant in this research in case you have any pertinent questions about the research or if you feel you have been placed at a risk by any person you may contact: Prof. Joseph K. Mintah, Mobile: 0540499131, email address: jmintah@ucc.edu.gh

Your rights as a Participant

This research has been reviewed and approved by the Institutional Review Board of University of Cape Coast (UCCIRB). If you have any questions about your rights as a research participant you can contact the Administrator at the IRB Office between the hours of 8:00 am and 4:30 p.m. through these phone lines 0558093143/0508878309/0244207814 or email address: irb@ucc.edu.gh.

VOLUNTEER AGREEMENT

The above document describing the benefits, risks and procedures for the research title ***(Evaluation of Community-based Disease Surveillance System in the Central Region of Ghana)*** has been read and explained to me. I have been given an opportunity to have any questions about the research answered to my satisfaction. I agree to participate as a volunteer.

_____ _____

Date Name and signature or mark of volunteer

If volunteers cannot read the form themselves, a witness must sign here:

I was present while the benefits, risks and procedures were read to the volunteer. All questions were Answered and the volunteer has agreed to take part in the research.

_____ _____

Date Name and signature of witness

I certify that the nature and purpose, the potential benefits, and possible risks associated with participating in this research have been explained to the above individual.

_____ _____

Date Name Signature of Person Who Obtained Consent

APPENDIX 4: SUMMARY OF CRONBACH'S ALPHA RESULTS

PRE-TEST FOR THE FOCAL PERSONS- RELIABILITY STATISTICS

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	No of Items
.719	.752	44

POST TEST FOR THE FOCAL PERSONS- RELIABILITY STATISTICS

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	No of Items
.819	.809	49

PRE-TEST FOR THE CBSVs- RELIABILITY STATISTICS

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	No of Items
.892	.890	99

POST TEST FOR THE CBSVs- RELIABILITY STATISTICS

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	No of Items
.989	.987	118

APPENDIX 5: DISTRICTS AND NUMBER OF COMMUNITIES SELECTED FOR THE STUDY

DISEASE	COMMUNITIES	SELECTED COMMUNITIES
Abura Asebu Kwamankese	146	90
Agona East	133	82
Agona West	179	110
Ajumako Enyan Essiam	124	77
Asikuma Odoben Brakwa	152	94
Assin Central	68	42
Assin North	103	63
Assin South	102	63
Awutu Senya	102	63
Awutu Senya East	91	56
Cape Coast	81	50
Efutu	54	33
Ekumfi	59	36
Gomoa Central	39	29
Gomoa East	117	72
Gomoa West	96	59
Komenda Edina Eguafo Abriem	108	66
Mfantseman	113	70
Twifu Ati-Mokwa	125	77
Hemang Lower Denkyira	85	52
Upper Denkyira East	95	60
Upper Denkyira West	60	37
Total	2232	1381

ABURA ASEBU KWAMANSE

No	Community	No	Community	No	Community	No	Community
1	Kwesiamaa	24	Ahofie No. 1	47	Krofofrodo	69	Kankaboom
2	Maninyinaka	25	Amoanda	48	Thompson	70	Ansafona
3	Kukwado	26	Abaka	49	Kyere Oyewo	71	Obokor
4	Nsien	27	Egyirkrom	50	Essandokrom	72	Mpeseduadze
5	Nyamedom	28	Oboka	51	Nsuekyir	73	Abakrampa Okwadubroamu
6	Broyinkrom	29	Empiro	52	Okyiriku	74	Nyamengyaw
7	Asuansi	30	Gyandokrom	53	Twere Nyame	75	Nkandar
8	Nyame bekyere	31	Tayedo	54	Kankamkrom	76	Wusorkrom
9	Nyame ye adom	32	Abura Denkyira	55	Asebufokrom	77	Papagya
10	Srafa	33	Enyinabrim	56	Esuoso	78	Tetekasum
11	Gyesikrom	34	New Kwadoegya	57	Obra Twa Owu	79	Essaman
12	Apenkwakrom(shell)	35	Techiman	58	Wiamoa	80	Ohiaba
13	Pekyerakyer	36	Ayeldo	59	Moree Junction	81	Homidakrom
14	Onsu Nyameye	37	Nyamebekyere	60	Moree Town	82	Kubekor
15	Musunkwa	38	Abompi	61	Brafoyaw	83	Musakrom
16	Kwekutu	39	Aponapondo	62	Sorodofo	84	Korkode
17	Obokrom	40	Odompo	63	Apewosika	85	Akokokrom
18	Obinyim	41	Korado	64	Apewosika	86	Edukrom
19	Pobi Akura	42	Aboase	65	Brebia	87	Tsetsi
20	Asomdwee	43	Odumase	66	Akonoma	88	Tsetsi
21	Brukukrom	44	Efiefie	67	Fotwekrom	89	Katekyiase
22	Obengkrom	45	Betsingua	68	Amosima	90	Tsetsekasum
23	Apaakrom	46	Akotsikokodo				

