SCHOOL OF PUBLIC HEALTH, COLLEGE OF HEALTH SCIENCES,

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EVALUATION OF NOTIFIABLE DISEASES SURVEILLANCE SYSTEM IN WESTERN AREA, SIERRA LEONE, 2014

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By

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THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF

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DECLARATION

This work is the result of an independent investigation under the supervision of Dr Priscillia Nortey and Dr Samuel .O. Sackey. Where my work is indebted to the works of others, I have fully acknowledged. I declare, therefore that this dissertation has not been presented elsewhere, either in part or in whole for another degree.

Signed by Resident……

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DEDICATION

This work is dedicated first and foremost to the Almighty God for his unending kindness and blessings to me, my father Mr. Sulaiman George Sowa and mother Mrs. Patricia George Sowa for all their financial and moral support towards ensuring that I completed this study and my lovely wife Naomi for her priceless encouragement and support at home during my absence.

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ABSTRACT

Background: In Africa, infectious diseases continue to be a major health problem because many of the national surveillance systems have scarce resources at their disposal and struggle to ensure timely detection or an effective response to disease outbreaks.

To address this issue, in 1998 the World Health Organization Regional Office for Africa approved the Integrated Disease Surveillance and Response (IDSR) strategy for strengthening infectious disease surveillance and response capacity among its 46 Member States and requested that Member States conduct assessments of their IDSR systems , the findings of which would act as a baseline for reform plans.

This study describes the structure, inputs, process and outputs of the notifiable diseases surveillance system in Western Area of Sierra Leone, assesses the knowledge on and practices of disease notification among primary health care providers in the Western Area.

Assessing peripheral health units (health facilities) on reporting practices and underreporting of notifiable diseases using cholera as a case study

Methods: An evaluation of the surveillance system was done. The study reviewed documents of the disease surveillance system in the Western Area district; reviewed notification data made to the district disease surveillance office by reporting sites. Semi structured questionnaires were used in interviews with communicable diseases coordinators and structured questionnaires were administered by telephone to a random sample of public general practitioners and reporting site staff.

Results: The research showed that the notification system in the Western Area District of Sierra Leone is deemed useful by the communicable disease coordinators as it can detect disease outbreaks. However data quality, as indicated by the incompleteness of the "Onset date" of illness reporting on notification, varied between; 33% (n=2) to 81% (n=13).

Compliance with disease notification was reported by twelve (12) (75%) of the public general practitioners and the mean score for knowledge on notification status of medical condition was 52%. A total of 258 staff were reported to be present at the sites surveyed; 206 (80%) of them are paid by the government and 52 (20%) of them are not paid by the government. The reporting sites that complied with disease notification were 24 (80%) and the mean score for their knowledge on notification status was 60%.

The study revealed that 10 (32%) of all reporting sites have been trained in the Integrated Diseases Surveillance and Response and 12 (38%) reported unavailability of disease manual at sites and all sites lacked trained personnel in data management. In addition 14 (45%) of the sites reported that the surveillance phones given to them for weekly notification reports had developed a fault. Sites asking for monetary incentives due to work load burden were 14 (45%). The unavailability of the notifiable diseases manual was recorded in 12 (38.7%) of the sites surveyed and the remaining 19 (61.2%) had charts on the wall that they could use to assess case definitions but are interested in acquiring the notifiable diseases manual. The shortage of reporting forms within the last six (6) months was reported by 93.5% of the reporting sites especially the tally sheets.

Conclusion: The notifiable diseases system is useful and can detect diseases. There are however, many challenges within the system which makes it inefficient at all levels. Even though both the public general practitioners and the site staff self-reported high compliance with notification they cited constraints of high work load and lack of motivation. The knowledge of the notifiable medical condition was lower for the general practitioners than the reporting site staff. The system could perform better with constant refreshers training being implemented at all the levels. The data collected, could also be much better and more meaningful if the system has specialised trained personnel within to analyse the data which in turn could yield more useful results for planning and policy.

Keywords:
Evaluation, Notifiable Diseases, Surveillance, Western Area, Sierra Leone

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CHAPTER 1

1.0 INTRODUCTION

1.1 Background

Notifiable Diseases are diseases that, by statutory requirements, must be reported to the public health authority in the pertinent jurisdiction when the diagnosis is made. These are diseases deemed of sufficient importance to the public health to require that their occurrence must be reported to health authorities. The reporting to public health authorities of communicable diseases is, unfortunately, very incomplete. The reasons for this include diagnostic inexactitude; the desire of patients and physicians to conceal the occurrence of conditions carrying a social stigma (e.g., sexually transmitted diseases); and the indifference of physicians to the usefulness of information about such diseases as hepatitis, influenza and measles. Yet notifications are extremely important. They provide the starting point for investigations into the failure of preventive measures, such as immunizations, for tracing sources of infection, finding common vehicles of infection, describing the geographic clustering of infection, and various other purposes, depending upon the particular disease. (Porta, 2008)

Notifiable Diseases Surveillance plays a vital role in ensuring that mortality and morbidity rates are reduced. This promotes the health of a given population. It provides information to public health authorities through ongoing collection, collation and analysis of data on priority diseases within a geographic area and in so doing guide public health planning and intervention. It also helps in the monitoring and evaluation

of programs as well as in generating hypothesis that will in turn stimulate public health research. (Porta, 2008)

The Notifiable Diseases Surveillance in Sierra Leone is the responsibility of the Ministry of Health and Sanitation through the Directorate of Disease Prevention and Control. This directorate supervises the National Surveillance Unit, which is headed by a National Surveillance Programme manager who coordinates and also supervises surveillance activities at all levels.

Sierra Leone experienced a 10-year brutal civil war (that ended in 2002), which totally devastated the country's economy, leaving in its wake, destruction of about 70% of the country's health infrastructure. This resulted in the death and mass movement of a large number of trained and experienced health personnel to other countries. Even before the 10-year civil conflict, Sierra Leone had been experiencing a decline in the health status of the population, primarily as a result of its declining economic situation. The war thus compounded these problems. (Government of Sierra Leone;Polio Doc, 2007)

The advent of peace in 2002 opened new opportunities and at the same time brought in new challenges for all sectors of the health system including Disease Surveillance. Peace consolidation and the subsequent improvement of security situation have resulted in an increased proportion of the population accessing the limited health services. (GoSL, 2004)

The country experiences from time to time outbreaks of the following epidemic prone diseases: Cholera, Yellow fever, Shigellosis, Lassa fever, Measles and Meningitis.

The country also has poor health status indicators due to high disease burden from mainly environmental related communicable diseases. This is aggravated by poor

nutrition, malaria, acute respiratory infection, watery & bloody diarrhoea which account for 65% of outpatient attendance. (Government of Sierra Leone;Polio Doc, 2007).

In a 2011 statistics by World Health Organization the country has one of the lowest densities of physician to patient ratio in the world; 95 Physicians; 991 Nursing and Midwifery personnel; 24 Dentists and 192 Pharmaceutical personnel.

The national health policy is based on the Primary Health Care concept. Following the implementation of several pilot primary health care initiatives, including the Bamako Initiative, a broad based health sector policy was developed in 1993 and revised in 2002. The policy has Primary Health Care as the main thrust and it is adequately reflected in the government's Poverty Reduction Strategy Paper (PRSP) document, using international and regional initiatives such as the Millennium Development Goals. (Ministry of Health and Sanitation;IDSR Plan, 2012)

At the National Surveillance Unit, there are four Surveillance Officers (National supervisors) responsible for each of the four regions and they supervise surveillance activities and also give technical assistance to Surveillance Officers in the districts known as District Surveillance Officers (DSOs). The DSOs are responsible for the bulk of the surveillance activities in their respective districts and are aided by the Surveillance Focal Points (Health Facility Staff) at chiefdom level in collaboration with community members.

Administratively the country is divided into four major regions namely; Northern Region, Southern Region, Eastern Region and the Western Area where the capital

Freetown is located. The regions are divided into twelve districts, which are in turn subdivided into chiefdoms, governed by paramount chiefs.

Figure 1.1 The administrative map of Sierra Leone showing the districts.

The Notifiable Diseases Surveillance system in Sierra Leone covers all the twelve districts and the Western Area in Sierra Leone. It is a system that involves mainly the public sector across all the twelve districts including the Western Area in the three tiered reporting system; peripheral, district and national levels. (Ministry of Health and Sanitation;IDSR Plan, 2012)

Therefore, this study describes the evaluation of the notifiable disease surveillance and gives an assessment of the knowledge and practices of primary health care staff on notifiable diseases surveillance in the Western Area, Sierra Leone.

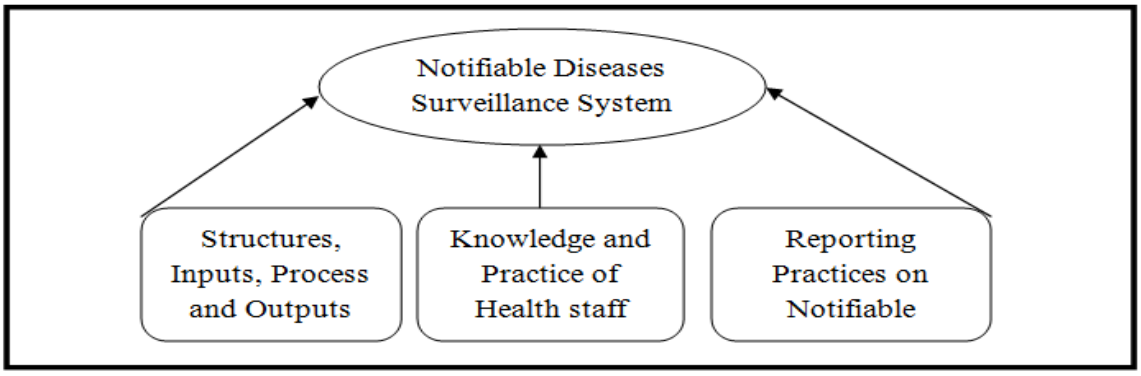
1. 2 Problem Statement

Despite the mandatory reporting by law, the Notifiable Diseases reporting system in Sierra Leone has poor compliance with the reporting details of notifiable diseases notably by primary health care providers. Timeliness, incompleteness and disparity between dataset collected for surveillance diseases at the various levels of surveillance and under reporting of cases in general is a problem; as seen in reviewed notification data sent to the disease surveillance units. An understanding of the reason for the incompleteness and disparity between datasets at all levels could lead to an improvement on the reporting details and reduction of under-reporting which will in turn help in the early detection of diseases.

Since Notifiable Diseases Surveillance plays an important role in health care service delivery, reporting cases of infectious disease is a critical element in planning and evaluation of disease prevention and control programs.

1.3 Conceptual Framework

Figure 1.2 Conceptual- framework for notifiable disease surveillance



1.4 Justification

This is likely to be the first evaluation of the surveillance system in the Western Area. The Western Area has the highest burden of communicable diseases within Sierra Leone by virtue of its population; as such a study of the notifiable disease surveillance within this area will give insight on timely and accurate disease surveillance data in the country.

1.5 Objectives

The general objective of this study is to evaluate the notifiable disease surveillance system in the Western Area.

1.5.1 Specific Objectives

1. To describe the structure, inputs, process and outputs of the notifiable diseases surveillance system in Western Area.

2. To assess the knowledge on and practices of disease notification among primary health care providers in the Western Area.

3. To assess reporting units (health facilities) on reporting practices and underreporting of notifiable diseases using cholera as a case study

CHAPTER 2

2.0 LITERATURE REVIEW

2.1 Surveillance System and Notifiable Diseases Surveillance

Public health surveillance is defined as the ongoing and systematic collection, collation and analysis of data and the prompt dissemination of the resulting information so that action can be taken by the authorities. (Porta, 2008)

Surveillance can be either passive or active. Passive surveillance requires health providers to notify public health authorities of cases of disease when they are diagnosed in the course of health care. Active surveillance of a disease or condition entails the active search by the health authorities for the occurrence of the disease or condition in a defined population. (Porta, 2008)

Public health policy forms the basis of evaluation of communicable diseases at both international and national levels. Resolutions passed by the World Health Assembly and the WHO regional committee for Africa urges member states to strengthen their national and local surveillance programs. As shown in Annex 4 (WHO, International Health Regulations (2005) WHO/CDS/EPR/IHR/2007, June 2007)

In September 1998, the 48th World Health Organization Regional Committee for Africa met in Harare. Through resolution AFRO/RC48/R2, Member States adopted Integrated Disease Surveillance (IDS) as a regional strategy for early detection and efficacious response to priority communicable diseases for the African region. On 23 May 2005, the Fifty-eighth World Health Assembly adopted the International Health Regulations in Geneva, Switzerland through Resolution WHA58.3. The International Health Regulations has since entered into force on June 15, 2007. (WHO, Technical

Guidelines for Integrated Disease Surveillance and Response in Sierra Leone, june 2008)

Communicable diseases cause many deaths, disability and illness in the African region. Many of these deaths occur prematurely, affecting families, communities and countries both economically and socially because they kill the very economically active people. But this prediction need not be fulfilled. (WHO, Protocol for the Assessment of National Communicable Disease Surveillance and Response Systems , 2001; WHO, International Health Regulations (2005), June 2007)

The principles contained in these regulations should be reflected in the policies and practices from the national level all the way through to the facility and individual level, where applicable. In article 5.1 of the regulations all state parties are required to develop; strengthen and maintain core surveillance capacity and the regulations include a tool for the monitoring and evaluation thereof. (WHO, International Health Regulations (2005), June 2007)

2.2.1 Status of Notifiable Diseases Surveillance Globally

Formal reporting of notifiable infectious diseases is a requirement placed upon health care providers by many regional and national governments, and upon national governments by the World Health Organization. Since 1969, WHO has required that all cases of the following diseases be reported to the organization: cholera, plague, yellow fever, smallpox, relapsing fever and typhus. In 2005, the list was extended to include polio and SARS. Regional and national governments typically monitor a larger set of communicable diseases that can potentially threaten the general population. Tuberculosis, HIV, botulism, hantavirus, anthrax, and rabies are examples of such

diseases. The incidence counts of diseases are often used as health indicators to describe the overall health of a population. (WHO, Guiding Principles for International Outbreak Alert and Response, 2014)

The World Health Organization is the lead agency for coordinating global response to major diseases. The WHO maintains Web sites for a number of diseases, and has active teams in many countries where these diseases occur. (Placeholder6; WHO, Guiding Principles for International Outbreak Alert and Response, 2014)

As the lead organization in global public health, the WHO occupies a delicate role in global politics. It must maintain good relationships with each of the many countries in which it is active. As a result, it may only report results within a particular country with the agreement of the country's government. Because some governments regard the release of *any* information on disease outbreaks as a state secret, this can place the WHO in a difficult position. (WHO, Protocol for the Assessment of National Communicable Disease Surveillance and Response Systems , 2001)

The WHO coordinated International Outbreak Alert and Response is designed to ensure "outbreaks of potential international importance are rapidly verified and information is quickly shared within the Network" but not necessarily by the public; integrate and coordinate "activities to support national efforts" rather than challenge national authority within that nation in order to "respect the independence and objectivity of all partners". The commitment that "All Network responses will proceed with full respect for ethical standards, human rights, national and local laws, cultural sensitivities and tradition" ensures each nation that its security, financial, and other interests will be

given full weight (WHO Strategic Plan for control of communicable diseases, 2009-2013)

The Guiding Principles for International Outbreak Alert and Response are an articulation of the consensus of partners in the Global Outbreak Alert and Response Network on how to prepare for field activity, to activate international support, to coordinate response in the field, to evaluate and follow up outbreaks of international importance. (WHO, Guiding Principles for International Outbreak Alert and Response, 2014)

Detailed standard operating protocols support the Guiding Principles and address the broad spectrum of operational issues and the challenges of coordinated international outbreak response.

