Disease Surveillance Practices Among Public And Private Health Facilities In Two Local Government Areas in Lagos State, Nigeria.

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Certification

I certify that this research project titled **Disease Surveillance Practices Among Public And Private Health Facilities In Two Local Government Areas Of Lagos State, Nigeria** was carried out by ChristianahOlubukolaOYEYIOLA under my supervision.

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Dr T. A Olowolafe. Date

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Dedication

I dedicate this work to God Almighty and my entire family, especially my husband and children including Miss Oyinlola whose support and encouragement is unquantifiable.

Acknowledgement

I thank the giver of life for the grace and strength to go through this programme.

I thank my husband, Hon. T.J Oyeyiola whose immeasurable support and encouragement kept me going even when things became rough.

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Even though the above mentioned instruction and persons have assisted in the process of this research work, I alone stand responsible for the errors, if any, found in this work.

Abstract

The level of understanding of disease surveillance officers, designated health care workers in health facilities is critical when considering the reason for not reporting or under reporting of diseases of public health importance. This was a cross-sectional study of 238 public and private health facilities in Lagos State, Nigeria. It was conducted to examine the level of compliance in disease surveillance reporting and the factors that influence its involvement.

Disease reporting using the IDSR tool has been observed to be poor. This is because most health facilities do not see the surveillance report as important and those who report do so late. The wrong reporting system observed also points to the fact that a lot of diseases are under reported giving the surveillance The complexity of the notifiable illness monitoring system, which has various inputs, processes, outputs, and feedback components, made it necessary to concentrate on only a few key areas. The primary objective is to analyze the performance and capacity of the notification system through a thorough qualitative evaluation of a few selected notification system components.

In public health, underreporting and late reporting frequently impair the proper response.

Justification

Lagos state is the industrial nerve centre of Nigeria and was the epicentre of the 2014 Ebola outbreak in Nigeria as it is also for the Coronavirus Disease (COVID-19) outbreak. With a population of about 21 million, it is classed as a megacity and has the highest population density. Lagos was the entry point of the index case of Ebola virus disease as well as COVID-19.13 The

state's capacity for these responses need to be evaluated noting the good practices as well as identifying areas of challenge.

According to T.A Onajole, in Nigeria, Lagos and Oyo states have recorded several cases of disease outbreaks lately despite the funding and capacity building for a robust IDSR system. Some of the challenges observed include poor attitude of personnel, knowledge gaps, lack of supportive supervision as well as lack of data banks that affects reporting at all levels.

The knowledge on disease notification is very significant in order to report notifiable diseases as the level of understanding of clinicians, disease surveillance officers, health facility surveillance focal persons or designated health care workers in each facility is key when considering the reason for not reporting or under reporting of diseases of public health importance.

Mushin and Alimosho LGAs were randomly picked for this research because there is not enough resources to carry out this research in the whole of the state and it is believed that the sample will give a good representation of diease surveillance knowledge and practice for the entire state.

Objectives of the study

This research aimed to determine the knowledge and practice of IDSR by surveillance focal persons in two LGAs in Lagos State.To also to measure the level of health workers' knowledge about surveillance as well as their level of reporting priority diseases.

Study Design

A cross-sectional study design was used.

Data collection

Data was collected using a semi structured self administered questionnaire.

Data Analysis

Data collected were entered into Microsoft excel and analysed using SPSS 20 statistical software. The data analysed was presented as frequency tables, chi square test will be used to test for association between variables. Similarly, quantitative variables were described using measures of central tendency (mean and median) and measures of dispersion (range and standard deviation) as appropriate. Level of significance is set at 5% ($P < 0.05$).

Results:

More than half of the respondents (57.3%) were able to correctly highlight that the agency for reporting priority diseases was the Primary Health Care Department (LGAPHC). Over three quarters of the respondents were able to correctly highlight Tuberculosis, Diarrhoeal diseases and Cerebrospinal meningitis as diseases of public health (91.8%, 78.4%, and 83.2% respectively). Majority of the respondents, 203(87.5%) were aware of the Integrated Disease Surveillance Response (IDSR), though less than 15% (13.3%) of those who were aware knew the number of IDSR Reportable Diseases in Nigeria. The highest frequency of respondents, which is 102 (44.2%), had fair knowledge of IDSR, 95 respondents (40.9%) had good knowledge, and just 35 respondents (15.1%) had poor knowledge meaning that the knowledge and attitude of health care workers in Lagos state is fair and this can be due to the presence of certain factors as seen in the process of conducting this research.

Conclusion: The presence of training, respondents' knowledge of Integrated Disease Surveillance and Response, attendance at Integrated Disease Surveillance and Response training in the previous year by 46.6 % of the respondents organized by any of the various bodies (LGA, SMOH, NPHCDA, FMOH, NGOs), the recording of diagnoses of cases of priority diseases in accordance with the standard case definition (70.3% of therespondents), and regular supply of IDSR tools (65.9%) were all factors that were associated with improved practice of IDSR (78%).

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List Of Acronyms

List	Meaning
LG	Local Government
CDC	Centre for Disease Control and Prevention
DSN	Disease Surveillance and Notification
IDSR	Integrated Disease Surveillance and Response
DSR	Disease Surveillance and Response
EPR	Epidemic Preparedness and Response
FMOH	Federal Ministry of Health
HF	Health Facility
LGA	Local Government Area
NHMIS	National Health Management Information System
NPHCDA	National Primary Health Care Development Agency
PHC	Primary Health Care
SMOH	State Ministry of Health
WHO	World Health Organization
DSNO	Disease Surveillance and Notification Officer
PHSWOW	Public Health School Without wall
FELTP	Field Epidemiology and Laboratory Training programme
ED	Emergency Department
NNDSS	National Notifiable Disease Surveillance System
BRFSS	Behavioural Risk Factor Surveillance Syste

Chapter One

Introduction

1.1 Background to the study

Disease surveillance is an "ongoing systematic data collection, collation, analysis, and interpretation, and the transmission of information to those who need to know so that action may be made." It is a constant examination of how illnesses develop and health-related events in order to quickly intervene and treat illnesses[1]. Disease surveillance is a method used in epidemiology to track the spread of illnesses and identify patterns in their development. The main goal of disease surveillance is to anticipate, monitor, and reduce the damage brought on by outbreak, epidemic, and pandemic conditions as well as to learn more about the causes of these events[1,2,3]

Decision-makers require competent staff personnel to deliver scientifically sound surveillance information and as well as to explain the findings information intended for action. For logical planning, execution, and intervention, epidemiologists and surveillance personnel are essential. The tool for estimating the health state and behavioral patterns of the populations serviced by health, financial, and charitable organizations is public health surveillance [2]. The capability of surveillance to directly quantify population activity makes it valuable for assessing both the requirement for interventions and the immediate benefits of actions. By providing prompt, helpful substantiation, surveillance aims to equip decision-makers in order to lead and manage more successfully [3].

Top administrators in developing country health departments and finance as well as donor organizations are increasingly realizing the value of data from efficient monitoring systems for allocating resources and assessing programs. For instance, the HIV and SARS epidemics highlighted the crucial role that monitoring plays in safeguarding both independent countries and the world society [1,4]. Brazil and Argentina decided to utilise World Bank loans to create surveillance capacity in 2005; China quickly started to increase its surveillance and intervention programs through its Paddock Epidemiology Training Program (FETP); and the United States Agency for International Development (USAID) remodeled its surveillance approach to concentrate on the use of data to enhance public health interventions (USAID 2005).Additionally, the World Health Organization (WHO) recommended that member nations must have important personnel and fundamental capacities in surveillance, according to the requirements for executing the 2004 draft modified International Health Regulations [4,5].

Following the determination of the 48th assembly, in the year 1998, WHO/AFRO began advocating for all member states to adopt Integrated Disease Surveillance and Response (IDSR) as the primary strategy to strengthen the national disease surveillance system with the following goals: strengthen divisional surveillance and response for prioritized diseases, incorporate laboratory with laboratory help, reduce unnecessary in reporting, pool resources among disease management programs, and translate surveillance data into action [2].

In Nigeria, surveillance and notification of diseases involve the immediate notification of epidemic prone diseases, diseases targeted for elimination and eradication and monthly notification of other diseases of public health importance.2 For a disease surveillance and notification system at the LGA level to be functional and effective in early detection of epidemic-prone diseases, clinicians remain indispensable to effective reporting because they can detect unusual disease manifestations and conditions that rely on clinical signs not related to laboratory testing, clusters of illnesses through history taking and clinical judgments.

Presently in Nigeria, the collection, collation, analysis and interpretation of disease-related data in public health institutions are often incomplete and untimely partly because of poor awareness among clinicians of the importance of their role in disease surveillance and notification activities for the prevention of infectious disease outbreaks. Many outbreaks which have occurred in Nigeria over the years have been attributed to clinicians either not reporting or reporting late when the index cases of epidemic prone diseases present in the health facility.