AGONA EAST

No	Community	No	Community	No	Community
1	Asamoakwaa	29	Oteibro	56	Amanful
2	Fawomanye	30	Brahabokum	57	Namanwora
3	Obosomase	31	Anaafo	58	Jacob
4	Osuankwaa	32	Jejewase 2	59	Mansofo
5	Akrobon Kojowusu	33	Kwasakrom 2	60	Tawora
6	Nyanasakyere	34	Sankwa	61	Mbem
7	Sasekwaa Sanikwa	35	Kotokoli Zongo	62	Nomabo
8	Gravas Maafi Oboa	36	Jejewase 4	63	Nantifa
9	Gyesikrom	37	Kwasi Paintsil	64	Asafo-Zongo
10	Adomkwaa	38	Osuankwaa	65	Nkwanta
11	Akoroma Akura	39	Krobofom	66	Aboso
12	Oboko	40	Dawda	67	Kwadaso
13	Kofi Otabil	41	Obakwaa	68	Mpesem
14	Asarekwa	42	Kokoado	69	Mankrong
15	Mankrong Junct	43	Fawhia	70	Akwakwa
16	Mankrong Junct.Ti	44	Kokorabo	71	Kwagyankwaa
17	Kwanyako Zongo	45	Duoto	72	Mensakwaa
18	Kwanyako Osu	46	Twatwaboso	73	Yenikwaa
19	Kwanyako Abonse	47	Anhuntem	74	Kwame Agyir
20	Kwanyako Ofoase	48	Ninta	75	Kobinakyer
21	Kwanyako Odumase	49	Dziboolase	76	Asabrekwaa
22	Kwanyako Salem	50	Nampong	77	Kwabol
23	Kwanyako Mango	51	Gyanadze	78	Tei
24	Zongo	52	Kojo Arhin	79	Fante Bawjiase
25	Clinic/IPMC	53	Coleman Villages	80	Fawhia
26	Ankobea	54	Kenyanko	81	Kwame Ntsiful
27	Ampomasu	55	Nkran Akura Villa	82	Nkubease
28	Nkumkum				

AGONA WEST

No	Community	No	Community	No	Community
1	Abigyakrom	38	Maame Ekuraa	75	Opanyinyena
2	Mfanteamoah	39	Nana Takyi	76	Brehoase
3	Esuadzidzi	40	Oguankwaa	77	Brew
4	Panfokwa	41	Papa Kramo	78	Samson
5	Appiahkwa	42	Wawase	79	Nkrumah village
6	Osipikwa	43	Ekuraa Nkyinho	80	Entsie
7	Nkodum	44	Yaw Tawiah	81	Germanfom
8	Okwehu	45	Edi-Blay	82	Dadzie
9	Potom	46	Domeabra	83	Okotokwaa
10	Nkubease	47	Betenase	84	Kofikwaa
11	Nsuekyir	48	Nkum Kwamando	85	Dunkwa Offin
12	Matwemeho	49	Kwaman Salem	86	Kofi Dotse
13	Kwamekrom	50	Zongo	87	Kwesi Donkoh
14	Sesewusu	51	Zongo	88	Osonbenomnsu
15	Zongo No 1	52	Tyrease	89	Eduamoah
16	Anaafo	53	Woeniato	90	Agya Kofi
17	Osu	54	Mensah	91	Adwenpaye
18	Supru	55	Armah	92	Mahodwe Electoral Area
19	Zongo No 2	56	Sekum	93	Yaabem South Electoral Area
20	New Site 1	57	Otibua	94	Yelewa Zongo Electoral Area
21	New Site 2	58	Adweneamantem	95	Main Zongo Electoral Area
22	Kukurantumi	59	Nsuekyir	96	Desuenim Electoral Area
23	Otsenkorang	60	Timtimso,	97	Abroye/Assinsim/RCH Electoral Area
24	Ekwamasi	61	Woarabeba	98	Zabon Zongo Electoral Area
25	Siankwa	62	Abodomfom	99	Mantemankabi Electoral Area
26	Kyekyewere	63	Ayensu	100	Artizan Village CHPS
27	Nsonan	64	NSUANSA	101	Nyamendam CHPS
28	Kofiadzikwa	65	Donkoh	102	Jukwa
29	Kwekukyekwa	66	Nsuansa Ketewa	103	Owumase
30	Bosompa	67	Kessewa	104	Kwame Kyere
31	Cediase	68	Abutuwa Ketsewa	105	Omani
32	Bonsuaku	69	Amasanwa	106	Wawase
33	Edukrom	70	Amponsah	107	Amenyonah
34	Kojoabo	71	Fahiakotwer	108	Mangoase
35	Nkrandokon	72	Kokoado	109	Samuel
36	Adasema Electoral Area	73	Armah CHPS	110	Upper Bobikuma West
37	Zongo Odumase Electoral Area	74	Upper Bobikuma East		