The Guiding Principles for International Outbreak Alert and Response aim to improve the delivery of international assistance in support of local efforts by partners in the Global Outbreak Alert and Response Network, and seek to promote the highest standards of professional performance in the field. (WHO, Guiding Principles for International Outbreak Alert and Response, 2014)

Guiding Principles for International Outbreak Alert and Response

1. WHO ensures outbreaks of potential international importance are rapidly verified and information is quickly shared within the Network.
2. There is a rapid response coordinated by the Operational Support Team to requests for assistance from affected state(s).

3. The most appropriate experts reach the field in the least possible time to carry out coordinated and effective outbreak control activities.
4. The international team integrates and coordinates activities to support national efforts and existing public health infrastructure.
5. There is a fair and equitable process for the participation of Network partners in international responses.
6. There is strong technical leadership and coordination in the field.
7. Partners make every effort to ensure the effective coordination of their participation and support of outbreak response.
8. There is recognition of the unique role of national and international nongovernmental organizations (NGOs) in the area of health, including in the control of outbreaks. NGOs providing support that would not otherwise be available, particularly in reaching poor populations. While striving for effective collaboration and coordination, the Network will respect the independence and objectivity of all partners.
9. Responses will be used as a mechanism to build global capacity by the involvement of participants from field-based training programs in applied epidemiology and public health practice, e.g. Field Epidemiology Training Programs (FETPs).
10. There is commitment to national and regional capacity building as a follow up to international outbreak responses to improve preparedness and reduce future vulnerability to epidemic prone diseases.
11. All Network responses will proceed with full respect for ethical standards, human rights, national and local laws, cultural sensitivities and traditions.

2.2 Communicable and Notifiable Diseases Surveillance in Sierra Leone

In Sierra Leone over the past years, there have been many vertical surveillance systems implemented by different health partners and organizations (Disease Control Programs, NGOs, Agencies and the private sectors). All these programs and organizations have their own data collection and reporting instruments. Many of these forms have been introduced in the districts making it very difficult, as staff members have to deal with many forms. (Leone D. S., 2012)

Recording and reporting of data becomes very difficult as timely, complete and quality data cannot be obtained. As a result of this, the Ministry of Health and Sanitation decided to adopt the Integrated Disease Surveillance and Response (IDSR) as a strategy to improve the data collection, reporting and analysis.

In 2004 Sierra Leone adopted the Integrated Diseases Surveillance and Response (IDSR) strategy and adapted the technical guideline with the selection of 22 priority diseases. However, the implementation of IDSR was not functional until 2005 when restructuring within the MoHS led to the development of the Directorate for Disease Prevention and Control (DDPC) which coordinates the national surveillance programs and five other programs under its supervision. In 2008 further revision of the IDSR guidelines took place in line with International Health Regulation (IHR) 2005 and list of priority diseases was updated to 37 with inclusion of non-communicable diseases as well as other emerging/re-emerging diseases such as dengue, trachoma, anthrax and human influenza caused by a new subtype. The majority of these diseases are reported on a weekly or monthly basis. (WHO, Technical Guidelines for Integrated Disease Surveillance and Response in Sierra Leone, june 2008)

The MoHS has two directorates; Directorate for Disease Prevention and Control (DDPC) and the Directorate for Planning and Information (DPI) that are responsible for health information in the country. The DDPC is basically responsible for planning, coordinating, supervising and monitoring of the major national disease control programs (such as disease surveillance programme, Malaria Control Programme, TB/Leprosy, Neglected Tropical Diseases (NTD), National HIV/AIDS Control Programme (NACP) and Expanded Programme on Immunisation (EPI) fall under the purview.

Each of these programs is headed by programme managers with support staff (such as monitoring and evaluation officers, data managers, public health sisters e.t.c) at national level. At district level each of these programs has corresponding specific disease focal points who are directly involved with planning; supervising; coordinating; and monitoring of programme activities.

The National Disease Surveillance Programme (NDSP) leads disease surveillance activities in the country. At national level there is a programme manager, four (4) national surveillance officers (NSOs), data manager and support staff. The NDSP is primarily responsible for planning, coordinating, supervising and monitoring of surveillance activities. The programme collects, analyses and disseminates information on immediately and weekly reportable diseases.

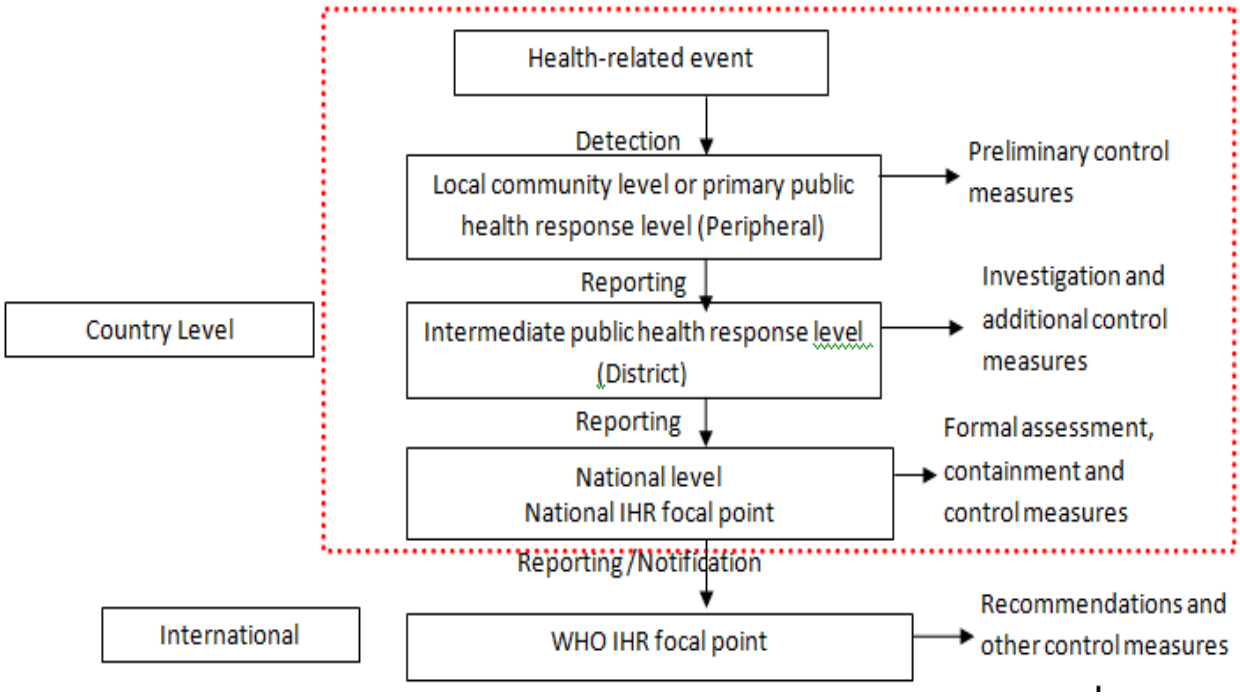
There are twenty eight (28) DSOs at the district level and they are supervised by the DMOs in the 13 districts. Reporting occurs from the PHU level to the district level and finally to the DPC at the national level, via mobile phone. Zero reporting is expected from all PHUs for the weekly reportable diseases and the DHMT participate in the preparation of national health policies and is responsible for their implementation at the

respective districts including planning and management of district healthcare services; diseases surveillance and response; health promotion; curative and rehabilitative services, ensuring provision of safe water and environmental sanitation; health data management, dissemination and utilization.

The DPI is responsible for all health related information collected from health facilities by M&E officers at district and national levels throughout Sierra Leone and from census, demographic and other surveys conducted.

Reporting starts from the PHU level to the district level and finally to the national level, primarily via phone and email. All epidemic-prone IHR recommended diseases and diseases targeted for eradication or elimination are 21 out of 37 diseases in number and should be reported immediately using case based forms. This data should be collated analysed and submitted weekly as national report to the WHO. Other diseases of public health importance are reported on monthly basis in collaboration with DPI using PHU or hospital monthly morbidity and mortality forms.

FIG 1.1 National and International Surveillance flow of Communicable Diseases according to the International Health Regulations



Referenced form International Health Regulation (2005)

A national weekly report which includes number of cases, deaths, attack rate and case fatality rate, timeliness and completeness of reporting are collated and analysed for the production and publication of weekly epidemiological bulletin which is co-authored by the National Disease Surveillance Programme and the WHO country office.

Supervision by the National Surveillance Programme at the district level and local health facility (PHUs) occurs routinely. Quarterly integrated surveillance meetings are conducted where district surveillance officers present all surveillance and some programmatic data from their districts (including surveillance information on HIV/AIDS, TB etc.) and all national programme managers under the DDPC attend to review data and discuss disease trends.

In addition district surveillance officers play a key role in the investigation and response to suspected outbreaks. When a notifiable disease is reported, officers visit the health facility to complete a case investigation form and collect specimen for laboratory confirmation. These are transported to the national level where case data is analyzed and specimens are confirmed locally or shipped out of the country for laboratory analysis.

Response to outbreaks is coordinated with assistance from the national surveillance office and other national or sub-regional partners and may include further investigation, community education, vaccination campaigns and mass treatments.

Since the end of 2008, the 19 local councils (12 districts Councils, 5 town councils, the Freetown City council and the Western Area Rural Council) are now responsible for managing the delivery of both primary and secondary health care services in the country.

Starting third quarter of 2005, tiered grants amounting to about a quarter of the national health budget were transferred to the local councils for the DHMT. These grants should cover activities such as vaccination campaigns, epidemic control including disease surveillance and outbreak investigation, infrastructure improvements and expansion and the operational expenses of the DHMT. In practice, many Local Councils turn these over to the DHMT who plan the activities and manage the funds with varying degrees of supervision from the Local Council.

WHO provides financial support to the disease surveillance programme with incentives to NSOs and DSOs for supportive supervision of districts/PHUs and payments for DHL

courier delivery services of specimens to the reference laboratories for specimen that cannot be analysed in-country.

2.3. Communicable Disease Burden in the Western Area, Sierra Leone

Communicable diseases along with maternal, perinatal and nutritional conditions in Sierra Leone accounted for an estimated 77 per cent of all mortalities. The prevalence of HIV/AIDS in Sierra Leone, as a percentage of population aged 15-49 years, stood at 1.5 per cent in 2012. The prevalence of HIV/AIDS in Sierra Leone has increased consistently since 1990, before plateauing in 2007. (Ministry of Health and Sanitation;IDSR Plan, 2012)

In 2011 there were a reported 638,859 cases of malaria in the country. Malaria has seen a rapid increase in the number of deaths and confirmed cases since 2005, although these figures are decreasing. There was a gradual and consistent increase in both estimated incidence of tuberculosis (TB) and estimated mortality (when mortality data excludes cases co-morbid with HIV) from this disease. There were a reported 382 cases of leprosy in 2010 and 31 reported cases of measles in 2009. (Ministry of Health and Sanitation Sierra Leone, 2013)

Sierra Leone's public spending on health was 3.4 per cent of GDP in 2011, equivalent to US$69 per capita.

In the most recent survey, conducted in the period 1997-2010, there were two doctors, and 17 nurses and midwives per 100,000 peoples. In 2011, 58 per cent of people were using an improved drinking water source and only 13 per cent had access to adequate sanitation facilities.

The most recent survey, conducted in the period 2000-11 by the Mininstry of Health and Sanitation, found that Sierra Leone has three pharmaceutical personnel per 100,000 people. There are about 80 hospitals in the public, private and NGO sectors in Sierra Leone and about 40 pharmacy importers (2006). These and other surveys point to the lack of adequate health personnel within the country.

The facilities include 17 government civilian hospitals with a key private hospital, Choitram, in Freetown. The largest mission hospital in the country is the Emergency Hospital established by the Italian NGO Emergency, and a key medical training facility is the College of Medicine and Allied Health Sciences (COMAHS).

The Hospital Boards Act of 2003 came into operation to ensure the better management of specified hospitals and the provision of efficient medical care in the country. Sierra Leone's pharmaceutical sector mainly consists of retailers, marketers and local agents of the big international pharmaceutical firms. The country imports almost all of its pharmaceuticals and the Pharmacy Board monitors such importation. The board has been involved in a series of efforts to stamp out the proliferation of counterfeit medicines, which continue to pose a threat to the pharmaceutical industry and public health in the entire region

2.3 Evaluation of disease notification systems

Evaluation is a process that attempts to determine as systematically and objectively as possible the relevance, effectiveness, and impact of activities in the light of their stated objectives. Evaluation measures change in targeted results that can be attributed to a particular system, programme or intervention; whilst analysing input and activities to determine their contribution to results. (Porta, 2008)

The validity of incidence and impact measures as reported through existing networks needs to be tested and part of the testing process includes a formal examination of the system to identify strengths and weaknesses. This informs decision making to improve system performance.

Reporting of cases of infectious disease is a critical element in planning and evaluation of disease prevention and control programs. Several studies have evaluated the completeness of reporting for particular diseases in various areas over a certain period of time. Despite the mandatory reporting by laws, the incompleteness of notifiable infectious disease reporting is well-documented in many countries for various diseases (Doyle, 2002).

A study on physicians in a health district in the UK showed that most physicians were aware that they have a legal duty to notify infectious diseases. However, more than half of them failed to correctly recognize certain diseases as notifiable (Voss, 1992)

In a study contracted with the Center of Disease Control in Taiwan; The sensitivity and positive predictive value of the communicable disease reporting system in Taiwan, primary doctors were asked about their knowledge of reporting communicable diseases.

Among the 1051 physicians who accepted the interview, only 295 (28.1%) correctly answered that chickenpox is a reportable communicable disease in Taiwan. This could be one of the major reasons for a low reporting rate. This study indicated that the physicians in Taiwan should improve their knowledge and attitude toward notifiable infectious diseases (Tan, 2006).