Lagos state, located in the southwestern region of Nigeria and the industrial nerve centre of the country, has been the epicentre of the COVID-19 pandemic in the country, similarly as it was for the EVD outbreak in 2014 . With a population of about 21 million, it is classed as a megacity and has the highest population density in Africa. Lagos was the entry point of the index case of EVD and thus there were already concerns about the entry of COVID-19 into Lagos before it was declared a pandemic and the State's capacity for response. Measures to manage the outbreak of a novel disease such as COVID-19 are reliant on a State's existing operational readiness and capacities to prevent, detect and respond to public health emergencies.12

A strong network of motivated individuals, a clear case description and reporting procedure, an effective communication system, fundamental epidemiological principles, laboratory support, and quick reaction are all essential components of IDSR. (See Figure 1 in appendix.)

Because the surveillance system is centered on gathering only the information necessary to fulfill goals for disease control, well-developed surveillance efforts in one area may operate as driving factors for enhancing other surveillance systems, offering potential synergies and common resources. The inputs, outputs, as well as feedback associated with the disease notification system can be explained. The input includes all of the actions that occur after a person with a notifiable medical condition is first identified and presented to a health facility or community, including data collection, collation, analysis, and interpretation, as well as dissemination of findings with the aim of promoting public health action [2,6,7] . The outputs include reports, data banks containing information on notifiable medical disorders, and public health actions (such as outbreak investigations).

The feedback loop, which is a component of monitoring and assessing the effectiveness of surveillance system performance, includes disseminating data to all levels of health care service delivery. Beyond the internal environment, the system results also include efficient public health interventions, and disease prevention and control of epidemic-prone diseases. A decrease in morbidity and death linked to the notifiable medical disorders should result from such action. The responsibility to inform the department of health at the LG through the Local Government Area Disease Surveillance Notification Officer of a patient's presentation at their first healthcare facility or professional with a notifiable sickness lies on them. It is the obligation of a community

member to alert the appropriate authorities in the event that a death brought on by such a sickness occurs in a communal setting [7].

Rapid communication is required during an outbreak by phone calls and text messages, but mostly, the community and the healthcare facility where the patient is visited can generate IDSR 002 forms on a weekly and IDSR 003 forms on monthly basis, respectively.

Acquiescence with disease observation and notification schemes varied greatly across the Nigerian states. This may possibly be an indication of how differently state government agencies that are in charge of managing disease surveillance in the states engage with and enforce disease surveillance priorities. The comparatively strong performance in Lagos State compared to the other states may be a result of the response to the Nigerian EVD outbreak in 2014 that sparked the pandemic [8].

The FMOH in Nigeria is in charge of overseeing the country's healthcare system, and since 2005, it has used the Integrated Disease Surveillance and Response (IDSR) method to carry out the IHR. The World Health Organisation Regional Office for Africa had approved the IDSR as a legitimate method of putting the IHR into practice in 1998. [4,9] It was widely adopted, with more than 90% of African nations doing so. The entire health facilties in the country are required by the strategy of IDSR to participate in a surveillance system that requires regular reporting of forty-one priority diseases and conditions to thesystem of IDSR as necessary, on a daily basis (epidemic-prone diseases), weekly (diseases focus on elimination or eradication), or month to month (other significant diseases, events, or conditions that are relevant to public health), using the IDSR001, IDSR002, and IDSR003 forms, respectively [10, 11].

1.2 Statement of the Problem

Disease reporting using the IDSR tool has been observed to be poor. This is because most health facilities do not see the surveillance report as important and those who report do so late. The wrong reporting system observed also points to the fact that a lot of diseases are under reported giving the surveillance The complexity of the notifiable illness monitoring system, which has various inputs, processes, outputs, and feedback components, made it necessary to concentrate on only a few key areas. The primary objective is to analyze the performance and capacity of the notification system through a thorough qualitative evaluation of a few selected notification system components.

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According to T.A Onajole, in Nigeria, Lagos and Oyo states have recorded several cases of disease outbreaks lately despite the funding and capacity building for a robust IDSR system. Some of the challenges observed include poor attitude of personnel, knowledge gaps, lack of supportive supervision as well as lack of data banks that affects reporting at all levels.13

The knowledge on disease notification is very significant in order to report notifiable diseases as the level of understanding of clinicians, disease surveillance officers, health facility surveillance focal persons or designated health care workers in each facility is key when considering the reason for not reporting or under reporting of diseases of public health importance.

The current best practices for gathering, collating, analyzing, and interpreting surveillance data come directly from a well-thought-out system. Data collection is essential in the public health profession, which is based on evidence, to support the equitable distribution of resources for care and prevention. The minimum requirement for a public health surveillance system is to obtain correct data during collection and collation, and continuing monitoring and intermittent evaluation to assure data accuracy are suggested for all systems.

Mushin and Alimosho LGAs were randomly picked for this research because there is not enough resources to carry out this research in the whole of the state and it is believed that the sample will give a good representation of diease surveillance knowledge and practice for the entire state.

1.4 Aim and Objectives of the study

This research aimed to determine the knowledge and practice of IDSR by surveillance focal persons in two LGAs in Lagos State.To also to measure the level of health workers' knowledge about surveillance as well as their level of reporting priority diseases.

The objectives of this research work are to:

1) Assess the knowledge of IDSR among focal persons in public and private health facilities in Mushin and Alimosho Local Government Areas.

2) Assess the practices of IDSR among focal persons in the public and private health facilities in Mushin and Alimosho Local Government Areas.

3) Determine the level of reporting of notifiable diseases among focal persons in both public and private health facilities in Mushin and Alimosho Local Government Areas.

4) Identify the factors influencing disease notification among focal persons in the public and private health facilities in Mushin and Alimosho Local Government Areas.

1.5 Research questions

1. Do surveillance focal persons have good knowledge of IDSR?
2. Do surveillance focal persons have good practice of IDSR?
3. What is the level of reporting of notifiable diseases in each health facility?
4. What are the factors responsible for under reporting/non-reporting?

1.6 Significance of the study

One reason for underreporting diseases has been linked to health care workers' comprehension of their reporting obligations and standards. In addition, many healthcare professionals in Lagos state are overworked, which causes them to either forget or purposely neglect to report cases or dieases that are notifiable through the IDSR system. In Nigeria, data collection, organization, analysis, and interpretation in healthcare facilities is frequently submitted in part because health-care staff are not sufficiently aware of the significance of this process. The research on DSN in Lagos State will be enhanced by this study. Therefore, in light of the foregoing, a study on the DSN in the chosen LGAs is required. Without a doubt, this study will pinpoint the aggravating

elements, give remedies, and aid in the formation of policy recommendations and suggestions for improving the state's DSN system.

1.7 Scope of the study

This study is limited to two LGAs in Lagos state. it is carried out amongst surveillance focal persons in health facilities or a designated staff. The study will investigate what the knowledge of health care workers about surveillance activities are, their attitude towards reporting of priority diseases and diseases of public health importance as well as their practice of disease reporting to the state through the LGA.

1.8 Limitation to the Study

Because the study was conducted among health professionals, participants' replies were probably influenced by their fear of being wronged by superiors. However, to circumvent this problem, the responders were given the assurance of anonymity and confidentiality in order to allay their concerns.

This study would have been done in all the 20 LGAs in Lagos state but for limited resources.

1.9 Operational Definition of Terms

1. **Disease surveillance:** Disease surveillance is an information-based activity involving the collection, analysis and interpretation of large volumes of data originating from a variety of sources.

2. **Notifiable diseases: This** is any disease that is required by law to be reported to government/ health authorities.
3. **Active surveillance:** By using active surveillance, healthcare professionals and the general public are contacted regularly in order to investigate health issues. Active surveillance is the most efficient and accurate way to obtain health information, but it is also quite costly.
4. **Passive surveillance**: In this arrangement, clinics, hospitals, public health components, or other references submit reports to a health dominion. In order to monitor the health of a community, passive surveillance is a moderately inexpensive way to cover large zones. Data quality and appropriateness are difficult to regulate due to the dependence on data provided by different institutions.
5. **Routine health information system:** This is a passive scheme in which public health workers, medical facilities, and clinics routinely report on illnesses and initiatives.
6. **Health information and management system**: Is a passive structure that allows for the utilization of routine reporting concerning the administrative, logistical, and other activities involved in the management of the clinical and public health systems.
7. **Integrated surveillance:** A mixture of active and passive devices that gather data on various illnesses or behaviors of interest to various intervention programs using a solitary infrastructure. For instance, a system situated in a medical facility may collect data on numerous contagious diseases and accidents.
8. **Priority diseases**: are diseases that have a high potential for causing epidemics or have been targeted for eradication or elimination.
9. **Epidemic**: an outbreak of disease that spreads quickly within a geographical area and affects many individuals at the same time.