AJUMAKO ENYAN ESSIAM

No	Community	No	Community	No	Community
1	Asempanyin	27	Appiatsekwa	53	Esikado
2	Attakwaa	28	Bebobraden	54	Essaman
3	Budukwa	29	Bekoso	55	Gyaasa
4	Enyan Apaa	30	Ebenezer	56	Hasowudze
5	Eyiakrom	31	Denkyira	57	Kwanyako
6	Isaadze	32	Essiam	58	Kyebil
7	Mando	33	Kwesi Gyan 1&2	59	Ntananta
8	Nkwojo	34	Nkwantakesedo	60	Nyankomase
9	Nsawadze	35	Ofosu	61	Omanso
10	Okokodo	36	Owomase	62	Oproprow
11	Onwane	37	Abeka	63	Osedzi
12	Onyaadze	38	Aharwoho	64	Yeboah
13	Abeadze	39	Anomabo kuma	65	Bentema
14	Abrofoa	40	Ayinasu	66	Akropong
15	Addobaw	41	Breman Fawomanye	67	Brofoyedru
16	Ajumako	42	Dwewoho	68	Dwenase
17	Amia	43	Ekwamase	69	Esupa
18	Amoa	44	Etsii Fawomanye	70	Kumasi
19	Assasan	45	Kososan	71	Nyaeadze
20	Attakorase	46	Meserenyame	72	Odumase
21	Baa	47	Nkatsim	73	Okontomire
22	Babinso	48	Nyamebekyere	74	Owura Ajdoa
23	Edumiam	49	Obrawugum	75	Senkusen
24	Eduyaw	50	Ogoekrom	76	Boso
25	Eshiem	51	Sonkwaa	77	Anyinasu
26	Aharmakrombua	52	Anamosi		

ASIKUMA ODOBEN BRAKWA

No	Community	No	Community	No	Community
1	Abeeko Junction	33	Nsuekyir	64	Eduakura
2	Adandan	34	Nworata	65	Ekumfi
3	Adukwa	35	Nyamebekyere	66	Enyankwaa
4	Adzenyewodze	36	Nyameyenam	67	Eshiem
5	Agave	37	Obono	68	Esiadze
6	Ahasowode	38	Odoben 1	69	Essumangwira
7	Ahenema	39	Odoben 3	70	Ewusem No 2
8	Akrumawa	40	Odumase	71	Fankyenko
9	Amanbete	41	Ofabir	72	Fosuansa 1
10	Amanfopong 1	42	Ohenebronso	73	Gyahadze
11	Amanfopong 2	43	Ohianhyeda	74	Jamra
12	Anhwiam	44	Ohiatwa	75	Junction/ Atu-Dawda
13	Ankaase	45	Ohurobo	76	Kofidadzikwa
14	Ankobea/Zongo	46	Okrakurom	77	Kofininson
15	Apegya	47	Okukrom	78	Kokoase
16	Asabiem	48	Otanikwa	79	Kokoso 2
17	Asentem	49	Owungya	80	Kuntanase 1
18	Aserekwa	50	Owura Yesu	81	Kuntanase 3
19	Asorefie	51	Owurakese	82	Kwakuninson
20	Asuokor	52	P.R.O	83	Kwanankwaa
21	Awoyo/Sawmail/Nkubease	53	Papa Okyere	84	Kweku Nungro
22	Ayewase	54	Salem	85	Larbikrom
23	Benin	55	Saviour	86	Mahogo
24	Bondakrom	56	Station/ Ahenbrom	87	Mangoase
25	Bonsunyina	57	Sunkwa	88	Mangoase & Nyamentonko
26	Bonte	58	Supunso	89	Menyewoyaw/Anaafo
27	Bosomase	59	Tomsease	90	Mpekyem
28	Bosomfo/Otabilkwaa	60	Tweredua	91	Nankese
29	Camp	61	Wubakwa	92	Nkumkwaa
30	Darumpong	62	Y Junction	93	Nkwanta
31	Diabene	63	Yenkukwa	94	Nkwantaeshiem
32	Dwendama				