The most common reason for physicians not complying with reporting requirements was lack of knowledge of the reporting requirements, followed by negative attitude toward reporting, misconceptions that may result from a lack of knowledge of the reporting system, concerns regarding confidentiality, and insufficient reward for reporting or penalty for not reporting (Voss, 1992)

In 2006 Hsiu-Fen Tan et al in a study titled; Evaluation of the National Notifiable Disease Surveillance System in Taiwan: An example of Varicella reporting, suggested that physicians should improve their knowledge and attitude toward notifiable infectious diseases.

In a study in Fiji by Saunders 2001; recommendations arising from the findings of the evaluation included revision of notifiable diseases lists with consideration of current priority diseases and determination of appropriateness of clinical versus laboratory reporting; training of health care workers in notification procedures; and improving feedback to reporting units (Saunders, 2001)

Underreporting could result from many reasons. The health seeking behavior and assess to services may be limited in lower income sectors of the population. This same population experiences a higher burden of disease and mortality rates as demonstrated

by research on the "social gradient" where people further down the social ladder are at higher risk of acquiring infectious diseases and higher mortality rates (WHO, Healthy Cities 21st Century,International centre for Health and Society The Social Gradient, 2003)

The non-compliance by general practitioners has long been a concern. The 1988 Acheson committee reporting on mandatory disease notification in United Kingdom claimed that many doctors claimed that they were unaware of their statutory obligation to report such conditions and a large number were unsure as to which diseases were notifiable at all.

However in 1994 in survey titled; Survey of Croydon general practitioners awareness of notifiable infectious diseases by Durrheim and Thomas; their results showed a relatively high level of correct identification of notifiable conditions (79% of 56 respondents surveyed) (Thomas J, 1994), but low levels of motivation were deemed to be important in explaining incompleteness of disease reporting.

2.4 Integrated Disease Surveillance and Response (IDSR)

In 2004, Sierra Leone adopted the Integrated Disease Surveillance and Response (IDSR) as a strategy to streamline and improve data collection, reporting and analysis from previously disparate disease reporting systems in the country. The current disease surveillance system is integrated with the Vaccine Preventable Disease surveillance systems.

Experiences with some disease eradication and elimination programs show that disease control and prevention objectives are successfully met when resources are dedicated to

improving the ability of health officials to detect the targeted diseases, obtain laboratory confirmation of outbreaks, and use thresholds to initiate action at the district level. Building on these successes, the World Health Organization (WHO) Regional Office for Africa (AFRO) proposed a comprehensive strategy for improving communicable disease surveillance through integrated disease surveillance and response (IDSR) linking community, health facility, district and national levels in the African region. (IDSR, 2008).

The IDSR strategy provides for a rational use of resources for disease control and prevention. Currently, many intervention programs have their own disease surveillance systems. Each program has made efforts through the years to improve its ability to obtain data for developing timely and reliable information that can be used for action. They involve similar functions especially at district and health facility levels. They often use the same structures, processes and personnel (IDSR, 2008).

The district level is the focus for integrating surveillance functions. This is because the district is the first level in the health system with full-time staff dedicated to all aspects of public health such as monitoring health events in the community, mobilizing community action, encouraging national assistance and accessing national resources to protect the district's health. (IDSR, 2008).

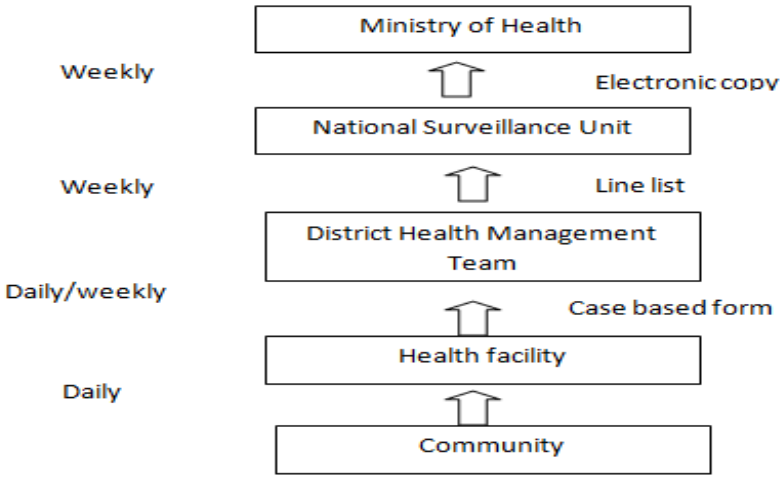
2.4.1 Objective of Integrated Disease Surveillance and Response

The goal of IDSR is to improve the ability of districts to detect and respond to diseases and conditions that cause high levels of death, illness and disability in the district's catchment area. An improved health and well-being of the communities in the district

can be achieved by strengthening skills and resources for integrated disease surveillance and response.

The general overall objective of the IDSR strategy is to provide a rational basis for decision-making and implementing public health interventions that are efficacious in responding to priority communicable and non-communicable diseases. To implement IDSR, WHO/AFRO has proposed to countries a system of simplified tools and response actions. These tools should contribute to efficient and timely decision-making based on the use of timely information, selection of appropriate responses and effective use of available resources for preventing and controlling communicable and non-communicable diseases. As shown in Appendix 5 (IDSR, 2008).

FIG 1.2 Flow diagram of disease notification in Sierra Leone



2.4.2 Diseases included in the Notifiable diseases list

The Ministry of Health and Sanitation recommends 37 communicable and non-communicable diseases and conditions for integrated disease surveillance and response

in Sierra Leone. The diseases are recommended As shown in appendix 6 because they fall into one or more of the following categories:

1. Are top causes of high morbidity and mortality in Sierra Leone (for example, malaria, pneumonia, diarrhoeal diseases, tuberculosis, and HIV/AIDS);
2. Have epidemic potential (for example, plague, yellow fever and cholera)
3. Surveillance required internationally (for example, Human influenza caused by a new Subtype, SARS);
4. Have available effective control and prevention interventions for addressing the public health problem they pose (for example, Schistosomiasis, Onchocerciasis, Trypanosomiasis);
5. Can easily be identified using simple case definitions;
6. Have intervention programs supported by W.H.O for prevention and control, eradication or elimination of the diseases [for example, the Expanded Program on Immunizations (EPI) and the Integrated Management of Neonatal and Childhood Illnesses (IMNCI)].

2.5 Functions of Surveillance according to guidelines

The surveillance guidelines assume that all levels of the health system are involved in conducting surveillance activities for detecting and responding to priority diseases, conditions and events according to the following:

Step 1 - Identify cases and events. Use standard case definitions to identify priority diseases and conditions. For events use the decision instrument (annex 4 of technical guidelines or annex 2 of IHR) to identify Public Health Emergency with International Concern (PHEIC).

Step 2 - Report suspected cases or conditions to the next level. If this is an epidemic prone disease or a potential Public Health Emergency with International Concern (PHEIC), or a disease targeted for elimination or eradication, respond immediately by investigating the case or event and submit detailed report.

Step 3 - Analyze and interpret data. Compile the data, and analyze it for trends. Compare information with previous periods and summarize the results.

Step 4 - Investigate and confirm suspected cases and outbreaks. Take action to ensure that the case or outbreak is confirmed including laboratory confirmation wherever it is feasible. Gather evidence about what may have caused the outbreak and use it to select appropriate control and prevention strategies.

Step 5- Respond. Mobilize resources and personnel to implement the appropriate public health response.

Step 6 - Provide feedback. Encourage future cooperation by communicating with the levels that reported cases, outbreaks, or events, on the outcome of the investigation and success of response efforts.

Step 7 - Evaluate and improve the system. Assess the effectiveness of the surveillance and response systems, in terms of timeliness, quality of information, preparedness, thresholds, case management and overall performance. Take action to correct problems and make improvements.

There is a role for each surveillance functions at each level of the health system. The levels are defined as follows:

Community: Represented by basic village-level services such as trained birth attendants, village leaders, school teachers, extension workers, and village health workers or similar care providers.

Health facility: Community Health Centre, Community Health Post, Maternal and Child Health Post, Non-Governmental Organization clinics, and Private clinics

District level: The District Health Management Team.

National level: The Directorate of Disease Prevention and Control and the Directorate of Planning and Information. In Sierra Leone this is where policies are set and resources are allocated.

Laboratory: National Reference Laboratory and district laboratory

2.6 Cholera surveillance

According to the Ministry of Health and Sanitation, cholera ranks among the five most important epidemic prone diseases in Sierra Leone.

Cholera is caused by a bacterium called *Vibrio cholerae*. There are more than 60 cholera bacteria; however, current outbreaks in Africa are caused by *El Tor* biotype of *Vibrio cholerae* sero-group 01. The serotype of *El Tor* biotype prevalent in Africa is *Inaba*. Vibrio cholerae 0139 serovar is the major causative agent of epidemics in Asia. Cholera has re-emerged as a major infectious disease in the recent past, with a global increase in its incidence. (Heiman, 2010)

In May 2011, the World Health Assembly recognised the re-emergence of cholera as a significant global public health problem and adopted resolution WHA64.15, calling for

implementation of an integrated and comprehensive global approach to cholera control. (Heiman, 2010)

According to the WHO epidemiological report 2012, the number of deaths from cholera rose from 4,948 in 2009 to 7,543 in 2010, an increase of 52% with an overall CFR of 2.38%. Of the 32 countries that reported deaths from cholera, 20 were from the African continent; these countries accounted for 3,397 deaths and 45% of the global total. (Heiman, 2010)

Cross border movement and trade, especially of food products, require special attention to prevent importation of diseases from one country to another. Shellfish are known vehicle of transmission of cholera. Cholera remains a major public health problem in the African Region. For the last several years, Africa has reported over 95% of global cholera cases and 99% of global cholera deaths.

In several West African countries, the prevailing strain is the *El Tor*. The cholera epidemic started in West Africa in the early 1970s and Sierra Leone experienced the first epidemic in 1970 which was nationwide and met the country ill prepared, leading to a fairly high attack rates and case fatality. Since then, the country has experienced three epidemics in 1985, 1994, 1995. There were several epidemics during the period 1998-2008 that caused major concern among public health authorities, healthcare workers, relief agencies and Non-Governmental Organizations (NGOs).

Despite the occurrence of outbreaks from 1998 to 2008, the health system was still ill prepared for the outbreak of cholera in 2012.

However the weekly surveillance reporting system was able to note an increase in the number of diarrhoea and vomiting cases in November 2011.the Ministry of Health and

Sanitation did not have the capacity to conduct laboratory bacteriological analysis at the time. With support of WHO, samples collected were tested in Dakar Regional Laboratory and revealed the causative organism as *Escherichia coli.*

In February 2012 the situation worsened, samples collected from Kambia, Port Loko and Pujehun districts confirmed *Vibrio cholerae 01 El Tor* Ogawa. The government of Sierra Leone then declared an outbreak of cholera on the 27th of February 2012. With the onset of the rainy season further increase in the number of cases was reported in the Western Area in the 25th epidemiological week. Samples were collected and analysed at the regional Laboratory in Ouagadougou and confirmed for *Vibrio cholerae 01 Ogawa* on 17th July 2012.

During the period July to August, the epidemic rapidly spread to 8 other districts (Bo, Kenema, Tonkolili, Kono, Koinadugu, Bonthe, Moyamba and Bombali). As of 31st December 2012, 12 out of 133 districts were affected with cumulative of 222,969 cases and 299 deaths (CFR = 1.30).Western Area which is most populated district where the capital of Sierra Leone; Freetown is located reported the highest (above 50%) number of cases. (MoHS, 2012)

The outbreak control response was conducted through the National Cholera Task Force led by the MoHS with the support of health development partners. A Cholera Command and Control Centre (C4) has been established; it is hoped that this group will help coordinate response to cholera epidemics. (MoHS, 2012)

Following the outbreak described above a way forward towards strengthening disease prevention and control included; increasing the involvement of clinicians in the

surveillance system and improvement on the use of information to detect changes on time and conduct rapid response to suspect epidemics and outbreaks among others

CHAPTER 3

3.0 MATERIALS AND METHODS

3.1 Study Design

This study is a Cross Sectional study and consists of both qualitative aspects and quantitative descriptive components of the notifiable disease system in Western Area of Sierra Leone.

The study population is the Western Area disease surveillance system, Reference laboratory and the primary health care providers.

The description of the methods of data collection as well as that of the tools used for data collection are presented sequentially below according to the objectives as set out in chapter 2 above.

The description of the methods and tools used for the qualitative evaluation of the surveillance system is presented first.

The second and third is the description of the methods and tools used for the two quantitative studies- one on the knowledge and practice survey among the primary health care practitioners and the other on the degree of underreporting of cholera by health care providers.

3.1.1 Surveillance System Evaluation

The method used in the surveillance system evaluation is based upon the updated Guidelines for Evaluating Public Health Surveillance Systems published by the Centers

for Disease Control and Prevention (Atlanta USA). This Guideline describes the critical attributes that a surveillance system should have to be effective and efficient. Evaluation of the surveillance system consists of semi-structured interviews with representatives of district communicable disease control offices, inputs of the key role players in Ministry of Health and Sanitation (MoHS)

The research was discussed with disease notification participants and partners and on review of the objectives and methods of the research the National disease coordinators, the Western Area District Medical Team; District Medical Officer. The Directorate for Disease Prevention and Control was informed about the research

The surveillance attributes on which data was collected were; level of usefulness; simplicity; flexibility; data quality; acceptability; sensitivity; positive predictive value; representativeness; and stability as defined in Appendix 7.

3.1.2 Survey of primary health care providers

A cross sectional study design is used. A sample survey by means of a questionnaire was used to gather data from primary health care providers in the Western Area of Sierra Leone. The data collected included; Demographic variables such as; Age, sex, address and variables associated with disease notification such as (compliance with disease notification, availability of case based forms, contact with district communicable disease control coordinators, knowledge; knowledge of notifiable diseases availability of guidelines on statutory disease reporting) and means of communication.

3.1.3 Assessing reporting practices in the Western Area among reporting units

A cross sectional study was carried on reporting sites in the Western Area using a semi-structured questionnaire administered telephonically over a period of two weeks.

A retrospective secondary data analysis was done on districts notification data on cholera cases to quantify underreporting of notifiable diseases in Western Area. Monthly Cholera notification was used as a proxy indicator for notification of other notifiable diseases.

3.2 **Study Area**

Sierra Leone located in the West Coast of Africa has an estimated population of 6,418,000 in 2014 projected from the 2004 national census data of which 45% is less than 15 years old, 17%, less than 5 years old and 4% less than 1 year old. The urban and rural distribution is 38% and 62% respectively. (D.S.Koroma & Turay, 2006)

3.3 **Population under study**

3.3.1 Surveillance System Evaluation

The study population included key stake holders in the public health sector of the Ministry of Health and Sanitation, Directorate for Disease Prevention and Control, the personnel directly involved in the notifiable diseases surveillance system (at the National and District levels)

Direct involvement in the system is defined as receiving, processing and reporting on disease notifications as submitted on case based forms. Communicable disease coordinators at the peripheral and district levels were interviewed

3.3.2 Survey of primary health care providers

The study focused on the public sector primary health care providers; medical doctors primarily, as this sector needed more clinician involvement in surveillance activities all over the country.