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CHAPTER TWO

Literature Review

2.1 Conceptual Studies

An Overview of Disease Surveillance and Notification in Nigeria

Following a significant outbreak of yellow fever in 1986–87 that took many lives in Nigeria and devastated ten of the then–19 states. The country instituted disease surveillance and notification in 1988. Prior to 1988, the nation lacked a coordinated system for illness reporting and surveillance; some states sent weekly, some sent annual reports, and some sent nothing at all. This developed into a significant cause for worry since it prevented access to health data required for prompt response to disease outbreaks [1,2] . Across order to provide a long-lasting solution to illness notification in the nation, the National Task Force on Epidemic Control was established. Low disease surveillance and notification were identified by the National Task Force as a significant national issue and a major barrier to effective disease control in Nigeria [3].

When it was first established, 42 disorders were formally recognized as notifiable for regular monthly reporting; in 1998, the number was reduced to 22. The Nigerian National Council on Health gave its approval for the adoption of the country's current DSN system in 1989 [1,4]. The Integrated Disease Surveillance and Response (IDSR) was adopted as a regional strategy for bolstering the frail national disease surveillance system in the African region at the 48[th] World Health Organization Regional Committee for Africa meeting in September 1998 in Harare, Zimbabwe (Reference document; AFRO/RC48/R2). The goal is to combine various surveillance systems to improve early illness outbreak identification in Africa thus, human alongside with other resource can be employed more effectively and efficiently. After the Integrated Disease Surveillance and Response (IDSR) strategy was adopted by the World Health Organization

(WHO), African region in 1998 as a regional strategy for disease control, Nigeria began efforts towards application of the IDSR plan in June 2000 with an orientationsession conducted to educate national program managers of vertical programs and partners on IDSR. A steering committee on IDSR was established in January 2001 to direct the implementation procedure. Abuja (the Federal Capital Territory) and the Federation's 36 states are all currently putting IDSR into practice [2, 3.]

In contrast to the previous vertical disease surveillance system, which distributed limited resources among numerous disease control programs, the current IDSR strategy in Nigeria is well coordinated and makes efficient use of resources to gather data on communicable disease from a single point of contact at each stage (community, healthcare facilities, LGA, State, and Federal).

Because the local government area level is the first in the Nigerian healthcare system and has full-time staff devoted to all aspects of public health, including monitoring health occurrence in the society, mobilizing public health actions, and utilizing regional resources to protect communities' health, it is crucial to note that the major focus in the IDSR system in country is the local government area (LGA) level. For the IDSR system in Nigeria, the Federal Ministry of Health has chosen forty (40) communicable, non-communicable diseases, and conditions connected to public health. These diseases were chosen based on the following criteria: top causes of high morbidity and mortality in the nation; diseases with potential for epidemics; requirements for international surveillance; the availability of effective control and precautionary intervention attempting to addressing the public health issue they pose; diseases that could be quickly identified using straightforward case definitions; and diseases with intervention programmes supported by the WHO for prevention and control, eradication, or removalAs

shown in Table 1, these illnesses have been divided into three categories: diseases that are susceptible to epidemics, illnesses that are important for eradication and elimination, and other illnesses with a bearing on public health [3, 6,7].

Public health surveillance provides the accurate and scientific data required for well-informed choice and successful public health action. The basic objective of surveillance is to collect information to guide interventions. The development and implementation of surveillance equipment are based on the objectives of public health and the procedures necessary to carry out effective interventions [2].

A surveillance program to track the impact of a tuberculosis control program on the populace, for instance, might only yield data every between one and five years using a series of health and demographic surveys. The basic notion is that different information systems are required for different public health objectives and the actions required to attain them.The kind of action that can be taken, when or how regularly the action needs to be taken, what information is needed to perform as well as monitor such activity, and when or how often that information is needed, should all be taken into consideration when choosing the type of questionnaire or health information scheme.Controlling a disease is the goal of information gathering, analysis, and dissemination [7,8]. If no action is taken, collection and analysis shouldn't be permitted to use up resources. The essential tenet of public health monitoring is that it should be planned and executed to give decision-makers accurate (correct) information as soon as feasible at the lowest cost possible. Giving up accuracy makes sense to increase timeliness and free up resources that may be used for public healthcare interventions because managements are unlikely to have to make adjustments to address minor discrepancies between areas. Based on the potential public

health activities, the utility of the surveillance datacan be seen as immediate, yearly, and archive [8, 9].

2.2 Theoretical Model

Knowledge Of Disease Surveillance

2.2.1 The Disease Surveillance System

Disease surveillance is an epidemiological practice by which the spread of disease is monitored in order to establish the trend of progression. The main role of disease surveillance is to predict, observe and minimize the harm caused by outbreak, epidemic, and pandemic situations, as well as increase knowledge about the factors that contribute to such circumstances. A key part of disease surveillance is the practice of case reporting [9], [1, 4,5].

In modern times, reporting incidences of disease outbreaks has been transformed from manual record keeping to real time reporting.

Hospitals and the community, which would be anticipated to observe the majority of the occurrences, typically contribute to the number of instances, which is then compiled and eventually publicly disclosed. This has drastically changed with the development of modern communication technology. Now, within days—and often even hours—of the occurrence, agencies such as the World Health Organization (WHO) as well as the Centers for Disease Control and Prevention (CDC) may report cases and fatalities from serious diseases. Furthermore, there is a lot of public pressure to release this data as soon as possible and accurately [9].

The World Health Organization is in charge of organizing the international response to serious diseases. The WHO has active groups in many nations where these diseases are present and maintains websites for a variety of diseases.

For instance, the WHO Beijing staff in the early 2004 SARS pandemic published reports every few days again for duration of the illness. The WHO has released comparable updates for H5N1 since January 2004. These outcomes are closely followed and publicly reported [10].

By integrating and simplifying common illness surveillance efforts, the concept and instrument known as Integrated Disease Surveillance and Response (IDSR) aims to encourage the wise use of resources. Many disease control and intervention strategies still rely on their individual disease surveillance systems before the adoption and implementation of the IDSR system in Nigeria, making efforts to increase their capacity to gather trustworthy and timely data so that they may use information to takeactions.However, it is crucial to remember that disease prevention and control goals can only be accomplished when available resources have been devoted to enhancing public health officials' capacity to identify the aimed diseases, obtain laboratory verification of these diseases, and use a threshold to trigger action [10, 11].

2.2.2.1 The Purpose of Disease Surveillance

The main drive of surveillance is to detect where illness organisms, such as bacteria and viruses might be located in order to predict and prevent human illnesses. A key objective of disease surveillance is to ensure good health for all Nigerians by providing a framework and guidance for strengthening skills, providing resources, and preventing, early detecting, and responding rapidly to diseases and conditions that are associated with high mortality and morbidity rates [10].

2.2.2.2 The Broad Objective of IDSR

Through accurate, full, and timely information regarding data gathering and transmission for practical prevention and control of communicable illnesses in the nation, IDSR strives to contribute to a decrease in mortality, morbidity, and disability caused by diseases.

2.2.2.3 Specific Objectives of IDSR (FMOH, Nigeria, 2005)

These are:

1. Integrating various surveillance systems to improve the effectiveness and efficiency of the use of forms, staff, and resources
2. Setting up a working national disease surveillance network that can spot epidemics early enough for prompt action.
3. Promoting improved surveillance data management and information use for disease control initiatives in resource mobilization, planning, implementation, monitoring, and evaluation at all levels.
4. Building a laboratory network for IDSR at the federal, state, and local government levels as well as enhancing the ability and participation of laboratories for disease surveillance.
5. Aiding in the development of an efficient communication network for the dissemination of epidemiological data and surveillance information at all levels.
6. Supporting the adaptation of training modules and the integration of IDSR into health institutions' training curricula to support the education and retraining of healthcare personnel on IDSR at all levels.

7. Constantly urging policy and decision-makers at all stages to provide funding and support for IDSR initiatives.
8. Increasing community knowledge and preparing them to quickly alert local health authorities to suspected epidemic-prone diseases and disasters.
9. Making sure IDSR operations are routinely monitored and overseen at all levels.
10. Improving the public and private healthcare institutions' mechanisms for reporting surveillance data to the regional health authorities.

2.2.4 Disease surveillance and notification (DSN) is a component of the Health Management Information System (HMIS), which consists of persons, resources, and databases that are organized to gather information that is used to make informed decisions.

The procedure of notifying the proper and designated authorities of the presence of a disease or any other health-related circumstances is known as illness notification. The Health Management Information System (HMIS), which consists of databases, persons, and materials which are organized to collect data used for informed decision-making, includes disease surveillance and notification (DSN) [12].