ASSIN CENTRAL

No	Cpmmunity	No	Community
1	Akwapim	23	Atonsu
2	Akrofuom	24	Nsuekyi Ii
3	Lds/Immigration	25	Ayigbe Town
4	Zongo	26	Seidukrom
5	Dompim Ii	27	Swedru Akwapim
6	Bantama I	28	Kumananta
7	Mempeasem	29	Nyardoum
8	New Apostolic	30	Anum
9	Antoabasa	31	Ntomatoma
10	Old Habitat	32	Bukari Forson
11	Kwaem	33	Atuahene
12	Rch/Methodist	34	Subinso
13	Lorry Station	35	Akropong Clinic
14	Education Road	36	Awotwekrom
15	Wurakese Station	37	Akropong Presby
16	Hospital	38	Nyankumasi Ii
17	New Town	39	Mesere Nyame
18	Dompim I	40	Aponsie
19	Pumpside I	41	Otabil Nkwanta
20	Adukrom	42	Juaso I
21	Bantama Ii		
22	Foso Dunkwa		

ASSIN NORTH

No	Selected Community	No	Selected Community
1	Akonfudi Clinic	33	Amoakrom
2	Akonfudi Pataasi	34	Sekambodua
3	Nkranfom	35	Basofi-Ningo
4	Kedadwen	36	Abekoase
5	Kano	37	Aboagyewa
6	Adiembra	38	Bediadua
7	Nkukuasa	39	Don Korkrom
8	Wawase	40	Atwereboanda
9	Anhwiensu	41	Yawsaman
10	Jerusalem	42	Sienchem
11	Beenuye	43	Assan
12	Asuoankomaso	44	Abodwese
13	Akonfodi Salem	45	Subriso
14	Atwereboanda	46	Market Square
15	Endwa Town	47	Techiman
16	Endwa Clinic	48	Ntenkyeme
17	Ayitey	49	Atentan
18	Sabina	50	Ninkyiso
19	Doreyem	51	Yentuminka
20	Asibrim	52	Presby
21	Aworabo	53	Kwame Ankra
22	Odumasi	54	Nduaso
23	Amoani	55	Brasiako
24	Krofoforodo	56	Dansame
25	Dwenekyi	57	Breman
26	Oboba	58	Simpa
27	Abease	59	Achiano
28	Semanhyia	60	Tatare Nkwanta
29	Gangan	61	Kushea
30	Kojo Bennyin	62	Praho
31	Ankaa	63	Praso
32	Kwame Atta		

TWIFU HEMANG LOWER DENKYIRA

No	Selected Communities	No	Selected Communities
1	Bukruso	27	Wawase
2	Amusa	28	Ayebiahwe
3	Suameri	29	Nitibi
4	Nyame Adom	30	Kwekukrom
5	Kwame Alert	31	Nyinabontoa
6	Twernyame	32	Ampenkro
7	Old Zongo	33	Mfuom
8	New Zongo	34	Apokwa
9	Pewodie	35	Asomdwe
10	Esikafoambantem	36	Kobeda
11	Abrosanekyir	37	Abrafo
12	Ehuntem	38	Antwikwa/Arkoh
13	Kofi Larteh	39	Camp
14	Ahunfragya	40	Amanase
15	Paaso	41	Asemasah
16	Nsueam	42	Sefwi
17	Afiaso	43	Kotobaabi
18	Abekankwanta	44	Zongo
19	Somnyamekodur	45	Domeabra
20	Bobi	46	Bremang
21	Anthony	47	Mbaniaye Proper
22	Shed	48	Watreso
23	Baakondidi	49	Achiase
24	Tosen	50	Ahwiamu
25	Mfantsefom	51	Krobo
26	Tafredjoa	52	Nkonkonso