Within the public sector the Primary Health Care Providers are medical doctors, community Health Officers or professional nurses trained in Primary Health Care.

In the private sector these services are delivered by medical doctors in independent practice.

The Sierra Leone Medical and Dental Association (SLMDA) have issued 145 registered active general practitioners in Sierra Leone with independence practice numbers (http://mdcsierraleone.org and personal communication with the SLMDA secretariat on 16th September 2013). This list however, has not been updated in a long time.

Therefore a list of the medical practitioners was obtained from the Ministry of Health and Sanitation showing 95 persons being directly involved in the public health sector as medical doctors that are currently being paid by the Ministry.`

Direct involvement in the system is defined as active work in the public health sector of Sierra Leone and paid by MoHS.

Of the 95 persons; Programme heads and district medical officers constituted 37 of the personnel, 7 are doctors on contract to the government, 13 are medical superintendent heading district hospitals, 18 are medical officers within the Western Area, 10 are new medical officers, and 10 were newly recommended to the medical practice.

3.3.3 Assessing reporting practices among reporting units in Western Area

The population of Western Area and the entire 112 reporting sites it contains is the focus of this study. The estimated total population of the Western Area is 1.2 million people projected from the 2004 census figures.

3.4 Sampling

3.4.1 Survey of primary health care providers

The sample frame contained 95 persons that were categorized into 3 categories for the purpose of this study as; Administrative heads (37 persons), doctors on contract; consultants (7 persons) and medical doctors in active practice (51 persons) in the Western Area of Sierra Leone.

The survey was focused on the 51 active persons within the public health sector as categorized above.

3.4.2 Assessing reporting practices among reporting units in Western Area

A total of 112 reporting sites in the Western Area were surveyed using a semi-structured questionnaire administered telephonically over a period of two weeks.

3.5 Data Collection:

3.5.1 Surveillance System Evaluation

1. Stakeholders; defined as individuals or organizations that generate or use surveillance data for promotion or control of diseases or adverse exposures of

disease scheduled under the Notifiable Diseases regulations; these were engaged at the inception of the research process.

2. Semi-structured interviews were conducted with representatives from district and national communicable disease control offices over a period of five days, each interview lasting approximately 50 minutes.

3. Respondents were sent hard copy of the questionnaire prior to the interview for the purposes of gathering relevant data or documents pertinent to the survey.

4. Permission for conducting interviews was obtained from the respondents respective supervisors.

5. A search was conducted on the epidemiology and public health significance of each of the notifiable conditions. This search was done using multiple databases namely; Google Scholar, Science direct; using a combination of key words; disease/condition, epidemiology, Sierra Leone, Western Area and Public health.

6. Relevant publications by the MoHS was consulted

7. A table listing each of the notifiable conditions and their indices of frequency and severity, disparities or inequities is noted in the epidemiology of the disease in Western Area, costs associated with it, preventability, natural history and extent of public interest

8. The MoHS and Western Area district health documents on notifiable diseases were reviewed. Hard copies of the document were obtained where available, others were downloaded in electronic format from the internet.

3.5.2 Survey of primary health care providers

The survey used a structured questionnaire and was administered by one interviewer and was conducted telephonically for some in the interest of time and cost.

The data collection instrument is a structured questionnaire form designed in Microsoft Access with specific checks in place to avoid erroneous data entry.

All questionnaires were administered by a single interviewer namely the principal investigator. Verbal informed consent was obtained from each respondent and the interviews lasted for five to ten minutes each.

At the end of each telephonic interview the participant was thanked and given the opportunity to ask questions and offered supplementary information on notifiable and communicable diseases

Three attempts were made to contact each of practitioners sampled. Failure to obtain a response by the third attempt or refusal to participate in the survey constitutes a; non-response.

3.5.3 Assessing reporting practices among reporting units in Western Area

Data was collected over a period of two weeks using semi structured questionnaires administered to reporting sites. Three attempts were made to contact each reporting site. Failure to obtain a response by the third attempt or refusal to participate in the survey constitutes a; non-response.

Notification data was compared from two sources in order to measure the degree of underreporting

1. The National Disease Surveillance Unit; cholera surveillance data base (recording clinical surveillance questionnaires)

2. The Western Area district communicable disease notification line lists, stored electronically as Microsoft Excel spreadsheets with relevant patient data included in the listings. The variables collected for comparison with other databases were; patient name, facility from which the case was reported and patient age.

3.6 Quality Control

3.6.1 Surveillance System Evaluation

Interviews with communicable disease control coordinators, was conducted; asking the level of their involvement in the system and according to a semi-structured questionnaire.

In the measurement of data quality sensitivity and positive predictive value, quality controls included checks on data based forms and manual reviews for consistency of data.

3.6.2 Survey of primary health care providers

The data collection instrument was pretested on medical staff (non-medical doctors) not selected as part of the study. The data was entered directly into Epi-info 3.5.4 which was reviewed after each interview.

To check for consistency respondents was asked first; whether they always report notifiable medical conditions to the disease prevention and control unit and subsequently asked whether they have disease notification forms or books available in their practice.

3.6.3 Assessing reporting practices among reporting units in Western Area

District notification data was manually examined for duplication based on patient names, age and residence details.

3.7 Ethical Considerations

Ethical approval for this study was obtained from the Research and Ethics Committee of Sierra Leone at the Ministry of Health and Sanitation to conduct the research.

Permission was sought from the Western Area disease prevention and control unit as well as the MoHS and the National Disease Prevention and Control Unit.

The ethical considerations for this research included the following;

1. The measurement of various attributes of the surveillance system required tracking specific patient records with patient's names and demographic details. All data was anonymized in the databases and data sharing was restricted. Each

patient record in the study was assigned a unique study number. This unique study number will prevent patients from being identified to protect patients privacy

2. Permission of the ;Access to patients- data forms was sort from the Ministry of Health and Sanitation

3. The questionnaire survey of the health practitioners and personnel within the communicable disease surveillance system are kept confidential

4. Participants were assured that this study would not lead to punitive measures for failure to comply with system requirements such as failure to report notifiable health events.

3.8 Data analysis

3.8.1 Surveillance System Evaluation

This is a qualitative descriptive study all the information gathered through interviews was compared to policy documents, published reports and evidence gathered from reporting databases.

Results are presented as a narrative and contingency tables were constructed for system, sensitivity and positive predictive values.

3.8.2 Survey of primary health care providers

Data preparation included tabulation and editing/ cleaning. The need for data editing/cleaning was reduced by checks built into the questionnaire form and supplemented by manual checking of electronic forms immediately after completion.

Responses to questions on notifiable diseases knowledge was counted and converted to scores

Tabulation was performed electronically and the table generated in Epi-info version 3.5.4 exported to Microsoft Excel.

Uni-variate and bi-variate descriptive statistics and inferential statistics was done using STATA MP 11 statistical software package. Table shells constructed were completed.

3.8.3 Assessing reporting practices amongst reporting units in Western Area

Responses to questions on reporting practices were counted and converted to scores

Tables and graphs were generated to depict gaps in notification data and trend lines over the six month period of the study.

CHAPTER 4

4.0 RESULTS

4.1 Description of the notifiable disease surveillance system in Western Area

4.1.1 Engagement of stakeholders

Three communicable disease control coordinators participated in the qualitative interviews; their professional and situational characteristics are listed in the Table 4.1

Table 4.1 Characteristics of qualitative interview respondents

	Respondent 1	**Respondent 2**	**Respondent 3**
Level	**National**	**National**	**District**
Professional appointment	Programme Manager; National Surveillance Unit	National Surveillance Officer	District Surveillance Officer
Size of population under surveillance (based on midyear estimates for 2014)	**6,418,000**	**6,418,000**	**1,200,000**

4.1.2 System Description

Interview of the National Surveillance Programme Manager revealed that the private sector remains a very challenging area to gather data. The attitude of many private practitioners is one of apathy that there is no reason why they should report cases because little or no public health action could result from it even when reported to relevant authorities. He further opined that the country's health system is still much challenged in delivering an effective service and still struggles with the implementation of Integrated Disease Surveillance and Response strategy. The IDSR strategy was adopted in 2004 but implementation began in 2005.

Surveillance and laboratory functions are still weak in the country. The laboratory results are delayed in getting to surveillance units for action. The accessibility of patients to health facilities is still a challenge. Refresher trainings are not being done to re-train staff and training of new staff is not being done regularly and the achievement of performance indicators remains elusive. Some of the factors responsible for this are; scarce resources for surveillance, inadequate human resources, poor capacity for surveillance and laboratory, lack/limited specialised personnel e.g epidemiology and microbiology, lack of adequate communication infrastructure for data transmission from the peripheral level coupled by the existing potential risk factor for disease occurrence are all factor that militate against effective surveillance in the country

The flow of data collection and sharing is sometimes reversed between the World Health Organization (WHO) and the Disease Prevention and Control Unit (DPC); WHO collates data and sends a copy to the DPC for records. This can be seen for diseases such as Influenza, Measles and Yellow fever.

This research found gaps which were also highlighted by the Surveillance Manager such as;

1. There was often a delay in reporting of cases fitting standard case definitions by health care workers.
2. There was a deficit in interpretation and use of surveillance data at district level as data and feedback was generally poor at all levels
3. Surveillance data were not used sufficiently for the evaluation of programs and public health intervention
4. Laboratory involvement in surveillance was inadequate.
5. There was insufficient supervisory support for surveillance and timeliness and completeness of reporting was lacking.

4.1.3 Evaluation of surveillance system attributes

4.1.3.1 Level of usefulness

The staff of the surveillance Unit interviewed indicated that the system is useful because it can detect outbreak of diseases making reference to cholera, measles and Lassa fever outbreaks. They indicated that because the system is able to do this it is useful even though they admit the system can perform better. The current surveillance system is mainly used to detect and respond to outbreaks.

All data collected by the system were being used by the Ministry of Health and Sanitation and WHO country office.

4.1.3.2 Simplicity

The system carries out mostly passive surveillance, with data being collected from the health facility level where the patient presents with a health related event.

The organizational structure of the notification system appears simple to follow and the flow of data appears to be in a straight line but there are variations in case definitions across various diseases, poor human resources at the periphery and high rates of attrition. In order to maintain the ease of data flow there is a need for urgent refreshers training and training of new staff in many peripheral facilities

FIG 4.1 Description of Surveillance Data Flow

Source: National surveillance Unit

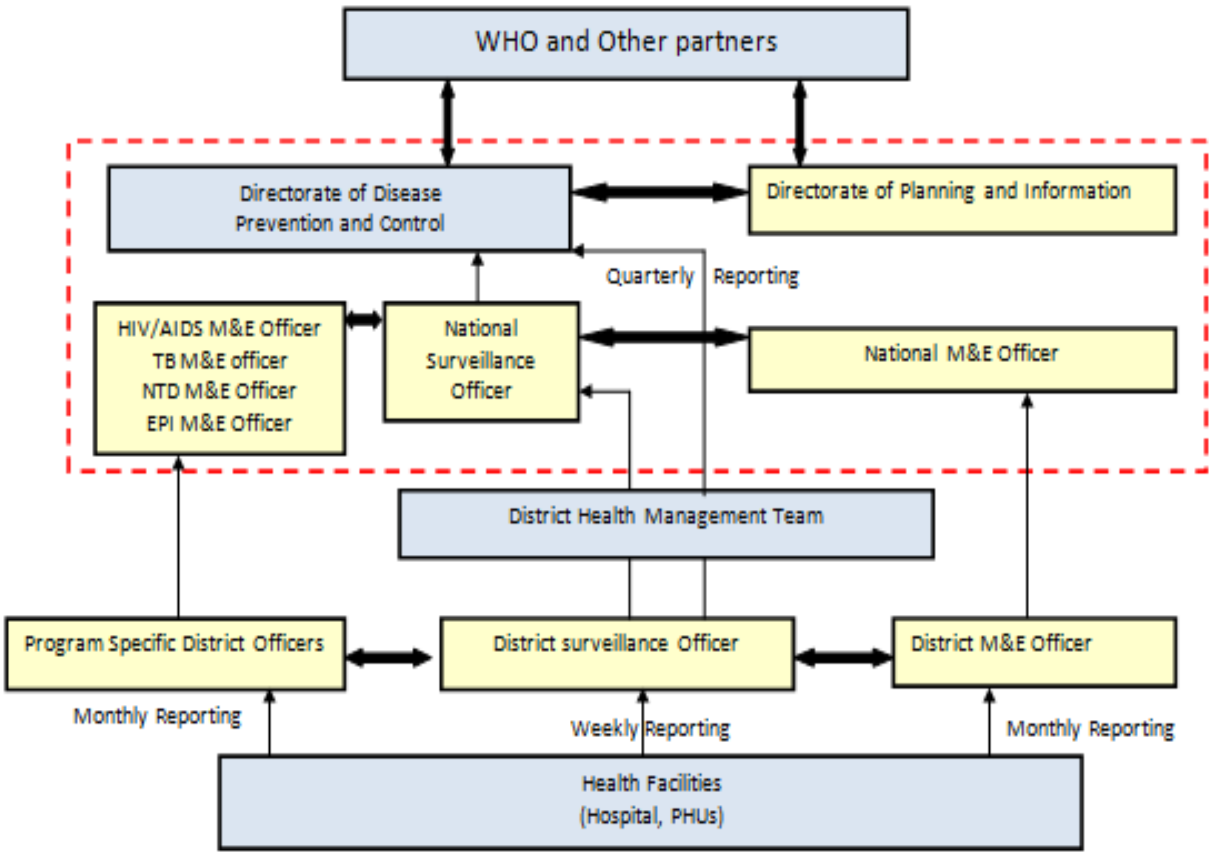
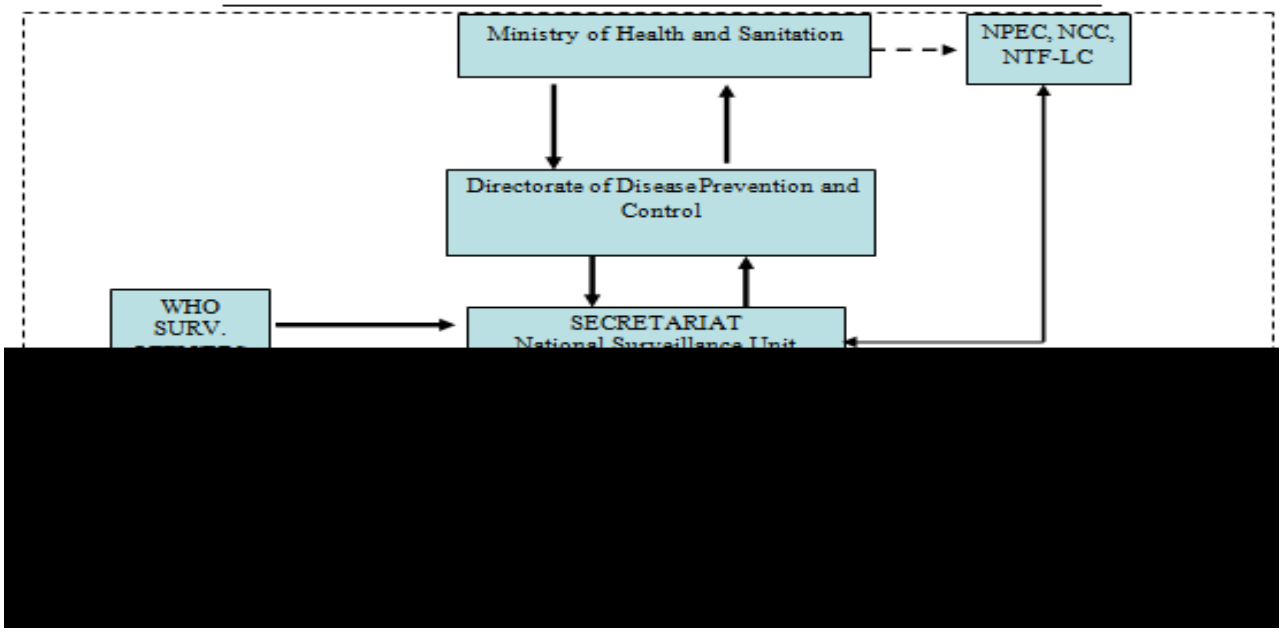


FIG 4.2 Surveillance Organogram



Source ; National Surveillance Unit

However, when there is an outbreak the District surveillance officers carryout an active case search in the communities affected.