Diseases that must be reported towards the public health care agency in the relevant jurisdiction whenever the diagnosis is established are known as notifiable diseases. Such illnesses are significant enough to the public health system to necessitate reporting them when they occur. In along with the monthly report, weekly records of epidemic-prone diseases are kept. Cholera, measles, cerebrospinal meningitis, yellow fever, and others are a few of them. Other diseases of public health significance like diarrhea and pneumonia in children under five, bloody diarrhea, HIV/AIDS, tuberculosis, onchocerciasis, malaria, pertussis, hepatitis B, plague, and sexually

transmitted infections (STIs) are also included. These diseases include those that are targeted for elimination and eradication such as poliomyelitis, neonatal tetanus, dracunculiasis, leprosy, lymphatic filarias. With the epidemiological shift came non-communicable illnesses like diabetes mellitus and hypertension, tropical illnesses like noma and buruli ulcers, and newly developing infectious illnesses like severe acute respiratory syndrome (SARS) and the H_5N_1 subtype of human influenza, and other illnesses within the International Health Regulation (IHR) [12, 13].

Public or private healthcare facilities serve as the first level for the collection of data about healthcare facilities, and they also receive information from community-based healthcare providers who serve in their catchment areas. Depending on the severity of the sickness or the state of the patient's treatment, the staff of the healthcare facility gathers data at this level, completes, and transmits the forms on a weekly, monthly, or immediate basis. The Local Government Primary Health Care Department receives these results through the DSNO, which compiles the information and delivers it to the State Health ministry (Epidemiology Unit). Prior to being submitted to the Federal Ministry of Health (Epidemiology), these data are analyzed for national collation, analysis, documentation, and action.

Again, for reporting of diseases that must be reported, understanding disease notification is crucial. However, as a contributing factor to underreporting, health care professionals' knowledge of reporting obligations and responsibilities has not been sufficiently investigated. At Nigeria, the collection, compilation, analysis, and presentation of data in healthcare facilities is frequently subpar, in part because health-care staff are not sufficiently aware of the significance of this process[13].

2.2.5 Disease Surveillance and Notification as a tool for Disease outbreak Prevention and Control in Nigeria

Effective and quick containment of outbreaks depends on early detection. The detection and monitoring of diseases and other events that may pose a threat to the public's health with regard to their source, timing, person, population, and location are among the main objectives of a workable disease surveillance and notification. This information is used to justify taking action in the area of public health. As the primary objective of surveillance system and notification, this has made it a powerful instrument for the prevention and management of disease outbreaks. Early recognition and identification of infectious diseases is the primary goal of an effective national disease monitoring and notification system since it allows for prompt public health response and reduces the number of persons who contract the disease.

Early notification of communicable disease cases and other situations that constitute a risk to the public's health could help to avert possible epidemics that would have a high illness and mortality rate. For instance, the few cases and fatalities from the Ebola virus disease (EVD) recorded in Nigeria between July and September 2014 could be attributed to the attending clinicians in Lagos, Nigeria, reporting the imported case of EVD to the designated public healthcare authorities in a prompt manner, which sparked an appropriate response that quickly contained the outbreak[12, 14].

2.2.6 Integrated Disease Surveillance and Response

In communicable disease monitoring systems at all levels of the healthcare system, the Integrated Disease Surveillance and Response (IDSR) strategy integrates laboratory and epidemiologic data with a focus on integrating surveillance and response. Africa was where it originally began to

exist. The Local Government Areas were chosen as the area of concentration for intensifying efforts in timely data collection, analysis, and use of the source data for PH responses. Case-patient discovery, registration, and verification; data reporting, analysis, use, and feedback; and outbreak preparedness and intervention, such as outbreak investigations, patient tracing, and public health involvements, are the main activities that make up the IDSR strategy. Examples of support functions include coordination, supervision or performance evaluation, instruction, and resource provision for infrastructure, including communication [12, 15].

Important steps in having to implement the IDSR strategy include raising awareness among significant health officials and stakeholders, conducting situational analysis, creating a strategic IDSR plan, identifying and training a skilled workforce, developing national IDSR technical guidelines, putting the plan into action, and monitoring and evaluating execution to enhance performance (WHO2000b). An evaluation of the present national surveillance including response activities is required in order to track progress, create consensus on the communicable diseases that should be given national priority, identify surveillance loopholes that exist for the priority diseases selected, document the weaknesses, strengths, and opportunities of such an existing structure, and make necessary recommendations.

Tools and guidelines for the implementation of IDSR at the national level have been developed by the WHO Regional Office for Africa in collaboration with its partners. The development and field testing of indicators to track the effectiveness of the surveillance as well as response.

2.2.7.1 The components of surveillance

Epidemiologists, the health care laboratory, and the healthcare delivery system are all simultaneously involved in infectious disease monitoring. The four fundamental elements of

surveillance are (1) gathering, (2) analysis, (3) dissemination, and (4) response, and each of these sectors contributes to each of these elements.

A functional surveillance system should:

- have explicit objectives;
- employ minimal pertinent data gathering for suitable action;
- lecture a defined target group;
- have stated data sources (such as healthcare facilities records (public/private), laboratory findings, surveys, case reports, and systems evaluation reports); and
- Include a well-defined information flow with established procedures for feedback and information distribution.

2.2.7.2 Criteria of evaluating surveillance systems

- The following qualities are typically used to evaluate surveillance systems:
- Simplificity.
- Versatility
- Acceptability
- Responsiveness.
- High prediction accuracy.
- Completion, Public/Private, and Representativeness.
- Promptness
- Sufficient resources (training cost, travel, materials, equipment and facilities).

Currently, the slow and frequently inaccurate collection, collation process, analysis, and explanation of disease-related data in public health institutions in Nigeria is a result of clinicians' lack of understanding of the importance of their position in disease surveillance as well as notification events for the prevention of outbreaks of infectious diseases[13, 11].

Practice Of Disease Surveillance

2.2.8 Clinicians' and focal individuals' roles in disease epidemic prevention and control

Disease surveillance is the ongoing observation of health-related incidents and illness occurrences to enable quick response for disease control. It entails the ongoing, methodical gathering, collation, analysis, and interpretation of information on the occurrence of diseases and events relevant to public health, as well as the dissemination of knowledge gleaned from such data for quick PH action. The official and prompt reporting of both the occurrence of certain conditions and diseases to designated public-health agencies for action via designated reporting instruments, on the other hand, is what is meant by disease notification. This is done by physicians and other health staff. A successful and effective disease surveillance system relies on data gathered via disease notification. Disease surveillance and notification (DSN) have been acknowledged as an effective technique for the control and prevention of diseases, especially those that are susceptible to epidemics [16, 8].

It is important to remember that disease outbreaks respect neither national borders nor advance notice of their emergence. When they inevitably do, infections are likely to multiply quickly and frequently, leading to high rates of morbidity and incident fatality and having an impact on the economy [9]. An efficient and appropriate disease surveillance and alert system enables the early

identification of disease outbreaks, triggering intervention to lower illness and mortality that may occur from epidemics of these communicable diseases. Individual, municipal, national, and worldwide levels of illness surveillance and notification are all possible. Efficient district/Local Governments Area (LGA) disease monitoring and control mechanisms with clinician involvement are frequently a prerequisite for effective national surveillance system and notification systems [7, 5].

Nigeria's surveillance as well as notification of illnesses includes the monthly notification of additional diseases of the public health relevance as well as the prompt notification of diseases that are epidemic-prone, diseases that are being eliminated or aimed for eradication. Clinicians continue to be essential to effective reporting because they are able to recognize uncommon display of disease and conditions that depend on clinical signs unrelated to laboratory examination, clusters of diseases through patient interviews, and clinical decisions. This is necessary for a disease surveillance and notification system at the district/LGA level to be workable and effective in the early identification of epidemic-susceptible diseases [18, 19].

Due in part to clinicians' lack of understanding of the significance of their job in disease surveillance as well as notification activities again for prevention of outbreaks of infectious diseases the collection, categorisation, analysis, and interpretation of disease-related data in public health facilities in Nigeria is currently frequently incomplete and tardy. When index cases of epidemic-prone diseases appear in the various health facilities across Nigeria, physicians frequently fail to report the cases or report them too late, which has led to numerous outbreaks. In light of earlier research on disease surveillance as well as notification, it is important to note that failure to comply with mandatory reporting requirements for notifiable diseases among clinicians, focal persons, and health workers in general has been attributed to ignorance of the

presence of a surveillance network for such diseases, including the necessity for reporting, which illnesses are notifiable, and when, how and to whom reporting should indeed be done.

In order to ensure that Nigeria's illness surveillance and notification is effective and responsive, the following tasks of clinicians and focal persons are described:

- The identification of suspected cases of identified diseases using the epidemiological surveillance guideline case definition and discrepancy diagnosis as outlined in the national technical standard [Table 3].
- Immediately informing designated local public health surveillance officers (LGA DSNO) of instances that have been discovered so that they can begin an investigation and collect samples for lab testing.
- Support designated LGA surveillance officers as they investigate instances to ensure sufficient samples are taken from the alleged cases to guarantee proper laboratory analysis.
- Case management utilizing the advised course of action, particularly as outlined in the national technical guideline [18, 2].