TWIFU ATI-MOKWA

No	Selected Communities	No	Selected Communities	No	Selected Communities
1	Eduabeng	27	Acquakrom	53	Ongwaso
2	Kwayako	28	Ayibwe	54	Aboso
3	Ntiamoah	29	Ayaase	55	Yewodze/Ke
4	No.1	30	Tarkwa	56	Official Town
5	Otuano Camp	31	Mirekukrom	57	Nyamebekyere
6	Anhwiasu	32	Tsimtsimhwe	58	Abodwese
7	Afosua	33	Agyinkrom	59	TOPP
8	Kenkunase	34	Denyase	60	Mintaso
9	Asare Kweku	35	Pra-Agave	61	Gyaware
10	Aklomaim	36	Hasowodze	62	Atokrom
11	Akwaykom	37	Kwankyemanso	63	Mpabaw
12	Akutuase	38	Gyaman	64	Bronikrom
13	Darmang	39	Gyaman F.	65	Kyirenkum
14	Afedzi	40	Caanan	66	Sebenso
15	New Market	41	Opokukrom	67	Moseaso
16	Bankyease	42	Bimpong-agya	68	Aketekyi
17	Cocoase	43	Subriso	69	Somnyamekoduru
18	Big Boss	44	Agyeikrom	70	Dodowa
19	Nyamebekyere	45	Kayireku	71	Agona
20	Domeabra	46	Madiamono	72	Adjetey
21	Kojokrom	47	Dorkordokor	73	Abuom
22	Old Praso	48	Otukrom	74	moseaso
23	Toffoe	49	Kojokrom	75	Beseadze
24	Roman Ridge	50	Adugyaa	76	Mmabasa
25	Anogyan	51	Bonsaho	77	Ganukrom
26	Anogyan 2	52	Abodom		

UPPER DENKYIRA EAST		GOMOA CENTRAL	
No	**Selected Communities**	**No**	**Selected Communities**
1	Besease	1	Aboso
2	Awokrom	2	Akropong
3	Nyameyadom	3	Benso
4	Gyaman	4	Dahom
5	Ayanfuri	5	Ekroful
6	Anikokoso	6	Hill City Area
7	Dabiasem	7	Kwasimoko
8	Adwenpaye	8	Charpess
9	Dominase	9	Fulani Settlement
10	Mensahkrom	10	Gomoa Asebu
11	Breman	11	Gomoa Mpota
12	Brofoyedur	12	Gomoa Pomadze
13	Akrofuom	13	Nyarkuadze
14	Abora	14	Oguaakrom
15	Adaboi	15	Abaasa
16	Nkroful	16	Abonyi
17	Kotedaso	17	Ayensuadze
18	Maudaso	18	Ekwamkrom
19	Amenase	19	Jukwa
20	Aboaboso	20	Manso
21	Brepro	21	Osamkrom
22	Dankwa-Krom	22	Achaise
23	Apaaho	23	Ahweafeten
24	Asantefor-Krom	24	Besiadze
25	Anane-Krom	25	Gyaman
26	Nkwantanum	26	Lome
27	Agona Port	27	Obuasi
28	Nkronua	28	Oku Kwaa
29	Krodua	29	Abekore
30	Tomkrom		
31	Pewodie		
32	Amoaman		
33	Ameyaw		
34	Owusu-Krom		
35	Betenase		
36	Nipanikro		
37	Nyinawusu		

UPPER DENKYIRA EAST

No	Selected Community	No	Selected Community
1	Buabinso	31	Asikuma
2	Zongo	32	Meretweso
3	Babianiha	33	Achiase
4	Nkwanta	34	Imbraim
5	Dodge City	35	Abudukrom
6	Kadadwen	36	Camp
7	Mbradan	37	Kona
8	Otincrescent	38	Motiakrom
9	Subinso	39	Yirepe
10	Abankesieso	40	Atobiase
11	Acquakrom	41	Abosomoho
12	Aggrey Road	42	Fawomanyo
13	Akyepem	43	Mampong
14	Amissah	44	Tegyamoso
15	Ananekrom	45	Asma Camp
16	Atechem P. Stn.	46	Denkyira Adwumaim
17	Breman	47	Denkyira Fosu
18	Cannary Road	48	Praprababida
19	Dankro	49	Gyampo
20	Dunkwa Soro	50	Atwenekrom
21	Kontokrom	51	Badoa #1
22	Mpeasem	52	Brentuo
23	Nkrukan	53	D. Akropong
24	Nsonwa Estate	54	Kumakrom
25	Onwi	55	Simawonoo
26	Otengkrom	56	Pokukrom
27	Presentiase	57	Compound
28	Rubbermu	58	Akrofoum
29	Sobroso	59	Maatodie
30	Sofoakurasi	60	Power Line