The process of notification of disease starts from the health facility to the district level and from the district level to the National level; by either cellular phone or hard copies or both using the porters if the report is generated from the peripheral level.

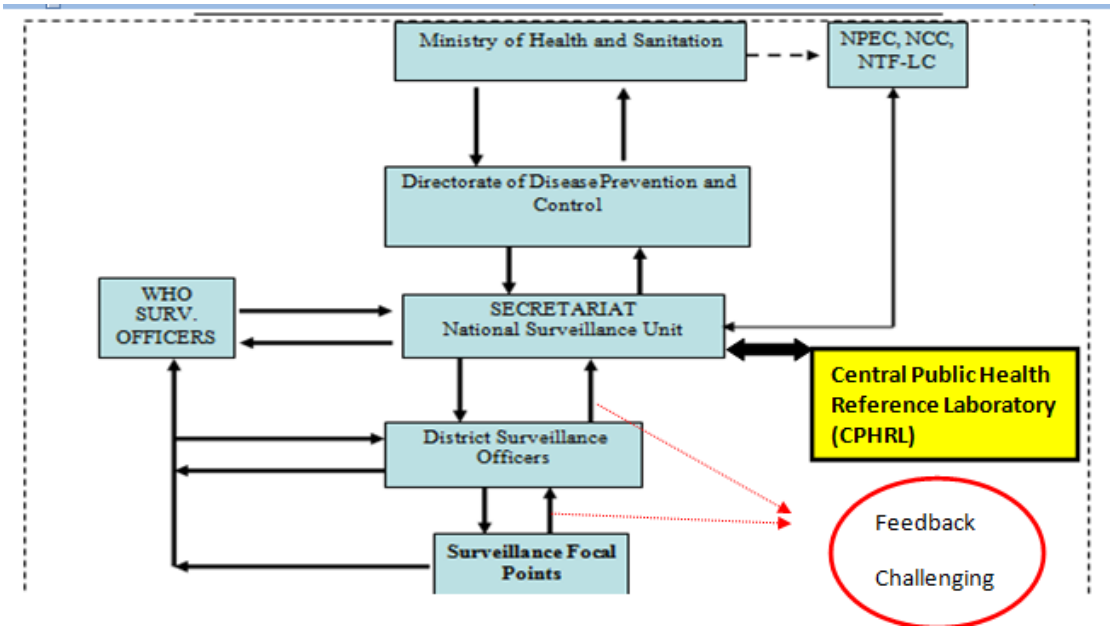
Upon notification by the periphery to the district level; samples are collected as appropriate and transported to the Central Public Health Reference Laboratory for testing

The district surveillance officers submit disease notification data either on the case based forms or in the line lists. Line listing is done more frequently in the event of a disease outbreak.

The process of giving feedbacks on the samples tested from the laboratory through the system remains one of the biggest challenges in the system as acknowledged by staff of the surveillance unit and staff at the reporting sites (respondents). All the respondents could produce the flow of reporting of notifiable diseases through the system

FIG4.3 Feedback Challenge

Source; Directorate for Disease Prevention and Control



4.1.3.3 Flexibility

The system was found to be flexible, with the expansion of the notifiable diseases list to 37 from 22; in 2008 to in order to accommodate the IHR recommended diseases. In recent times the commencement of the Influenza sentinel surveillance in 2011, the ROTA virus surveillance in 2012 are indications that the system can still accommodate other diseases.

At the district level the data is captured in a Microsoft Excel spreadsheet which is easily transferred to the national level by email.

4.1.3.4 Data quality

Data quality can be measured by the completeness and timeliness of reporting. The completeness of many reports is still a challenge with sections such as the address, sex and age details being sections being left blank Examining cholera surveillance between October 2012 and December 2012 in four districts shows the following.

Using the fields "Date of onset", "Symptoms" and "Suspected cause" are very important in the application of the case definition and the diagnosis of the patient. These were used as a proxy to measure completeness of reporting (Table 4.3).

Table 4.3 Incompleteness of reporting details on line listings for cholera case notifications October 2012 to December 2012

Site	Total number of cases of influenza diseases	Number of line list entries with blank details		
		Date of Onset	Symptoms	Suspected cause
Western Urban	16	13 (81%)	12(%)	2(12.5%)
Kenema District	35	18 (51.42%)	11(%)	8(22.8%)
Bonthe District	10	5 (50%)	5(50%)	0(0%)
Bo District	6	2 (33.33%)	2(33.33%)	3(%)

4.1.3.5 Acceptability

The surveillance system has acceptability among the operators since there is willingness of personnel to participate in the surveillance activities. The health facilities still respond to reporting though some are erratic in their reports.

4.1.3.6 Sensitivity

The system can be said to be sensitive in that it picks up new cases of diseases. The case definition for some diseases is not uniform and this affect the identification of cases such as cholera some accept frequent stooling as a suspected case definition whilst others accept frequent stooling in conjunction with wasting or vomiting.

4.1.3.7 Positive predictive value

Over the years the positive predictive value for some notifiable diseases has been on the decline. For as shown in the surveillance data; the predictive positive value for influenza dropped from 10% in 2011 to 7% in 2012 and 0.4% in 2013.

4.1.3.8 Representativeness

A public health surveillance system that is representative accurately describes the occurrence of a health-related event over time and its distribution in the population by place and person.

The distribution of a health event in a given population will give its representativeness and this is best addressed in quantitative terms as is shown in the cholera notification example in section 4.3. The data collected in the system is representative and is categorized in person, place and time.

4.1.3.9 Stability

Stability refers to the reliability (i.e., the ability to collect, manage, and provide data properly without failure) and availability (the ability to be operational when it is needed) of the public health surveillance system.

The reliability to collect, manage, and provide data properly without failure is still very challenging; this was measured by the number of unscheduled outages and down times for the system's computer. The respondents self-reported frequent power outages of the system due to the poor electricity supply which makes data retrieval from the system difficult. During the course of this study the retrieval of data from the District surveillance data base was challenging due to power outage.

4.2 Survey of the public sector primary health care providers in Western Area

Characteristics of the sample

The survey was conducted over a period of seven weeks and 20 public practitioners were interviewed with four (4) stopping and opting out of the interview midway citing

an operation to carry out or that he/she had to attend to patients; this left a total number of 16 medical practitioners fully interviewed. The response rate was 31.37% (16 out of 51).

Of the 31 remaining medical doctors, 3 stated that they were not in a position to answer because most cases were being handled by their subordinates (Community Health Officers) and only difficult ones are brought to their attention. 1 medical doctor stated that he was new to the system; as he was just returning to the country after 15 years of practice in Saudi Arabia. The remaining 17 practitioner were unavailable at the times calls were made. Three attempts were made to call each practitioner before being classified as non-response. The characteristics of the samples are presented in table 4.4

Table 4.4 Characteristics of General Practitioners who responded

Characteristics	Number (n)	Percent (n)
District where practice is situated		
Western Area	4	25%
Bo District	4	25%
Kailahun District	2	12.5%
Characteristics	**Number (n)**	**Percent (n)**
Port Loko District	3	18.5%
Tonkolili District	1	6.25%
Kenema District	1	6.25%
Moyamba District	1	6.25%
Years since medical graduation		
0 to 10 years	10	62.5%
11 to20 years	3	18.75%
21 to 30 years	2	12.5%
More than 30 years	1	6.25%
Number of patients seen per day for consultation		
1 to10	1	6.25%
11 to 20	5	31.25%
21 to 30	4	25%
Characteristics	**Number (n)**	**Percent (n)**
31 to 40	2	12.5%
More than 40	4	25%
Access to communication media		
Land line telephone	0	0%
Cellular phone	16	100%
Internet access at practice	16 (but personal)	100%

The median length of time since qualification as a medical practitioner was 8 years (i.e qualified in 2006) and the range was between three (3) to thirty three (33) years.

The median number of medical doctors working at the respondents practice was between; one (1) to two (2) with a mode of one.

Seventy five percent (n=12) of the respondents said they reported cases of notifiable conditions though 50% (n=6) of these said they usually delegate the duties to

community health officers under them and they ensure that the report gets to the District Health Management Team or through a Monitoring and Evaluation Officer.

Reasons cited for not reporting notifiable diseases were workload and administrative duties which makes delegating the reporting to the subordinate staff inevitable.

All respondents complained of the workload and the time spent in public practice as being too demanding.

Table 4.5 Cross tabulation of cohorts of years since qualification by self reported compliance with Notification

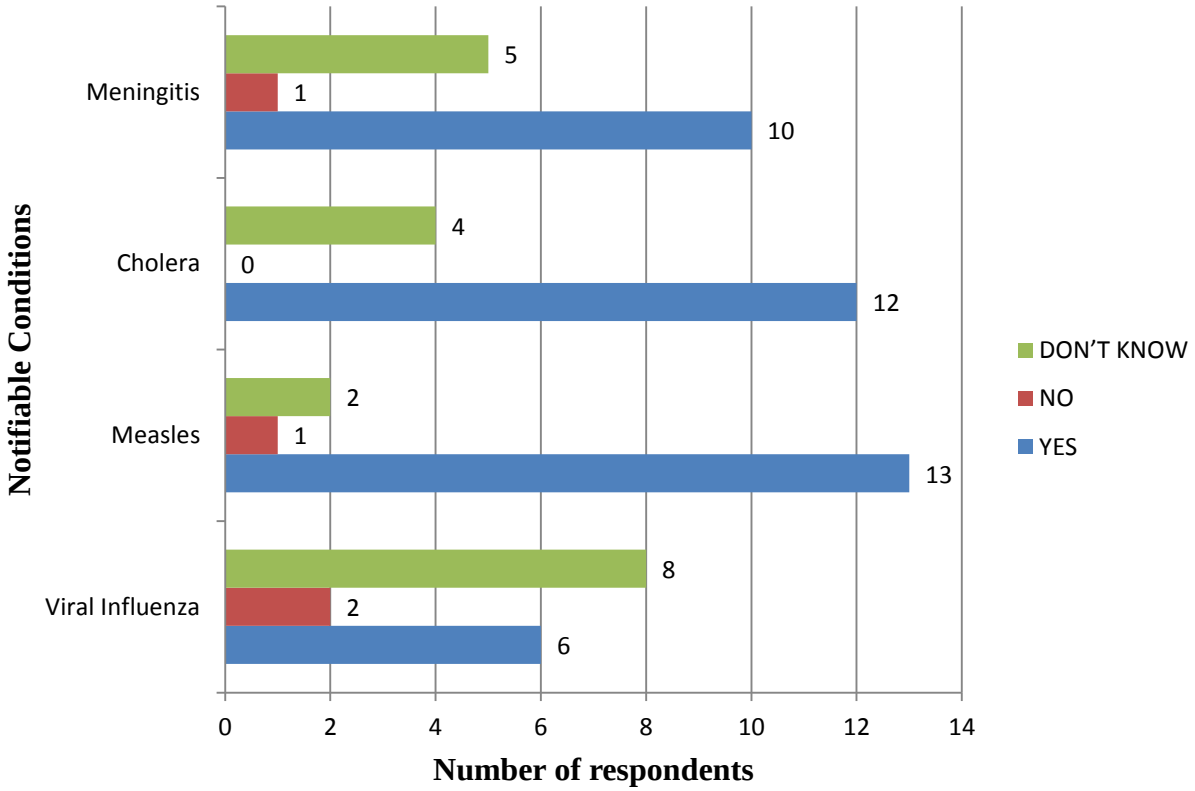
Years since qualifying	**Not compliant**	**Compliant**	**TOTAL**
1 to 10 years	2	7	9
Row%	22.22	77.77	100
Col%	50	58	56.25
11 to 20 years	2	2	4
Row%	50	50	100
Col%	50	16.66	25
21 to 30 years	0	2	2
Row%	0	100	100
Col%	0	16.66	12.5
> 30 year	0	1	1
Row%	0	100	100
Col%	0	8.33	6.25
TOTAL	4	12	16
Row%	25	75	100
Col%	100	100	100

The table above compares the years of graduation from the medical school versus the level of compliance reported by the medical practitioners at the time of interview

The medical practitioners interviewed were questioned on their awareness regarding whether or not specific medical conditions are notifiable of the 13 medical conditions