2.2.9 The Flow of IDSR Data in Nigeria

Following several sets of standard operating procedures, the Nigerian National Policy suggests that collected information from the LGA and healthcare centers be provided either instantly, weekly, monthly, quarterly, or yearly, as appropriate. This recommendation calls for two forms of reporting: routine summary reporting and urgent reporting.

When an epidemic-prone illness is suspected and requires prompt notice, immediate report is expected to be carried out for a specific case. For illnesses that are being eradicated or for which

an action threshold has been reached, case-based data is also presented. However, the national rules provide special reporting criteria for those diseases that are prone to epidemics. Leprosy cases and deaths, for instance, are recorded every three months, as are cases of cerebrospinal meningitis, cholera, yellow fever, and measles[17, 14].

It is standard practice to report the total cases and fatalities from priority diseases for a specific time frame (such as weekly or monthly). These data are examined, and the findings are used to measure the success of disease preventive initiatives in the LGA, monitor progress toward illness reduction targets, and spot hidden outbreaks or issues so that quick action can be done

The community and healthcare facilities in Nigeria are the main sources of information for the IDSR system. Diseases with epidemic potential and those that are targeted for elimination and eradication are immediately reported to the focal people in the healthcare facility, and then to the LGA Disease Surveillance and Notification Officers (DSNO) at the Primary Health Care (PHC), which serves as a conduit between the public health facility or communities and other tiers of the IDS system utilizing specified IDSR reporting forms[4] [Figures 2 and 3] and submitting to the State Ministry of Health, which is the next step (SMoH) [11, 17].

Analysis plus feedback to healthcare facilities are anticipated to be done at the LGA level. Data from the LGAs are compiled by the SMoH's epidemiology section, which then sends it to the Federal Ministry of Health's epidemiology division (FMoH). Planning suitable operations and disease management measures, as well as providing analysis as well as feedback to healthcare facilities and the general public, are all done at the SMoH.

At the Federal Ministry of Health data are compiled and sent to the statistics section for analysis, feedback, and planning for the right intervention depending on the findings of the analysis. [Figure 4].

The current IDSR guideline, which has been widely disseminated in the nation, requires clinicians to report suspected cases of epidemic-prone diseases as well as illnesses that are intended for extermination and elimination immediately to the Local government are Disease Surveillance and Notification Officers (DSNO) at the Primary Health Care Unit of each LGA in the nation for subsequent reporting to State and Federal authorities (Figure 4) using surveillance case definition and the designated IDSR reporting forms (Table 2) [20] .

2.2.10.1 The Strategies for the Implementation of IDSR

The National Policy on IDSR stipulates that the IDSR be implemented in stages at the local, health facility, LGA, State, and Federal levels as previously mentioned in the section on the flow of IDSR data, with the LGA serving as the smallest administrative unit inside the national health system. The following tactics were listed for action in order to deploy this system effectively.

2.2.10.2 Advocacy and Sensitization

Advocacy efforts should be ongoing to ensure that IDSR is implemented effectively. Through frequent advocacy trips to this group, this will be done to guarantee the support of decision makers, opinion leaders, and partners. These trips will be utilized to raise money for IDSR and

mobilize resources. Additionally, workshops and sensitization campaigns must to be run at all levels.

The community opinion leaders, health professionals, and other private professional groups must be made aware of the need for their support and involvement in the implementation of IDSR.

2.2.10.3Programme management and Coordination

All healthcare facilities, the LGA PHC department, state ministries of health, and the federal ministry of health have designated a focal unit for IDSR, and a focal person is appointed to this unit at all levels.

2.2.10.4 Strengthening Communication Capacity

At all levels, basic communication equipment should be accessible. At the 20 LGAs, State, and Federal levels, a minimum of telephones (land, mobile), high frequency radio, and email should be made available. Computers are expected to be available in the lab service offices, federal, state, and LGA IDSR units.

2.2.10.5 Capacity Building

The Federal Ministry of Health has developed core trainers who will collaborate with partners to periodically teach and retrain health professionals, program officers, and IDSR focal persons at all levels using WHO generic IDSR training modules customized for Nigeria. The procedures for training of trainers would be used during training sessions. The states, LGAs, and medical services training activities are supported technically by the core facilitators. All facets of disease surveillance, laboratory testing, epidemic preparation (EPR), and data management will be

covered in the course. These trainings typically come with skill reinforcement supervision visits and follow-ups from the federal ministry of health. To promote sustainable IDSR implementation, pre-service trainings for health professionals should be implemented. It is important to educate the leaders of medical and health training institutes about the importance of incorporating IDSR within their various curricula. To promote sustainable IDSR implementation, pre-service trainings for health professionals should be implemented. It is important to educate the leaders of medical and health training institutes about the importance of incorporating IDSR within their various curricula.

2.2.10.6 Strengthening Data Management

The National IDSR unit should create an extensive data base for major communicable diseases. Additionally, the unit is planned to offer data management policies that may be used at all levels. Priority diseases have standard case definitions that are generated and distributed to all implementation levels. To promote sustainable IDSR implementation, pre-service trainings for health professionals should be implemented. It is important to educate the leaders of medical and health care training institutes about the importance of incorporating IDSR within their various curricula. To promote sustainable IDSR implementation, pre-service trainings for health professionals should be implemented. It is important to educate the leaders of medical and health training institutes about the importance of incorporating IDSR within their various curricula.

2.2.10.7 Establishment of sentinel Sites

Sentinel sites are created to support active surveillance and to produce more thorough data that is broken down by sex, a more specific age range, and classification for particular target diseases of

public health importance, such as cholera, measles, cerebrospinal meningitis poliomyelitis, viral hemorrhagic fever (Lassa fever), yellow fever, malaria, HIV/AIDS, diarrhea diseases, guinea worm, acute respiratory infection, onchocerchi It will be assumed that the sentinel surveillance locations will use IDSR. In partnership with the various programs or any other program that desires to establish one, the data gathering format, rules, and manual will be produced. Intensified active case search for priority diseases is taking place at the sentinel sites.

2.2.10.8 Epidemic Preparedness and Response (EPR)

At all levels, an epidemic emergency preparation and response committee must be established, and when possible, enhanced. The committee should have clear terms of reference, an action plan, and operating procedures and meet quarterly or as needed. This committee ought to have the tools and support it needs to act quickly at all levels.

2.2.10.9 Strengthening Laboratories and Case Management

In States, laboratory networks must be set up for IDSR. For effective laboratory services, central and standard laboratories as well as recommendations are produced. Continuous training of lab staff is required to guarantee the availability of skilled labor on a regular basis. An adequate system is set up to communicate with the LGAs on the collection, transportation, and reporting of specimens and results. Administrators of public health laboratories at the state and federal levels make sure that reagents as well as other supplies are always available. Reference labs are bolstered for the verification of unique diseases and serve as quality assurance for state labs.

2.2.10.10 Case Based Surveillance

Case-based surveillance is always carried out whenever there is a suspected case of an epidemic-prone disease, a disease that is being eliminated or eradicated, or when one of these diseases is on the rise. To find out more about the distinct disease patterns, health professionals conduct case-based investigations. Health professionals are supposed to apply the epidemiological clinical criteria to find probable cases, record them by age, sex, place of residence, and date of onset, and collect the necessary samples for laboratory confirmation.

2.2.11 Level of Reporting Notifiable Diseases

An illness or condition is regarded to be notifiable if frequent, regular, and timely information on specific cases is deemed important for the disease or condition's prevention and control. The NNDSS, that is neither a single monitoring system nor a means of reporting, is used to collect data. In order to improve data collection, analysis, and distribution of notifiable disease data, CDC at the national level coordinates a "system of systems" among disease-specific initiatives. Monitoring surveillance data allows public health officials to spot unexpected changes in the prevalence and distribution of diseases or conditions, pinpoint adjustments to agents and host variables, and spot adjustments to medical procedures.

Case notification reports of nationally notifiable illnesses and conditions that have been sent from the state, territory, and chosen Local health department to CDC are used to generate data for national-level surveillance.

Reports of illnesses, disorders, and epidemics from the local to the state level are the initial source of information used to locate cases. health-care provider, hospitals, labs, and others must provide information on notifiable conditions to public health officials or their agents in accordance with applicable law, regulation, or other guidelines in those jurisdictions. Local case

reporting helps to safeguard the public health by ensuring accurate case identification and follow-up. Public health professionals make certain that people who are already ill receive the proper care, track down contacts who require vaccinations, treatment, quarantine, or education, investigate and control outbreaks, remove environmental hazards, and close locations where it is thought that ongoing disease transmission is taking place [21,]

2.3 Review of Empirical Studies

2.3.1 Factors That Affect Disease Notification

2.3.1.2 Timeliness of Notification

Public health services must be informed of infectious diseases in a timely manner to be able to act quickly. Timely notification is made possible by adequate notification systems. To evaluate the findings of studies on notification timing and identify the components of notification systems that are related to timely notification, a systematic literature analysis was conducted.[24] For the purpose of identifying outbreaks that require public health intervention and control measures, infectious disease monitoring is crucial. As a result, effective and trustworthy surveillance and alerting systems are essential for tracking public health patterns and identifying disease outbreaks early on [2].Timeliness, which is described as "representing the speed between phases in a public health surveillance system," is a key metric for assessing surveillance systems.