MFANTSEMAN

No	Selected Communities	No	Selected Communities
1	Ewoyaa	36	Mampong
2	Kormantse	37	Nsaadze
3	Otsir	38	Nsuekyir/Nsanfo Junction
4	Amansopokum	39	Obontsir
5	Abankrom	40	Pomase
6	Abeadze Dominase	41	Tuafo
7	Akobima	42	Akatakyiwa Chps Compound
8	Akropong	43	Akroful
9	Duadze	44	Annafo
10	Edumanu	45	Eduma
11	Efutuakwa	46	Egyirfa
12	Efutukwaa	47	Etifi (Yamoransa)
13	Kwakrom	48	Junction
14	Kwesi Ansah	49	Kojokrom
15	Kyeakor	50	Kokodo
16	Mprafu	51	Matsemakebi
17	Mprenkyi	52	Nkramofokrom
18	Nyansakyere	53	Pusubanho
19	Ohenkwaa	54	Waakrom
20	Onyaapa	55	Zongo
21	Opem	56	Anaafo
22	Takoradi	57	Baifikrom
23	Towoboase	58	Eshirow
24	Adambo	59	Estate
25	Akraman	60	Krofu
26	Amoanda	61	Nkwanta
27	Anomabo Apatem	62	Twafo
28	Bantuma/Tuntuminim	63	Ankaful Chps Compound
29	Buranamoah	64	Appiahkwaa
30	Dwendwenbadze	65	Ekuadaa
31	Egyaa No. 3	66	Hinii Chps Compound
32	Egyaa No.2	67	Kuntu Chps Compound
33	Eshirow	68	Nankesedo
34	Fari/Aweano	69	Pebi
35	Hasowodze	70	Prabiw

KOMENDA EDINA EGUAFO ABRIEM

No	Selected Community	No	Selected Communities
1	Aburansa	34	Ayensudo Newtown
2	Dominase	35	Essaman
3	Nyinase	36	Ankwanda
4	Duakyimase	37	Ataabadze
5	Epowano	38	Marine Market
6	Kafodzidzi	39	Gyerodo
7	Anomako	40	Mante Mankebi
8	Sasem	41	Sanka Estate
9	Nsadwir	42	Bantuma
10	Dutch Komenda	43	Estate
11	Zongo	44	Tetekesim
12	Anweem Kumasi	45	Mbofra Akyinim
13	Egyankwanta	46	Santiwade
14	Kofofordo	47	Damabodo
15	Appiakrom	48	Roman Hill
16	Asenser	49	Amoanda
17	Woarabeba	50	Ntranoa
18	Abeyee	51	Abee
19	Kwame-Ta	52	Camp
20	Kwabasa	53	Ssnit
21	Komfokrom	54	Ankaful Psychiatry
22	Kokwoado	55	Sewage
23	Kwahinkrom	56	Worakese
24	Dompoase	57	Maana Jerusalem
25	Besease	58	Kwesiedum
26	Anweem Junction	59	Sap
27	Dumtu	60	Saaman
28	Eduko	61	Old Ataabadze
29	Kissi Zongo	62	Abreshia
30	Kissi	63	Eguago
31	Kojogada Village	64	Breman
32	Abakano	65	Dabir
33	Sefwi	66	Egyeikrom

GOMOA WEST

No	Selected Communities	No	Selected Communities
1	Adanka	31	Brofo B
2	Alata	32	Manso
3	Kantam	33	Ohun
4	Zongo	34	A.K. Debiso
5	Dankor	35	Achiasi
6	Dago Newton	36	Akyimpim
7	Brofoyedur	37	Dunkwa
8	Dogo Kokodo	38	Eshiem Abora
9	Obiri	39	Eshiem Odumasi
10	Ajumako Ansa	40	Eshiem Sraha
11	Abutsia	41	Mankessim
12	Ajumako	42	Obokrom
13	Akyerema	43	Oguaa
14	Amamudu	44	Tarkwa Aboso
15	Boambua	45	Tarkwa Osu
16	Mamfam	46	Techiman
17	Nsuekyir	47	Abrekum
18	Akyenfo	48	Bewadze
19	Ayensuano	49	Gyankrom
20	New Town	50	Mprumen
21	Penkye	51	Onyandze
22	Amanful	52	Simbrofo
23	Assin	53	Dawurampong
24	Dago Asaa	54	Denkyira
25	Dago Nkum	55	Koforidua
26	Fawomanye	56	Mampong
27	Hwida	57	Nkran
28	Odumasi	58	Osedze
29	Adam	59	Wassa
30	Asempanyin		