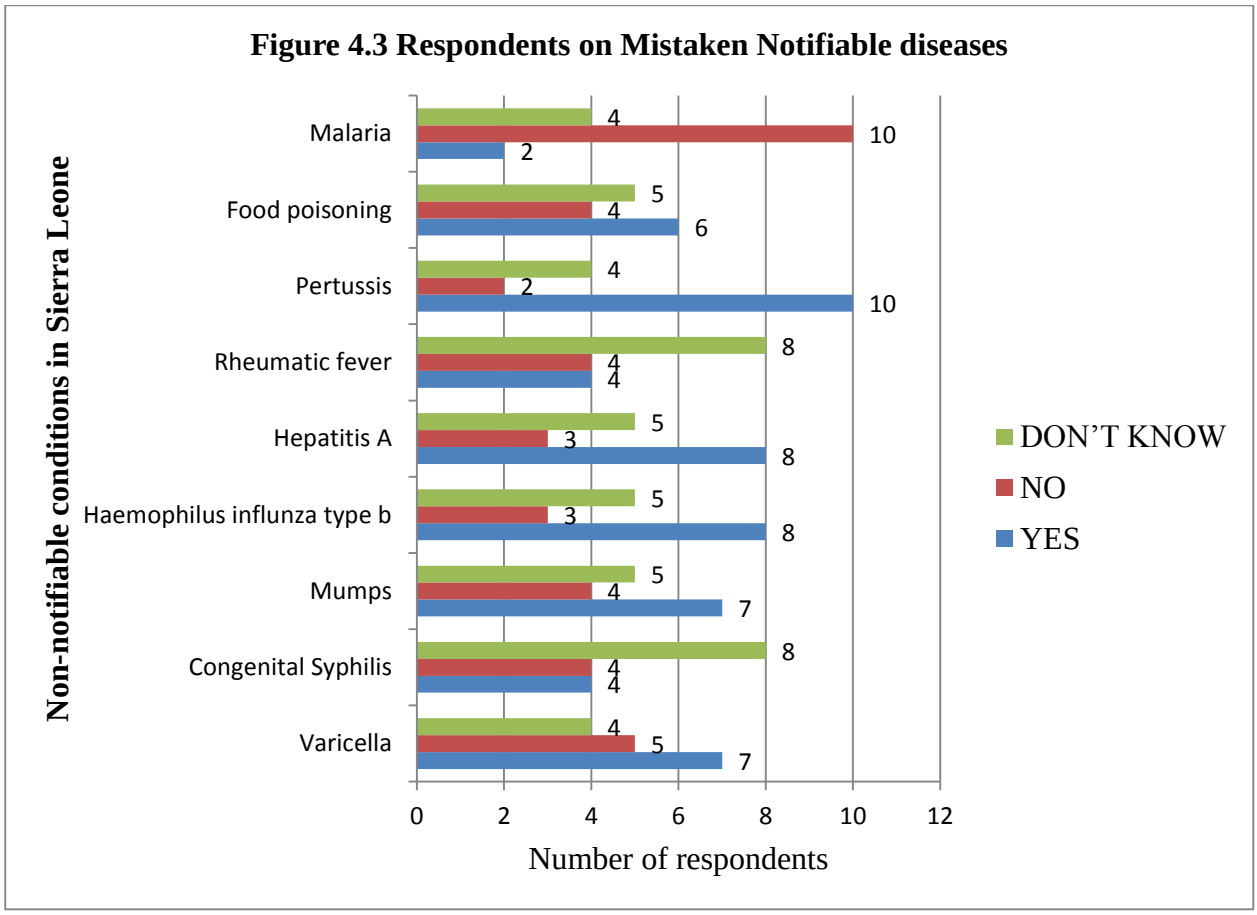
listed in the survey questionnaire only 4 were notifiable. Fig 4.2 demonstrates the responses to whether or not these diseases are notifiable

Figure 4.2 Participant responses on knowledge about notifiable diseases



Respondents showed an understanding of the notifiable medical conditions but mistook other diseases for notifiable diseases in the Sierra Leone setting. This is shown in Figure

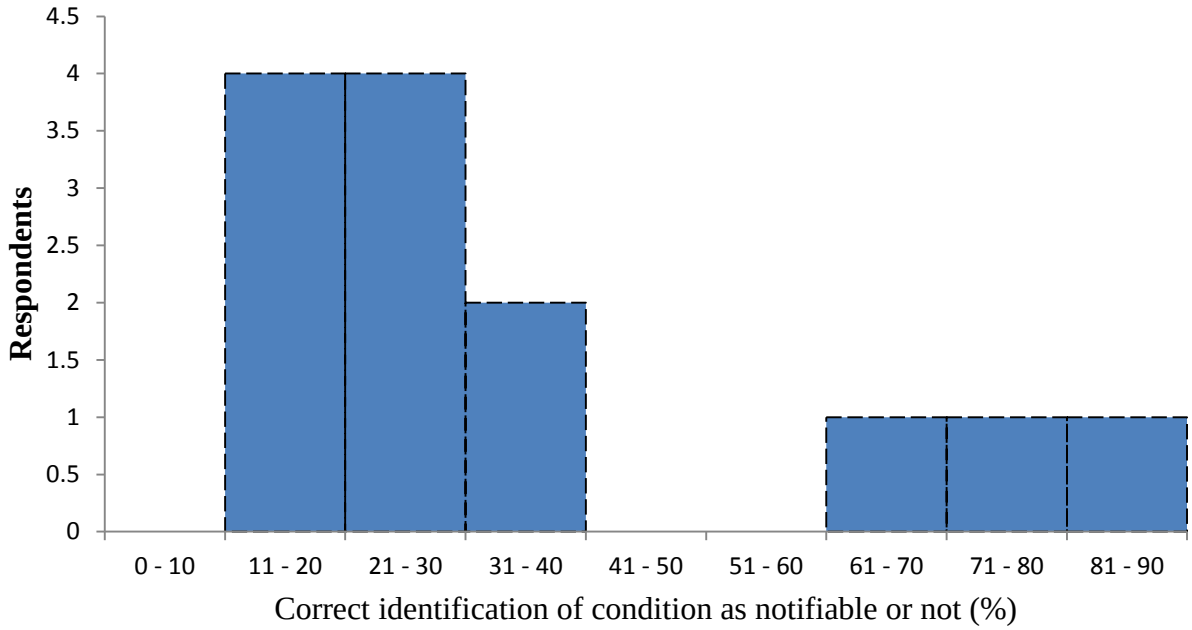
4.3 below



As shown above 50% of all respondents thought that Hepatitis A is notifiable when it is rather Hepatitis B that is notifiable in Sierra Leone.

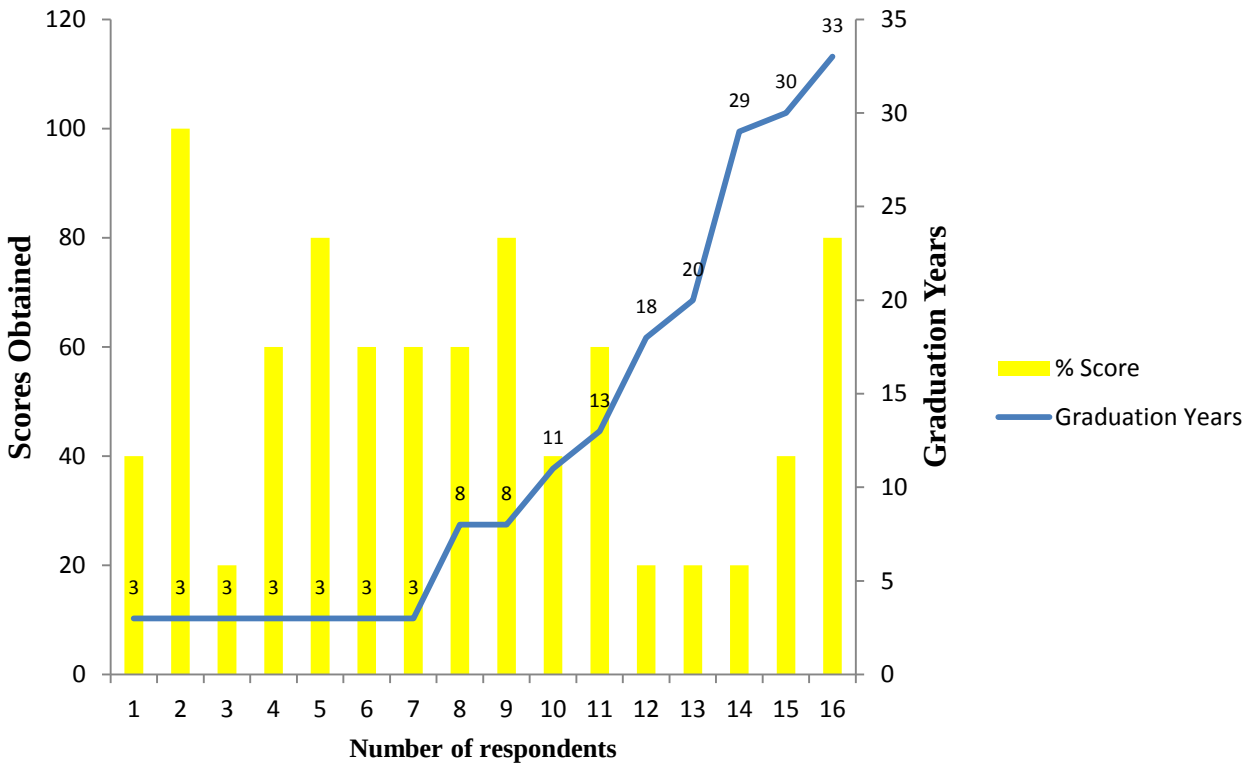
The number of correct answers as a percentage of total number of questions was calculated for each respondent. This is shown in Fig4.4

Figure 4.4 Frequency of distribution of response scores on knowledge of notifiable diseases



The interval since medical graduation was also compared to the result given by respondents as presented in Figure 4.5

Figure 4.5 Years since graduation against percentage of notifiable and non-notifiable conditions correctly identified



The relationship between the intervals of medical graduation and the results showed an inverse relationship as shown above

More than half of the respondents (9/16) indicated that they had seen at least one case of cholera in their practice over the past one year and none had ever used a rapid test kit for cholera before.

Seventy five percent of the respondents (12/16) indicated that they have guidelines for notification of medical conditions the remaining complained of not being supplied and will be interested.

Fifty six percent of the respondents (9/16) claimed to have been in contact at least once within the last one month preceding the interview.

All the respondents indicated that they have personal internet connections paid for by themselves.

In addition fifty six (56%) of them indicated that they would rather get their medical information from the textbooks rather than the internet.

4.3 Assessing the reporting practices among reporting units in the Western Area

A total of 112 reporting sites were surveyed 61 sites in the urban area and 51 sites in the rural area. The response rate from reporting sites was 27.6% (n=31) and out of this number 11(35.5%) were from the urban area and 20 (64.5%) were from the rural area.

The respondent sites included; sixteen (16) Community Health Centres (CHCs), three (3) Community Health Posts (CHPs) and twelve (12) Maternal and Child Health Posts (MCHPs) as shown in Table 4.6 below.

The staff type surveyed at the time of call included sixteen (16) Community Health Officers (CHOs), one (1) Community Health Aide (CHA), one (1) Midwife, one (1) SECHN Nurse and twelve 12 MCHAide Nurses as shown in table 4.7 below.

Table 4.6 Characteristics of reporting sites surveyed

Facility	Level	Population	Number surveyed
Community Health Centers (CHCs)	Chiefdom	10,000 – 20,000	16
Community Health Posts (CHPs)	Section	5,000 – 10,000	3
Maternal Child Health Posts (MCHPs)	Village	< 5,000	12

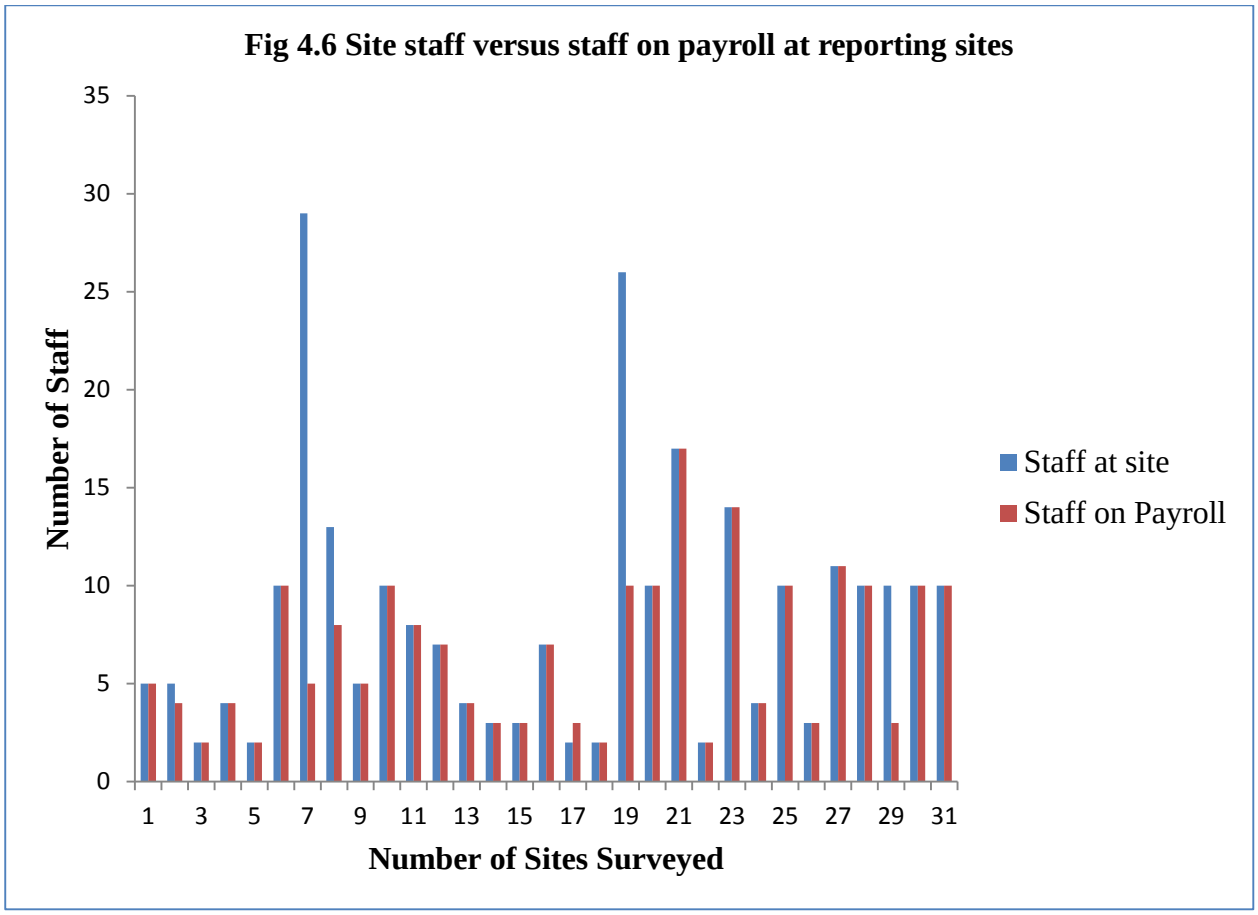
Table 4.7 Characteristics of Health staff surveyed

Staff type	Number surveyed
Community Health Officers (CHO)	16
Community Health Aides (CHA)	1
State Enrolled Community Health Nurse (SECHN)	1
Midwife	1
Maternal Child Health Aide Nurse (MCHAide)	12

The numbers of the site staff reportedly working at each of the sites varied from site to site, it ranged from two (2) for some MCHPs to twenty nine (29) staff including volunteers with a median of 10 staff per site for site with high workload. The volunteers are not paid nor given incentives.