The timeline for reporting infectious diseases shows how notification results from a series of events that start with infection and end with a report to local, state, or national public health agencies. Condition-specific delays in this chain occur as a result of the following factors:

1) Patient delay, or the amount of time between the onset of the disease and consulting a doctor.

2) The length of time it took doctors to order a laboratory confirmatory test after consulting with patients.

3) Depending on the length and frequency of testing, a laboratory delay, or the amount of time before a confirmation test result, may occur.

Last but not least, there is a delay in reporting to state and/or national medical institutions as well as in notifying the local healthcare department from the laboratory or doctor.In order to ensure prompt reaction and to adhere to international laws, the majority of nations have established legislative requirements for doctors and diagnosing facilities to notify public health authorities about specific infectious diseases within a specified timeframe [22].

2.3.1.3 Awareness and knowledge of disease surveillance and notification by health-care workers

According to some findings, DSNOs have already received funding to attend a number of workshops. In-service training to advance their education is not offered, though. Additionally, it was claimed that only DSNOs and focus individuals attended these training, making it challenging for the other healthcare professionals to understand the DSN concept and also the role they are supposed to play. Even the chosen do not instruct others when they return. The cornerstone of passive epidemic surveillance systems like the Nigerian Integrated Disease Surveillance and Response system (IDSR) is physician reporting [23].

Though the Nigerian government made investments in training, awareness-raising, and response initiatives relating to physicians' disease reporting, no study has been published to date looking into issues affecting physicians' knowledge, perceptions, and reporting practices regarding

notifiable diseases, especially in the context of infection in humans with avian influenza. Additionally, there aren't many statistics available globally addressing physician knowledge, attitudes, and practices (KAP) for notifiable disease reporting. It is crucial that health data be disseminated to the medical community rapidly and effectively in order to enable public health officials to react swiftly to potential outbreaks of such a new or developing threat. However, little is understood about the preferred strategies used by doctors in under-resourced settings to acquire new health data, particularly for threats that are new or emergent.

Despite the fact that most doctors in the survey were aware of and had previously reported laboratory - confirmed diseases, they cited numerous perceived barriers to reporting. The reporting system criteria must be explicitly explained to collaborating physicians in order to efficiently identify human AI cases as well as other contagious diseases through IDSR. Perceived barriers, such as a lack of infrastructure, must also be removed. Future updates to the reporting process should take into consideration rising internet, mobile, and email-based communication usage [24].

2.3.2Establishing and Maintaining a Surveillance System

Managers who choose to employ surveillance of public health as a management tool must be aware that they will need to dedicate political backing, human and financial resources, and other resources as well.Every health system requires finding or training qualified, driven healthcare professionals, as well as providing them with career routes and oversight. There are six (6) steps to setting up a surveillance system after a manager makes the decision to do so. These phases are continuously linked because the system needs to adjust to shifts in the population as well as the physical and social surroundings [25, 26].

2.3.3 Analysis and Dissemination of Surveillance Data

Analysis of surveillance data is done by time, place, and subject. Technical experts should frequently evaluate data to check for validity and to find information that will be useful to top managers. The best tools for summarizing and displaying data are straightforward tables and graphs. The effectiveness of surveillance data depends heavily on the timely dissemination of information to those who develop policy and carry out intervention initiatives.

A truly integrated public health surveillance system based on data standardization, a communications networks, and laws governing data access and sharing is possible thanks to the quickly developing field of public medical informatics, which deals with the collection, categorization, storage, retrieval, analysis, as well as presentation of massive amounts of health data. Adopting a methodical strategy for establishing data standards for content will be advantageous for surveillance. In order to promote automatic electronic submission of diagnostics laboratory results for notifiable diseases, the U.S. Center for Disease Control and Prevention (CDC), for instance, has implemented standards-based systems. As a result, more cases of notifiable diseases are reported, and results are received more quickly. Utilizing data standards makes it easier to compare surveillance data over time, across various surveillance modalities (for instance, facility-based reporting in comparison to sample surveys), and across nations and regions. A globally approved standards-development institution that is also able to maintain and evolve the standard over time must have established the standard via an open, participatory approach before it can be considered credible. The application of public health data must go beyond clinical medicine to a variety of other fields (examples are environmental toxins, unintentional injury, and food safety) [27].

Epi Info, a computer program for epidemiological surveillance and biostatistics that is utilized in many nations' information systems, is one example of an international standard computer program. Epi Info is produced, updated, and distributed by the CDC at no charge to users.

2.3.4 Surveillance as a Component of National Public Health Systems:

Public health surveillance is listed as a necessary component of a public health system by both World health organization (WHO) and the World Bank. By focusing interventions and tracking their effects on the population, surveillance data increases the efficiency and efficacy of health services when connected to policy and program units. Assuring the adequacy and efficiency of surveillance and public healthcare responses in a decentralized setting is a major problem for the health industry in developing countries. Managers of national programs and surveillance systems risk losing control over the accuracy and timeliness of data gathered locally [27]. This can be prevented by educating local decision-makers on how to use data to serve their requirements and negotiating for them over the primary data gathered by each local unit. By supporting national networks for scientific surveillance and quality control, tying financing to the availability of sufficient data, and conducting periodic surveys to validate local reporting's findings, national managers or donors also can increase the quality of information. Local managers should be given the authority to carry out programs, so national-level managers will only require a few summary indicators instead of the detailed data they may be accustomed to. Managers in state and municipal governments frequently favor integrated systems to reduce the need for filling out extra documents. Donors require monitoring data to evaluate and target their contributions. They might establish parallel, non-governmental surveillance systems to directly collect data to fulfill their demands if they see weaknesses in the national system. The best qualified individuals in the

government structure may depart to work for the parallel connection because it always pays employees more than government positions do. Although this approach satisfies the immediate requirements of contributors, it always weakens governmental structures. Parallel systems might not be viable if external funding stops and might damage the ministries they are supposed to support. As a result, parallel systems are fundamentally unfair and ought to only be employed as a last resort [5, 27].

2.3.5 Surveillance as a Tool to Improve Public Health

Managers must decide on initiatives to improve the health of people within their community based on targeted, timely, valid scientific information that gives evidence. It is not sufficient to merely gather and deliver data. Between the ability to produce data and the capacity to transform that data into actionable information and launch the necessary public health action, there is a significant gap in supporting effective monitoring. Data usage hemisphere and data generation hemispheres can be used to represent surveillance and reaction (USAID 2005). The traditional perspective on surveillance is represented by the data creation hemisphere, whereas the public health response, which starts with the interpretation of data from the monitoring system, is represented by the data use hemisphere [8, 10, 27.]

The principles of field epidemiology have been used to build public healthcare and disease control strategies in developed nations. Building and maintaining human capacity in field epidemiology is necessary for developing nations. A nation can benefit from improved field epidemiologic capability in the following areas:

• delivering a solution to pressing issues

• offering a scientific foundation for decisions about programs and policies

• putting in place disease surveillance systems;

• assisting with national health planning;

• deciding how to allocate resources.

• distributing the human resource base to national health priorities.

Among the specific competencies which should be developed are the following, but are not restricted to them:

- Design and conduct a scientific investigation.
- Analyze and interpret the data from the investigation.
- Recommend logical and useful public health actions.
- Be proficient in all facets of diseases of public health importance.
- Identify and assess an actual public health problem.
- Design, implement, and evaluate surveillance for a health event (examples are sexually transmitted diseases, tuberculosis, HIV/AIDS, malaria, and zoonoses) [25, 27].

These skills must be adjusted for the different tiers of the healthcare system.

Since 1975, Centre for Disease control and prevention (CDC) and World health Organisation (WHO) have worked with more than thirty (30) nations to improve health systems and address the demand for flexible, long-lasting training in disease identification and response. More than half of the world's population now resides in a nation where FETP staff and trainees, including those from Public Health Schools without Walls, the European Program for Intervention Epidemiology Training, and the Epidemic Intelligence Service in the United States, conduct surveillance, investigations, and response activities. These initiatives typically operate within central health ministries and might not be apparent to those outside the public healthcare system. In addition to teaching the majority of public health professionals that oversee surveillance systems at the highest level, it can be claimed that these programs supply the majority of global surveillance and response to new illnesses. FETPs are two-year programs created to equip a ministry with such a motivated, qualified team of field epidemiologists who can respond to managers' requests for information, conduct surveillance, deal with epidemics, and instruct and manage technical staff at other tiers (White and others 2001) [17]. There are now different models. A prime example of this effective local adaptation is Guatemala's union of its FETP (which is a component of a broader, Central American FETP) with the Statistics for Decision Making program (Pappaioanou and others 2003). Health professionals are enlisted by Data for Decision Making from the sub-district and community levels to get training in epidemic investigation and surveillance in the context of their regular job. This training is provided as a series of interconnected seminars with real-world field projects that offer immediate assistance at the local levels. The most promising course graduates are chosen for additional training in a FETP. India offers another example for enhancing national surveillance due to its fragmented structure, complicated cultural dynamics, and disparate levels of public health organization sophistication.