GOMOA EAST

No	Selected Communities	No	Selected Communities	No	Selected Communities
1	Safari Estate	25	Duawofor	49	New Road
2	Star Point	26	Abodwe	50	Biakoye
3	Tamalem/Policeman City	27	Nkwantanan	51	Dr Jesus
4	Adade	28	Ojobi	52	Psu
5	Pentecost	29	Nyamebekyere	53	Limousine
6	American Junction	30	Tipper Junction	54	Mandela
7	Dampase	31	Fetteh Abura	55	Jehova Witness
8	Shadow Inn	32	Adabra	56	Barrier
9	Suncity	33	Anaama	57	Zone 1&2
10	Agrofam	34	Buduatta	58	Zone 11
11	Fifi Pratt	35	Dabanyi	59	Zone 12
12	Salaman Down	36	Dominase	60	Amakum
13	Fijai	37	Dominase Junction	61	Suncity
14	I See	38	Essiwkwaa	62	Blue Rose
15	Jehovah	39	Kristo Asafo	63	Zone 4 &7
16	Kakraba Top	40	Manfi	64	Akotsi
17	Kojo Oku	41	Odumasi	65	Asanukwaa
18	Memenda	42	Mafekope	66	Anopansu
19	Millenium City Top	43	Anokwaa	67	Akutuase
20	Nadom	44	Adawukwa	68	Fetteh Kakraba
21	New Town	45	Mampong	69	Tuansa
22	Mameahoadzen	46	Nyamebekeye	70	Walliskwaa
23	Onyanase/Oyarko	47	Panfokrom	71	Kofi Ketu
24	Aprah	48	Potsin Junction	72	Leh

EKUMFI		EFUTU	
No	**Selected Communities**	**No**	**Selected Communities**
1	Abor	1	Gyahadze
2	Adansi	2	Ateitu
3	Adansimaim	3	Gyangyanadze
4	Akra	4	Osubonpanyin
5	Akwakrom	5	Worabeba
6	Akwansa Kokodo	6	Pumping Station
7	Bogyano	7	Low Cost
8	Ebiram	8	Ansaful
9	Edukuma	9	Winneba Junction
10	Ekotsi	10	Bombirimu (Sign Board)
11	Ekrawfo	11	Ntakorfam
12	Ekumpoano	12	Seed Co
13	Essarkyir	13	North Campus(Uew)
14	Essuehyia	14	Ssnit
15	Ewiem	15	Egyaa Lodge
16	Gyinankoma	16	Kojo Bedu North
17	Kutukwa	17	Obrawugum
18	Mbobroto	18	Don Bosco
19	Sarkwa Mampong	19	Fetteh No 1
20	Abaka	20	Zongo
21	Amissano	21	Kwendrum
22	Asaafa	22	Victoria Road
23	Asokwa	23	Abasraba North
24	Dunkwa	24	Brosam
25	Edukrom	25	Dwoma
26	Kokodo	26	Kokobim
27	Obidan	27	Abasraba South
28	Suprudo	28	Otutuase
29	Akosombo	29	Alatakokwado
30	Ayigbe Town	30	Adansi
31	Egyankwa	31	Ofunhnyam/ Aboadze
32	Gyabenkwa	32	Ndaamba
33	Kontankore	33	Lancaster
34	Ntseatsea		
35	Owuya		
36	Srafa Kokodo		

CAPE COAST

No	Selected Communities	No	Selected Communities
1	Nkwantado	26	Ekon
2	Amoyaw	27	London Bridge
3	Asenadzie	28	Ayiko Ayiko
4	Kramotawiah	29	Kotokuraba
5	Nanabakrom	30	Aboom
6	Essuekyir	31	Antem
7	Tsibu Darko	32	Master Sam
8	1st - 4th Ridge	33	Tsimtsimwhwe
9	Adisadel	34	Bakaano
10	Akaikrom	35	Fawohodzi
11	Amissano	36	Ketsekokwaado
12	Ankaful	37	Turom
13	Anto Essuekyire	38	Idun
14	Basakrom	39	Gyegyeano
15	Ebubonko	40	Krootown
16	Krofofrodo	41	Ahiaboboe
17	Mpeasem	42	Amamoma
18	Nyamebekyere	43	Duakor
19	Taido	44	kwaproh
20	Kakumdo	45	OLA
21	Pedu	46	Efutu
22	W'enyiato	47	Efutu Mampong
23	Enyitsuwdo	48	Nyinesin
24	Nkanfoa	49	Dehia
25	Amoakofua	50	Acquakrom