The number of staff reported to be on government payroll also varied from two (2) in a site to seventeen (17) as shown in Figure 4.6 below;

Figure 4.6 Characteristics of staff remuneration on site



The average number of work hours spent per staff was reported as eight (8) hours per day. This figure varies for the MCHPs in the villages which actually see the patients at any time of the day.

The average number of patients seen per day ranged from ten (10) to twenty five (25) patients seen per day with high workload areas handling up to 70 patients per day.

Compliance with weekly and monthly reporting routines was reported by 80% of health facilities who reported and scored a mean 60% in their knowledge of notifiable diseases. They also reported that supervisory visits were carried out by district surveillance officers to supervise their sites regularly.

The unavailability of the notifiable diseases manual was recorded in 12 (38.7%) of the sites surveyed and the remaining 19 (61.2%) reported they had charts on the wall that they could use to assess case definitions but expressed interest in acquiring the notifiable diseases manual. The shortage of reporting forms within the last six (6) months was reported by 93.5% of the reporting sites especially the tally sheets. They complained that sometimes they spend out of pocket monies to photocopy reporting forms for the sites.

Only thirty two percent of the sites reported they have done on Integrated Disease Surveillance and Response training. Forty five percent of the sites reported they were experiencing problems with the surveillance phones supplied to them two years ago; ranging from poor charging to faulty screens.

A total of 258 staff were reported to be present at the sites surveyed; 206 of them are paid by the government (80%) and 52 (20%) of them are not paid by the government

Following data review of notification reports received from reporting sites the scale of underreporting is depicted in Table 4.8 below

Table 4.8 Summary of the reporting received from 108 reporting sites from 1st January 2013 to 31st June 2013 showing marked under reporting across the district

Week	Place	No. of PHUs	no. of PHUs reporting	no of PHUs reporting on time
week 1	rural	58	35	21
	urban	50	32	20
	grand total	108	67	42
week 2	rural	58	34	20
	urban	50	30	18
	grand total	108	64	38
week 3	rural	58	47	38
	urban	50	24	12
	grand total	108	71	47
week 4	rural	48	30	28
	urban	57	42	29
	grand total	105	72	67
week 5	rural	58	47	38
	urban	50	30	18
	grand total	108	77	55
week 6	rural	58	44	33
	urban	50	19	7
Week	Place	No. of PHUs	no. of PHUs reporting	no of PHUs reporting on time
week 6	grand total	108	63	37
week 7	rural	58	48	40
	urban	50	32	20
	grand total	108	80	59
week 8	rural	58	49	41
	urban	50	32	20
	grand total	108	81	61
week 9	rural	58	44	33
	urban	50	33	22
	grand total	108	77	55
	urban	48	31	20
	grand total	106	80	60
	urban	48	31	20
	grand total	105	77	56
	urban	48	39	32
	grand total	105	89	75

Week	Place	No. of PHUs	no. of PHUs reporting	no of PHUs reporting on time
week 10	rural	58	49	41
	urban	48	31	20
	grand total	106	80	60
week 11	rural	57	46	37
	urban	48	31	20
	grand total	105	77	56
week 12	rural	57	50	44
	urban	48	39	32
	grand total	105	89	75
Week	Place	No. of PHUs	no. of PHUs reporting	no of PHUs reporting on time
week 13	rural	48	38	30
	urban	57	45	35
	grand total	105	83	66
week 14	rural	48	31	20
	urban	58	44	33
	grand total	106	75	53
week 15	rural	48	29	25
	urban	57	42	37
	grand total	105	71	62
week 16	rural	48	35	31
	urban	57	43	38
	grand total	105	78	69
week 17	rural	48	33	31
	urban	57	43	41
	grand total	105	76	72
week 18	rural	48	36	30
	urban	57	38	31
	grand total	105	74	67
week 19	rural	48	30	28
Week	Place	No. of PHUs	no. of PHUs reporting	no of PHUs reporting on time
week 19	urban	57	42	29
	grand total	105	72	67
week 20	rural	48	35	26
	urban	57	45	36
	grand total	105	80	61
week 21	rural	48	29	18
	urban	57	38	25
	grand total	105	67	43
week 22	rural	48	24	12
	urban	57	38	25
	grand total	105	62	37
week 23	rural	48	28	16
	urban	57	37	24
	grand total	105	65	40
week 24	rural	48	27	15
	urban	57	39	27
	grand total	105	66	41

Source; District Surveillance Office

Table 4.9 summary of key findings at surveyed reporting sites

Findings	Statistics
Total sites surveyed	112
Total respondent sites	31
Self-reported compliance to reporting	25 (80%)
Mean score on notifiable diseases knowledge by sites	60%
Notifiable diseases manual availability at sites	12 (38.7%)
Stating of case definition using cholera as a cases study	22 (70%)
Availability of case definition charts	19 (61.2%)
Sites asking for monetary incentives for motivation	14 (45%)
Faulty surveillance phones reported by sites	14 (45%)
Total number of staff reported to be on payroll	258
Number of staff on government payroll	206 (80%)
Number of staff not on government pay roll	52 (20%)

A total of 112 reporting sites were contacted for assessment on reporting practices and 31 sites responded with full participation in the survey. The number of sites that self-reported compliance with reporting practices was 25 (80%). Notifiable diseases manual was available at 12 (38.7%) of the sites surveyed. Case definition for Cholera was correctly stated by 22 (70%) of the sites and the case definition charts supplied by the Ministry of Health and Sanitation was reported by 19 (61.2%) of the sites. In addition none of the sites had any soft copy of the notifiable diseases manual. Sites asking for monetary incentives due to work load burden were 14 (45%) and those that reported

faulty surveillance phones were also 14 (45%) and stated that this affected their weekly and reporting to the district surveillance unit at regular intervals.

Another deficiency of the system can be shown in tables 4.10 and 4.11 below with Cholera sample characteristics handled at Central Public Health Reference Laboratory (October to December 2012) and line listings and aggregate data of epidemiological weeks 25 to 42 in 2012 at the DHMT Western Area

Table 4.10 Cholera sample characteristics handled at CPHRL (October to December 2012)

Variable	Western Area samples sent to Central Public Health Reference Laboratory (CPHRL)
Total number of cholera cases	15
Age distribution	
Under 5 years	1
5 to 20 years	6
21 to 40years	5
Over 40 years	3
Age not reported	0
Sex distribution	
Female	8
Male	7
Sex not documented	0

Following the outbreak of cholera in 2012 which has not been officially declared over, the public health authorities agreed that each district will on a weekly basis send 20 samples each (rectal swabs) to the Central Public Health Reference Laboratory (CPHRL) for testing in order to declare the outbreak over. This has however not been happening as described in the data Table 4.10. The Cholera samples sent to the Central Laboratory for analysis was far below the expected numbers. If sampling had been going as stipulated by the authorities the CPHRL should have handled a total of 3120 (rectal swabs) samples between October 2012 and December 2012. This is a period of twelve weeks and 13 districts to report, so each week there should have been 260 rectal swabs.

Table 4.11 Shows Discrepancies between line listings and aggregate data of epidemiological weeks 25 to 42 in 2012 at the DHMT Western Area

Epidemiological weeks	Line list	Aggregate form	Dicrepancy
wk25	11	11	0
wk26	18	25	-7
wk27	45	45	0
wk28	178	189	-11
wk29	632	660	-28
wk30	877	955	-78
wk31	1140	1140	0
wk32	1450	1459	-9
wk33	1216	1200	16
wk34	1297	1240	57
wk35	1015	1117	-102
wk36	714	903	-189
wk37	645	757	-112
wk38	610	621	-11
wk39	411	476	-65
wk40	332	382	-50
wk41	246	252	-6
Epidemiological weeks	Line list	Aggregate form	Dicrepancy
wk42	163	178	-15
TOTAL	11000	11610	-610

Source; District Surveillance Office

Table 4.11 clearly shows a discrepancy between aggregated and line listed data with a total difference of 610 cases that cannot be reconciled this may be due to underreporting or not recording correctly within the surveillance system.

CHAPTER 5

5.0 DISCUSSION

Since the advent of peace in 2002 and the adoption of the IDSR in 2004 and its full implementation in 2005 the Ministry of Health and Sanitation (MoHS) through the DPC has been trying to carryout diseases detection amidst scarce resources. Before the implementation of the IDSR in 2004 the country had many vertical reporting systems and it still is the case with some non-governmental organizations which are still not under the national surveillance system especially the private practitioners. The challenges of a vertical reporting system still remains though it is much reduced than in 2004, there are still none state actors establishing parallel systems, using community health workers. In spite of these challenges the performance of the routine health information systems still needs to be monitored and evaluated. The willingness of stakeholders can be seen in the enthusiasm to participate in this evaluation and can also be seen as their willingness to improve on the surveillance systems performance.

The private sector remains a challenging area to gather data as many people with better socioeconomic standing will rather go to these places than the public sector and many private practitioners feel there is no purpose in reporting cases because little or no public health action could result from it even when reported to relevant authorities. More collaboration is needed between the public and private sector for surveillance to be very effective in the country and for such perceptions to be dispelled.

On the notifiable diseases list conditions are reportable on clinical grounds alone even without laboratory testing yet some peripheral health units (PHUs) are hesitant to

classify a case because of unavailability of test kit e.g. cholera because of unavailability of rapid diagnostic tests to confirm cholera cases during outbreaks some of the cases are not reported as cholera. At the peripheral levels the objective and purpose of the disease notification system is not fully understood which is an indication of lack of information flow to the other levels of the health care system.

Data collected by the surveillance system could be used for many other purposes but at present the information derived from it is mainly for response to outbreaks (e.g. cholera) and to fulfill statutory reporting requirements. The research revealed that the usefulness of the system is mostly to detect cases and respond to outbreaks. The usefulness of the system is mostly based on the fact that it detects diseases. This however, could be much better and more meaningful if the data collected has specialized trained personnel e.g. epidemiologists and microbiologist within the system to analyse the data which in turn could yield more useful results for planning and policy.

Surveillance review meetings are held quarterly within the public sector by both the district and national surveillance officers. This type of meeting is lacking, between the public and private sectors which leads to lack of information sharing between the two sectors. The incorporation of the private sectors in routine reporting is being negotiated by the Directorate for Disease Prevention and Control. In fact a Memorandum of Understanding has been signed between the DHMT and some private health facility within the Western Area to comply with the notification requirements. The organizational structure of the disease notification system conforms to ideal routine information system design.

However, the clinicians rely on their subordinates to mostly do the reporting of notifiable diseases to the district surveillance officers. The cooperation however,

between the district and peripheral personnel is cordial. The disease notification system within the district as well as the data submission process is flexible.

Data quality is poor; with incomplete and untimely reporting being a challenge, as shown in the results section some diseases have key variable sections being left-out as blanks these should be avoided if the data is to be used as information for timely intervention. The quality of surveillance data is challenging and many stakeholders are skeptical about the validity of the data. An example of incompleteness of reporting is in chapter four Table 4.3 where the date of disease "onset date" was missing in 13(81%) out of 16 cases registered for influenza in the Western Area Urban.

If compliance was being monitored this would have been noted, compliance with notification is not being monitored on a checklist of reporting units.

The positive predictive value of disease notification gives a direct indication of resources expended in a surveillance system. In system based on clinical suspicion rather than laboratory result there is the potential for high number of false positives.

Lack of compliance in notification of diseases by reporting sites was clearly stated by all disease control coordinators interviewed as a very challenging area for effective surveillance

The primary health care survey yielded a low (39.2%) response rate. There may have been non-response bias where practitioners not participating in interviews were systematically different from respondents in that their practices were busier.

Being that the median number of patients seen by respondents (medical prqactitioners) is 30 for out patients and 35 for in-patients in the facility this may represent busy practice and high workload.

Even though there was risk of participants terminating the interviews almost all interview were completed. There may have been less interview credibility than in-person interviews. Another limitation of the survey is that potential respondents were limited to those whose details were in the database (staff list of clinicians in the MoHS).

There are many aspects of the survey which the DHMT should consider. A list of 19 diseases was presented to the respondents; four of them were notifiable and nine were not. Three of the four notifiable diseases listed were identified as notifiable by at least half of the respondents namely; Meningitis, Cholera and Measles. However, for Influenza which is a notifiable disease most respondents said they did not know whether it was notifiable or not.

Out of the nine non-notifiable diseases presented in the list namely; Malaria, food poisoning, Pertussis, Rheumatic fever, Hepatitis A, Haemophilus Influenza type b, Mumps, congenital Syphilis and Varicella; all respondents knew that Malaria is not notifiable except two whilst four of them did not know at all whether it was notifiable or not. Most of the respondents said that Pertussis was notifiable even though it is not notifiable under the statutory reporting requirements. Half of all respondents also thought that Hepatitis A was notifiable when it is actually Hepatitis B that is notifiable. Half of respondents also thought that Haemophilus Influenza type b is notifiable when it is not. For both Rheumatic fever and Congenital Syphilis, most responded that they did not know whether it was notifiable or not.

From the above result it is clear that there is an assumption on the part of the clinicians interviewed that they know the notifiable conditions whereas they don't.

Upon the termination of the interviews respondents were asked whether they had questions regarding communicable diseases or reportable medical conditions none of them asked they only expressed interest to further their careers in public health

CHAPTER 6

6.0 CONCLUSIONS AND RECOMMENDATIONS

This evaluation has revealed strength and weakness in the notifiable diseases surveillance system in the Western Area of Sierra Leone. The personnel working in the notification system appear to be dedicated, informed and conscientious; though the culture of monetary incentives for motivation to work is widely shared.

This research however, suggests that there is suboptimal use of the information for action in certain areas. The completeness and accuracy of notification data is not sufficient to give a true picture of disease burden in the district due to underreporting by some reporting sites

Identification of the threats to public health such as emerging and reemerging diseases could likely be through routes order than the notifiable diseases surveillance.

The assessment is intended to enlighten policy makers on the current state of the communicable diseases surveillance system in the district. It highlighted areas in which improvements can be made as well as reinforce successful practices. The communicable diseases surveillance system forms an integral part of the health system and public health planning and implementation.

A huge investment over a long period of time is required to make the system operate optimally and remove deterrents towards achievement of a robust disease surveillance and laboratory capability.

Since the goal of the notifiable diseases surveillance is to guide policy makers the following recommendations have been made;

1. The District Health Management Team should carry out Evaluation of the Notifiable diseases surveillance system at regular intervals and the result of this research could be used as a baseline for such assessment.