The Integrated Disease Surveillance Project, started by the World Bank, increases the capability of local and midlevel surveillance employees in India. In addition, FETP alums are hired as the project's state-level surveillance officers to organize the surveillance efforts of the hundreds of community health workers across the states [19, 22].

2.3.6 Surveillance Strategies

The design and implementation of surveillance systems must take top management's need for focused, trustworthy, timely evidence into account. Due to the fact that these needs vary based on management requirements, numerous various techniques have been devised. Here are a few of the best.

- **Sentinel Surveillance**

In a sentinel surveillance system, a pre-selected sample of reporting sources consents to report all incidents of specified conditions, which could reveal trends in the entire target population.

When implemented appropriately, these systems provide a useful way to make use of scarce resources and allow quick, flexible monitoring as well as investigation of potential public health issues. Private practice networks that report influenza instances or a sentinel system based in a lab that reports cases of certain bacterial illnesses in children are two examples of sentinel surveillance. Sentinel surveillance is very good at spotting significant public health issues, but because these illnesses can spread throughout the community, it may be unresponsive to unusual events like the early development of a new disease [21].

- **Periodic Population-based Surveys**

If they are conducted repeatedly on a regular basis, population-based assessments can be utilized for surveillance. The BRFSS in the United States, surveys on HIV prevalence, household surveys, and also the demographic and healthcare surveys that many developing nations do every five (5) years are all examples of population-based surveys used in surveillance. The methodology for population-based surveys must be carefully considered, with special attention to the use of uniform protocols, interviewer supervision, comparable sampling techniques, and standard questions. These studies need a precise definition of the target population to whom the results may be applied, and they need to pay close attention to the sample size, depending on effectiveness and the epidemiologic traits of the medical condition under surveillance (such as, rare conditions require substantial samples). To prevent prejudice, interviewers must be closely supervised, and response rates must be high. Because the polls are conducted often, population changes (due, for instance, via morbidity and mortality) could skew the results.

- **Laboratory-based Surveillance**

A country's economic development affects the spectrum of infectious disease surveillance techniques that are deployed. For instance, there are four various levels of surveillance for Foodborne disease (FBD). Each level requires more infrastructure and resources, but it also offers a larger potential for disease detection and control [21].

- **Spectrum of Case-based Foodborne Disease Surveillance**

In the developing world, surveillance for clinical symptoms is the most used type of surveillance for FBD. Monitoring FBD outbreaks that are being looked at by public health officials is frequently an effective way to keep an eye on both the security of food supply and the operations of the public healthcare system. The future of FBD surveillance is laboratory-based, even if both outbreak and clinical symptom surveillance will continue to be crucial. A sample of patients suffering from acute gastroenteritis can be monitored based on the microbiologic diagnoses if they are routinely sought after. Determining the serotype of the strains at central reference laboratories for enteric bacterial infections like Salmonella or Shigella allows for more rapid and thorough diagnosis of epidemics, which may avert death and disability [21].

Systems for laboratory-based surveillance necessitate resources, infrastructure, and training. To ensure, control, and support quality, a central public health benchmark laboratory is necessary. Such a laboratory-based system may start by routinely referring a sample of strains discovered at a sampling of sentinel clinics, as well as strains associated with out-breaks. Better statistics are obtained via a methodical sampling plan than from a more random attempt at uniform reporting. The public health microbiological laboratory and epidemiologists must regularly exchange information if it is to be used effectively.

Serotyping is widely used as a global language for Salmonella subtypes because to its practicality. Sixty-one (61) nations acknowledged using Salmonella serotyping for monitoring public health in a recent survey.

2.3.7 Informal Networks as Critical Elements of Surveillance Systems

Numerous organizations, including the DSNO, State Ministry of Health, WHO, and others, regularly receive calls or unofficial reports regarding urgent health incidents. Public health professionals can respond to health concerns without waiting for formal reports because WHO provides an informal list of such "rumors" One of the most significant informal networks is made up of the graduates of FETPs and other programs that offer competency-based on-the-job education in ministries of health [3,13].

FETPs and related programs help their respective ministries of health while also training epidemiologists. For instance, a student with in Brazilian FETP was given the task of reviewing regular data on leishmaniasis patients. A subsequent investigation revealed that a medicine being used to cure leishmaniasis was tainted with heavy metals, and she discovered that some patients had signs of heavy metal toxicity. The issue was fixed and the medication was reformulated. Other nations outlawed the medicine until it was reformulated after this report was presented at the regional meeting of a Training Programs in Public Health Interventions Network (a network of FETPs and related training programs). Large categorized monitoring systems are costly, and staff members may grow jaded, especially if the disease under observation is uncommon. For instance, the Western Hemisphere's polio surveillance system for acute flaccid paralysis did not find any cases in July 2000.While looking into a case of suspected infant poisoning, a trainee from FETP of the Dominican Republic discovered the first epidemic of circulating vaccine-type poliovirus with in Western Hemisphere since 1991. There were 8 cases in Haiti and 13 confirmed cases in the Dominican Republic. Her research resulted in national immunization day in both nations, increasing immunization rates and putting an end to the outbreak [19].

2.3.8 The Role of Surveillance in Major Outbreaks

It seems impossible that a deadly disease like AIDS could have spread covertly to so many nations over such a long period of time before it was discovered and before efficient control mechanisms were put in place in the 1980s. In recent years, all levels of surveillance as well as response systems have improved in their ability to spot and stop the spread of contagious diseases. Example: Global SARS surveillance and response. In Guangdong province, China, a severe pneumonia epidemic of unknown etiology was discovered in November 2002. Based on the disease's transmission pattern, control measures were put in place. The illness expanded to Hong Kong (China) in February and March 2003 before moving on to Vietnam, Singapore, Canada, and other countries. On the basis of preliminary epidemiologic investigations, a tentative case definition for this novel illness was constructed and given the label severe acute respiratory syndrome. In March, a brand-new coronavirus (SARS-CoV) was discovered as the disease-causing agent, and full genome mapping was finished in April. This worldwide epidemic came to an end in July 2003 when transmission was stopped in Taiwan (China), affecting more than 8,000 people across 26 nations and five continents, with 774 confirmed fatalities. Working with sub - national and national health professionals, WHO oversaw the international campaign to contain this pandemic. All 20 of the FETP's trainees were mobilized in China, where they assisted local health officials in monitoring, investigating, and controlling the SARS outbreak. The FETP was launched in October 2001 at the China Center for Disease Control. Eight of the ten FETP residents were connected to the SARS outbreak in Canada, the country with the highest number of SARS patients outside of Asia.

In addition to establishing surveillance, they carried out epidemiologic investigations, developed preventative and control guidelines, addressed public and media queries, and planned and carried out epidemiologic research [8, 25].

The open collaboration of scientists and officials from various nations, as well as the prompt and precise sharing of surveillance data within and across nations, were essential to the success of this international effort to control the very first new epidemic disease of the twenty-first century. Rapid global spread was acknowledged, and on the basis of an agreement on case definition which was sufficiently particular to guarantee successful reporting, a global surveillance network was constructed. In order to identify newly diagnosed SARS patients and distinguish this sickness from other severe respiratory illness causes, particularly influenza, public health surveillance is essential. Continuous investigation of environmental causes and also clinical, laboratory, and epidemiologic issues will enhance surveillance for this important public health issue. Notably, experienced, committed healthcare professionals with access to great communications were able to control this extremely infectious disease—for which there is therefore neither vaccine nor a cure. SARS was more difficult to control than smallpox, which has extensive incubation periods and a vaccine that makes it easier. Although it is comforting that national, regional, and international systems were successful in containing SARS, there is no justification for us to sit back and take it easy. The only thing that is clear is that there would be more fresh difficulties, perhaps even additional SARS outbreaks [23].

The following goals can be attained by using the Thai example: (a) increasing public awareness of the possibility of a global catastrophe early enough to allow for the creation of plans to prevent or lessen harm; and (b) demonstrating that, similar to SARS, the disease can be controlled without the use of vaccines, drugs, a high-tech laboratory, or a surveillance system.