AWUTU SENYA EAST

NO	Community	No	Community
1	Akwelley	29	Christian Hill
2	Annor Town	30	Free Town
3	Gada	31	High Tension
4	Ofaakor	32	Jomens
5	Otamens	33	Kpormetey
6	Zakari	34	Mali City
7	Amuzukorpe	35	Point 4
8	Ayigbetown	36	Semenhyia
9	Down Town	37	94
10	Insaaniyaa	38	Dokukyekorpe
11	Lamptey Mills	39	Holy Family
12	Samapa Estate	40	Lawyer
13	Agya Appiah	41	Tv3
14	Akwelley Newtown	42	Adom City
15	Alico	43	Asamoah Town
16	Awoshie Tetteh	44	Blue Kiosk
17	Donkor Akwraa	45	Enigyekrom
18	Kaneshie	46	Old Soldier
19	Obimpeh	47	Prisons
20	Ofaakor Newtown	48	Abease
21	Otaa City	49	Bravo Town
22	Queen City	50	Everlip/Flower Pot
23	Un City	51	Poultry
24	Adakorpe	52	Sure Way
25	American Town	53	Top Hill
26	Asempa	54	Walantu 2
27	Assemblies	55	Walantu 4
28	Big Man Town	56	Windy Hill

AWUTU SENYA

No	Community	No	Community
1	Akotoakoto 2	34	Zone 2
2	Ahwiahwia	35	Zone 4
3	Kwashiamabu	36	Aberful
4	Aplano	37	Samsamso
5	Small London	38	Kokobeng
6	Tayano	39	Nkwadum
7	Akrampa Village	40	Kwei
8	Kwame Wettey	41	Babali
9	Loye	42	Akrabong
10	Chochoe	43	Mfafo
11	Osimpo	44	Ahentia
12	Ajaa	45	Kojo Ashong
13	Kroboakyire	46	Asempanye
14	Kojo Ahinsan	47	Nsuekyir
15	Obaakwei	48	Dadathick
16	Castle	49	Zongo
17	Winneba Road 1	50	Sarkwa
18	Lybia House	51	Mensakwa
19	Mantemankabi	52	Kofi Ansah
20	Abease	53	Kofi Weittey
21	New Town	54	Kakraka
22	Akuffo Krodua	55	Kawanopado
23	Ck	56	Aboankyewowe
24	Osae Krodua	57	Kofi Kwaa
25	Teteoko	58	Kawanopado
26	Orphanage	59	Senease
27	Anomawobi	60	Akpeteshie Camp
28	Nkrontorowa	61	Old Police Station
29	Papaase No. 1	62	Mfantefum
30	Kwabondzie	63	Kwaman No1
31	Justab	64	Awakyekwaa
32	Providence		

ASSIN SOUTH

No	Selected Communities	No	Selected Communities
1	Kotobabi	33	Tebil
2	Dosii	34	Odumanim
3	Seidukrom	35	Framase
4	Kruwa	36	Gyinabodie
5	Kruwa Bonkutu	37	Adadientem
6	Darmang	38	Abodweseso
7	Otabil krom	39	Kyinso
8	Juabeng	40	Dadieso
9	Kumasi	41	Dawumako
10	Manso	42	Amanbete
11	Ayaase	43	Akrofoum
12	Asano	44	Bepokoo
13	Amoabin	45	Beyeden
14	Asratoase	46	Ayigbo
15	Abaase	47	Nsuta
16	Mesomagor	48	Homaho
17	Asratoase	49	Kwarful
18	Nyamebebu	50	Kwame-Annan
19	Damptsekrom	51	Dominase
20	Nsueam	52	Adiembra
21	Kyekyewere	53	Nuanua-1
22	Ngresi	54	Taylor
23	Domeabra	55	Jahadzi
24	Kyinaso	56	Abass
25	Odumasi	57	Nsaabaa
26	Nyankumasi-Ahenkro	58	Mankata
27	Bosomadwe	59	Aduanum
28	Beposo	60	Aboabo Camp
29	Affaw	61	Kramokrom
30	Metemano	62	Brahabebome
31	Achiase	63	Sergeant
32	Ochiso		