2. Due to the low density of medical doctors in the country, the surveillance system must continue to train and build capacity of existing health personnel in the country, whilst the Ministry of Health and Sanitation in conjunction with the Ministry of Education must also promote the training of medical doctors to offset the low ratio of physician to population figures currently trending in the country.
3. The National Surveillance Unit should involve the private sector practitioners in their quarterly surveillance review meetings in order to facilitate the private practitioners compliance with notifiable disease reporting
4. A softcopy of the notifiable diseases should be distributed to all the reporting sites by the DHMT
5. Regular short courses should be organized by the National Surveillance Programme office to train all disease surveillance personnel on epidemiology and data analysis.
6. The current list of notifiable medical conditions should be reviewed periodically. There is a need for explicit case definitions to clarify what should be reported
7. The communicable disease control line lists of notification only includes the "date of onset" of illness but not "date of receipt" of notification forms.

Therefore retrospective determination of delays is impossible without this very important information. Incorporating this into the health information system would be valuable for prospective analysis

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LIST OF APENDICES

***APPENDIX 1*: District Communicable Disease Control Coordinator Questionnaire**

DISTRICT COMMUNICABLE DISEASE CONTROL COORDINATOR QUESTIONNAIRE

Respondent:
Location(District, National e.t.c):
1. What is the purpose of the notifiable disease surveillance system? …….
2. Do you have written documentation of the objectives of the surveillance system? ☐ Yes ☐ No ☐ Don't Know
3. What is the data you collect used for? ……..
4. Who uses your data? ……
5. Do you have a list of case definitions available to you? Yes ☐ No ☐ if so, from where? ……

6. What is your authority for data collection?

   ……

7. Where does your department reside within the notifiable disease system?

   ……

8. To what extent is disease notification at your level integrated with other systems? ……

9. Do you have a flow chart of your notifiable disease system for your district?

   ☐ Yes ☐ No If so, please could I have a copy?

B. Components of system

1. Could you describe the population under your surveillance with regards to notifiable diseases?.....

2. How frequently do you collect /receive data on notifiable diseases?

   .....

3. How do you collect notifiable disease data?

   ……

4. Who reports notifiable diseases to you/ what are your reporting sources of data? ……

5. With regards to data management:

   a. Who enters the data?

      ……

   b. What coding system is used to enter data?

      ……..

c. Is the data checked or validated? if so how?

……..

d. Where are your data stored?

……..

e. Do you make backups of data? If so how?

……

…

6. How are your data analysed?

……

7. To whom do you disseminate your data and how?

……..

8. How do you ensure patient privacy, data confidentiality, and system security? …….

9. Do you make use of a records management program?

.....

C. Systems resource requirements

1. Under whose budget does notifiable disease surveillance fall?

……

2. How many personnel are involved in notifiable disease reporting at your level? ……

3. What percentage of your time are spent on notifiable disease surveillance and follow up?

……..

4. What other resources are needed for notifiable disease reporting?

a. Travel
b. Training
c. Supplies
d. Computer and other equipment
e. Related services
5. Can you describe any instances when your notifiable diseases led to changes in policies or programs in your district?
D. System attributes
1. How much information is necessary to verify a case? ……
2. How many forms need to be completed per case of disease?
a. At facility level
b. At district level
3. How many reporting units do you have in your district? …….
4. How much follow up is necessary for notifiable diseases?
a. Priority conditions
b. Routine notifiable conditions
5. How easily can you add a disease onto your reporting system? ……
6. How willing are reporting units to submit information to you? …….
7. How do you check timeliness and completeness of reporting? …….

8. How often on a monthly basis is your system down? ……
9. How long on average, does it take from receiving data to processing and releasing it?.....
10. Do you personally give any feedback to your reporting units and if so, how? ……
11. What do you feel was your units greatest achievement? ……
12. What do you feel is your units greatest challenge? ……

***APPENDIX 2*: General practitioners survey questionnaire**

PUBLIC PRACTITIONER SURVEY QUESTIONNAIRE

Informed consent

Dear Doctor

You are requested to participate in this questionnaire survey as part of an evaluation of the Notifiable Disease surveillance system in Western Area and the rest of the country 2014. This research is being conducted by Mr. Dauda Sowa as part of his Mphil in Applied Epidemiology and Disease Control.

The purpose of the study is to describe the current state of the notifiable disease surveillance system in Western Area and the rest of the country and to make due recommendations for its improved performance.

This telephonic administered questionnaire will take about five minutes to complete and all information obtained will be entered electronically into a database that will not contain any information that could identify you personally.

Note:

The implication of continuing with this telephonic interview is that informed consent has been obtained from you. Thus any information derived from your form (which will be totally anonymous) may be used for e.g. publication, by the investigator in charge. As all information or data are anonymous, you must understand that you will not be able to recall your consent, as your information will not be traceable. If you should wish to stop or terminate this telephonic interview at any stage, you are free to do so. If you

have any queries with regards to this research Mr. Dauda Sowa may be contacted on 076- 232- 480.

Yours faithfully

Mr. Dauda Sowa

Questionnaire

1. GPID……
2. In which district is your practice situated? ....
3. How many doctors are working at your current practice ……..
4. In what year did you qualify as a doctor? ……..
5. Please list any additional medical qualifications you obtained after your medical graduation:…… …… ……

6. What is the average monthly household income of your patients?

   .....

7. On average, how many patients do you personally see at your practice during the course of a

   day?.....

   .....

8. What percentage of your professional time, if any is spent in public sector practice?

   ……

   ……..

9. Do you always report mandatory notifiable medical conditions to the DHMT of health? Y ☐ N ☐

10. Why not? .....

11. Do you currently have a case based form in your practice?

    Y ☐ N ☐

12. Did question 11 require a prompt? Y ☐ N ☐

13. When was the last time you had personal communication with your district communicable disease control coordinator or someone from that office?

    ……

    ……

14. Which notifiable disease have you seen within the last year? …… ……	
15. Which of the following conditions are notifiable by Sierra Leonean law? (please answer yes/no/don't know)	
a. Varicella	Y N DK
b. Congenital Syphilis	Y N DK
c. Mumps	Y N DK
d. Haemophilus Influenzae type b	Y N DK
e. Hepatitis	Y N DK
f. Rheumatic fever	Y N DK
g. Pertussis	Y N DK
h. Food Poisoning	Y N DK
i. Viral Influenza	Y N DK
j. Measles	Y N DK
k. Malaria	Y N DK
l. Cholera	Y N DK
m. Meningitis	Y N DK
16. Have you seen any of the following diseases in your practice over the past year? (yes/no)	
a. Measles	Y N
b. Malaria	Y N
c. Viral hepatitis	Y N
d. Cholera	Y N

e. Meningitis	Y N
17. Do you make use of cholera rapid test in your practice Y N	
18. If you saw a meningococcal meningitis case in your practice now, how would you go about reporting/referring it? …… ……	
19. Do you have guidelines on reporting of notifiable diseases in your practice? Y N	
20. Which of the following means of communication do you have in your practice?	
a. Land line	Y N
b. Cellular Phone	Y N
c. Work internet access	Y N
d. Home internet access	Y N
e. Work e-mail address	Y N
f. Home e-mail	Y N
g. Fax	Y N
21. Do you ever access the internet for medical information Y N	
22. Which websites do you use for medical information?	
23. Where do you obtain information on communicable diseases? Internet…. Popular media……., Textbooks, Journals……., Others…….	

24. In your experience, would you rate the communicable disease response in your district as good, adequate or poor or have you had no experience with it? Good……, Adequate……, Poor……., No Experience…….

APPENDIX 3 **Western Area reporting sites questionnaire**

Respondent Site:
Location(Urban, Rural):
1. What is the notifiable disease surveillance system? …….
2. Do you have written documentation of the objectives of the surveillance system? ☐ Yes ☐ No ☐ Don't Know
3. Have you been trained on IDSR ……..
4. Do you have a notifiable diseases manual at your site ……
5. Do you have a list of case definitions available to you? Yes ☐ No ☐ if so, from where? ……
6. Are you supervised by the district regularly? ……
C. Systems resource requirements
7. How many personnel are involved in notifiable disease reporting at your level? ……

8. What percentage of your time are spent on notifiable disease surveillance and follow up?

   ……..

9. What other resources are needed for notifiable disease reporting?

   f. Travel

   g. Training

   h. Supplies

   i. Computer and other equipment

   j. Related services

D. System attributes

13. How much information is necessary to verify a case?

    ……

14. How many forms need to be completed per case of disease?

    c. At facility level

    d. At district level

15. How many patient do you see per day on the average?

    ……

16. How much follow up is necessary for notifiable diseases?

    c. Priority conditions

    d. Routine notifiable conditions

17. How willing are you to submit reports to the DHMT?

    ……

18. How often do you report on time to the DHMT?

    ……

19. How often on a monthly basis fail in reporting? ……
20. What do you feel was your units greatest achievement? ……
21. What do you feel is your units greatest challenge? ……

APPENDIX 4 Resolution AFR/RC43/R7

(1993) dedicated the subsequent five years to the prevention of the occurrence of epidemics of communicable diseases through improved epidemiological surveillance systems in selected African WHO member states and revealed the following problems:

1. Vertical surveillance established as part of specific disease control programs sometimes resulted in duplication of efforts (both in reporting and administration)

2. There was often a delay in reporting of cases fitting standard case definitions by health care workers.

3. There was a deficit in interpretation and use of surveillance data at district level as data were commonly submitted to provincial or national levels without further analysis and feedback was generally poor at all levels

4. Little attention had been given to opportunities for integration of diseases surveillance activities

5. Many surveillance systems did not include surveillance of childhood diarrhea or pneumonia which both carries a high burden of diseases in Africa.

6. Surveillance data were not used sufficiently for the evaluation of programs and public health intervention

7. Laboratory involvement in surveillance was inadequate.

8. There was insufficient supervisory support for surveillance and timeliness and completeness of reporting was lacking.

APPENDIX 5 The specific objectives of integrated disease surveillance are to:

1. Strengthen the capacity of Sierra Leone to conduct effective surveillance activities
2. Integrate the multiple programme surveillance systems so that forms, personnel and resources can be used more efficiently and effectively
3. Improve the use of information for decision making
4. Improve the flow of surveillance information between and within levels of the health system
5. Improve laboratory capacity in identification of pathogens and monitoring of drug sensitivity
6. Increase the involvement of clinicians and other health workers in the surveillance system.
7. Emphasize community participation in detection and response to public health problems
8. Strengthen the involvement of laboratory personnel in epidemiologic surveillance.\

APPENDIX 6 The list is recommended based on the local epidemiological situation

It is adapted to Sierra Leone by WHO sierra Leone and the Disease Prevention and Control Unit of the Ministry of Health and Sanitation from the recommended priority diseases list for IDSR by WHO/AFRO

Revised List WHO/AFRO IDSR Priority Diseases, conditions and events

Epidemic-Prone and IHR recommended Diseases, conditions and events	
1. Acute watery diarrhoea (Cholera suspected) 2. Acute bloody Diarrhoea (Shigella suspected) 3. Measles 4. Meningitis 5. Plague 6. Viral hemorrhagic fevers (Lassa Fever, Ebola, Marburg, Rift valley fever,) 7. Human influenza caused by a new Subtype	8. Yellow Fever 9. SARS 10. Smallpox 11. Dengue 12. Trachoma 13. Anthrax 14. Typhoid fever 15. Hepatitis –B
Diseases Targeted for Eradication and Elimination	
16. Poliomyelitis 17. Guinea Worm 18. Leprosy	19. Yaws 20. Neonatal tetanus 21. Noma
Other Diseases of Public Health Importance	
22. Diarrhoea in children < 5 years of age 23. Pneumonia in children <5 years of age 24. HIV/AIDS 25. Malaria 26. Onchocerciasis 27. Sexually transmitted infections (STIs) 28. Trypanosomiasis 29. Schistomiasis 30. Soil transmitted helminths	31. Tuberculosis 32. Asthma 33. Diabetes mellitus 34. Epilepsy 35. Hypertension 36. Sickle cell disease 37. Malnutrition

Note: While prioritizing the national priority list of diseases for the integrated disease surveillance, the MOHS officials have ensured the diseases in the epidemic prone and eradication/elimination categories are included because of their international implications. The Ministry of Health also included diseases under the category of the other diseases of public health importance.

APPENDIX 7 Evaluation attributes

(a) Attributes evaluated

i. **Usefulness;** A public health surveillance system is useful if it contributes to the prevention and control of adverse health-related events, including an improved understanding of the public health implications of such events. A public health surveillance system can also be useful if it helps to determine that an adverse health-related event previously thought to be unimportant is actually important. The communicable disease control respondents were questioned to gain a better understanding of the system´s usefulness

ii. **Simplicity;** This attribute of the system refers to both its structure and ease of operation. A flow diagram to demonstrate the processes in the system has been constructed from the information provided by disease control coordinators during interview.

iii. **Flexibility;** This refers to the system being able to adapt to changing information needs or operating conditions with little additional time, personnel, or funds. Interviews with communicable disease coordinator in conjunction with retrospective review of published materials were used to assess the introduction of new medical conditions into the reporting system.

iv. **Data quality;** This reflects the completeness and validity of the data recorded in the notifiable disease surveillance system. The completeness was measured by calculating the percentage of blank lists in surveillance line lists (as

transcribed from notification forms). The validity of the data may be tested by repeated interviews of the patients on whom the notification data is collected but this is beyond the scope of this research.

v. **Acceptability;** Acceptability reflects the willingness of persons and organizations to participate in the surveillance system. This attribute was ascertained through interviews with systems participants

vi. **Sensitivity;** The sensitivity of a surveillance system can be considered on two levels. First, at the level of case reporting, sensitivity refers to the proportion of cases of a disease detected by the surveillance system. Second, sensitivity can refer to the ability to detect outbreaks, through trends in the notification data. This research measures sensitivity using Cholera Data by comparing laboratory diagnosis and the notifications made to the health authorities.

vii. **Positive predictive value;** Positive predictive value (PPV) is the proportion of reported cases that actually have the health-related event under surveillance. The positive predictive value has a direct bearing on the quantity of resources expended on response to positive cases. The PVP was determined by dividing notified case numbers by the sum of notified case numbers with corroborating positive laboratory results and those without.

viii. **Representativeness;** The extent to which the surveillance system accurately describes the medical conditions over time and their distribution in the

population by person and place is an indication of its representativeness. This assessed by comparing the characteristics of reported events to the expected occurrence of events based on the existing epidemiological knowledge.

ix. **Stability;** Stability refers to the reliability (i.e., the ability to collect, manage, and provide data properly without failure) and availability (the ability to be operational when it is needed) of the public health surveillance system. This was assessed by interviewing the communicable disease personnel on the frequency of times the system has unscheduled outages and down times for the system's computer.