Example: Ebola in Uganda, the Role of the PHSWOW/FELTP

On October 8, 2000, a second-year student in the Ugandan PHSWOW returned to Gulu district in northern Uganda for his field project. He found a hospital jammed with patients with high fevers, diarrhea, and bleeding. He diagnosed viral hemorrhagic fever. He called the Ministry of Health in Kampala, where that weekend a graduate of the PHSWOW was in charge of taking calls about epidemics. She agreed with his diagnosis and arranged for samples to be rushed to the National Institute for Virology in South Africa, the nearest WHO reference center for viral hemorrhagic fevers. When the minister of health arrived at his office the next day, the graduate briefed him. Recognizing the gravity of the situation, the minister sent the graduate to head the public health team surveillance and control team in Gulu, and the student headed the clinical team that established infection control in hospitals and treated patients.

The sickness was Ebola hemorrhagic fever, which typically kills more than 50% of individuals afflicted, as soon as laboratory tests revealed it. For a number of reasons, public health surveillance proved challenging. Rural villagers worried that they may be shamed if the authorities found out about cases within their area because the disease seemed severe and quickly fatal. Others fled immediately they discovered they had already been exposed, which led to breakouts in two additional areas. Some others sought out conventional healers. Political unrest existed in the Gulu region, and access to several settlements was problematic due to banditry or rebel activities. The Ugandan government requested assistance from the WHO, CDC, and other international teams while also deploying the military to aid in case investigation. The lack of supplies in Gulu's hospitals made it impossible to stop the spread of infection from several patients at once. Despite this circumstance, Ugandan healthcare professionals selflessly attended to the sick. The greatest Ebola outbreak ever seen reached 425 patients by January 23, 2001. In contrast to the eighty-eight percent (88%) reported in the Democratic Republic of the Congo (previously Zaire) Ebola outbreak in 1976 and other earlier epidemics, only 53% of the patients had died in this outbreak. Sadly, 22 medical professionals became affected. The other two outbreaks, which began when infected Gulu residents fled to far-off villages, were quickly found and contained due to the team from the Ugandan Ministry of Health established active surveillance across the country. "National notification and surveillance measures led to the prompt identification of these centres and to effective containment," observed international observers [9, 18].

Through the PHSWOW, an active collaboration with Makerere University, the Rockefeller Foundation, the CDC, and WHO, the Ugandan Ministry of Health made investments in the development of qualified, driven health workers. Both undergraduates and recent grads helped the ministry recognize and quickly contain this deadly outbreak. The minister was able to promptly alert other nations and summon international teams prior to the further spread of the disease since he had timely evidence. Uganda has emerged as one of the top nations adopting the IDSR program, in part because to the lessons learnt during this pandemic [14].

2.3.9 Surveillance for Specific Conditions

Systems of surveillance are crucial instruments for identifying, tracking, and assessing several health risks and solutions. Systems have been created and tested to fulfill managers' needs since they require a wide range of information for particular interventions.

Environmental surveillance for public health

Data on risks, exposures, and health consequences must be gathered, analyzed, and disseminated as part of environmental public health surveillance.

2.3.10 The Process of Adverse Effects and the Corresponding Surveillance: Relevant health outcomes include sickness, injury, disability, and death. However, for environmental public health surveillance to be effective, those outcomes must be linked to specific environmental exposures and dangers. Toxic chemical, physical, biomechanical, and biologic substances can be found in the air, water, soil, food, as well as other environmental media as hazards. Monitoring individuals within the community for the existence of an environmental substance, its metabolites, or its clinically undetectable effects is known as exposure surveillance [16].

Monitoring of environmental public health is made more difficult by four factors. First, our limited understanding of pathological conditions, lengthy lead times, inadequate exposure assessments, and a multitude of disease-causing potentials limit our ability to correlate particular environmental causes to unfavorable outcomes. Second, evidence gathered for other purposes is rarely complete enough to support a case definition for a condition brought on by an environmental agent. Third, public panic is frequently out of proportion to the danger being raised, and public opinion frequently shapes public policy more strongly than scientific data. Fourth, biologic markers will be an increasingly important component of monitoring environmental exposure. The only bio-monitoring data routinely gathered in a number of nations, either through national surveys or through regular screening for children at high risk, concerns childhood blood lead levels.

Environmental PH-specific health outcome surveillance is similar to conventional surveillance methods. In the United States, the emphasis is on surveillance for birth defects, cancer, neurological diseases (such as Parkinson's disease, Alzheimer's disease, and multiple sclerosis), developmental disabilities (such as autism, cerebral palsy, and mental retardation), asthma and other chronic respiratory diseases (such as bronchitis and emphysema). Different priority conditions for monitoring exist in other countries. Health conditions have been tracked using sources such as disease registries, vital statistics data, annual health surveys, and administrative data systems (such as hospital discharge data) [15].

2.3.11Injury Surveillance

With an estimated 5 million deaths and high rates of disability each year, injuries are one of the top ten (10) global causes of death and a significant public health issue. All socioeconomic levels are at risk for injuries, but injury-related mortality rates are often higher in developing nations. Injury surveillance comprises keeping an eye on the frequency, factors that contribute to injuries that are deadly and those that are not. Violence-related injuries and unintended injuries are divided into two categories based on the aim of the act. Guidelines have been created by the Pan American Health Organization and WHO for the establishment of injury surveillance systems in poor nations.

If the range of fatal and nonfatal injuries, as well as the risk factors that can lead to injury, are to be fully captured, surveillance systems need to be established in multiple settings. Fatal injuries can be captured by using forensic or death certificate data. A far greater number of injuries are nonfatal and can be tracked through hospital- or primary care–based systems. Systematic information on nonfatal injuries, including prevalence, incidence, and related risk behaviours can also be obtained through on-going population-based surveys [7, 20].

Critical points should be addressed when planning an injury surveillance system in a developing country. First, data sources need to be clarified. In some developing countries, routine data on injuries are not always captured in health information systems. It is therefore necessary to consider other sources of data—for example, law enforcement agencies or medical examiners. The events and variables in an injury surveillance system should be defined according to the objectives of the system. Criteria such as the intentionality (violence-related injuries versus unintentional injuries); the outcome (fatal injuries versus nonfatal injuries); and the nature of violence-related injuries (physical, sexual, psychological, deprivation, or neglect) should be considered when establishing the system. Finally, case definitions and coding procedures should be defined before implementing the system.

For instance, in 2001, the Nicaraguan Ministry of Health started building and implementing an injury surveillance system with the help of the CDC and the Pan American Health Organization. The system, which is based on the emergency department (ED) of a medical facility, gathers data on injuries in accordance with the Injury Surveillance Guidelines set forth by the WHO. According to the system, a notifiable case is a patient who passed away from an injury or had ED treatment for one. Patients with unintended and violence-related injuries are included in some cases [17].

In five hospitals in Nicaragua, ED members of staff identify cases and gather data. Direct patient or patient representative input is used to compile the instrument's data. Upon the patient's arrival, an ED admissions clerk gathers basic demographic information. During triage and assessment, ED medical employees (physicians and nurses) gather the remaining data, such as the location, mechanism of the injury, kind, severity, and events surrounding the injury

Every day, the hospital epidemiologist gathers data collecting forms from the ED, evaluates the accuracy of the information, and, if necessary, contacts the ED personnel for more information. Each day, the statistician reviews the data. Periodically, the country project leader checks on the data's quality as well [1, 11]. The project coordinators use Epi Info 2002 tools created especially for this project to monitor patterns and find potential danger factors. The data is utilized to create reports every month that are distributed. There are reports on information at both the regional and national levels. Surveillance data is used by injury prevention initiatives in Nicaragua to determine whether new policies or programs are necessary, as well as to analyze the efficacy of already-existing ones. For instance, the municipality of León is using the data from the hospital to evaluate a cross - functional and campaign to promote life that encompasses primary through tertiary preventative initiatives and track the rise in suicide attempts among young people abusing pesticides.

2.3.12 Surveillance for Biologic Terrorism

The main goals of biologic terrorism surveillance are the management and identification of outbreaks. Similar to the prevention and control of naturally occurring epidemics of infectious diseases, surveillance must assist the early detection of a biologic terrorism occurrence and its characterization [10].

Early detection of outbreaks can be accomplished by the following: prompt recognition and reporting of outbreaks to health departments by physicians, medical facilities, and laboratories; timely and thorough receipt, review, and investigation of illness case reports; and promptly and thoroughly receipt, review, and examination of disease case reports.

Gaining new types of data (for example purchases of healthcare products, absences from school or work symptoms reported to a healthcare provider, or requests for laboratory tests) that can indicate an outbreak earlier in its course will improve one's ability to recognize patterns suggestive of a potential outbreak early in its course. Earlier in the course of such an outbreak, before infection, environmental detection techniques for microbial pathogens and chemicals of concern for biologic terrorism may also be characterized as new categories of data. The traditional disease-reporting systems for communicable disease covered elsewhere in this chapter serve as the main surveillance tools for incident detection and management. Before new data kinds may be thought of as an addition to public health surveillance, these fundamental surveillance techniques need to be reliable.

2.3.13 Syndromic surveillance is an investigational approach by which health department staff members, assisted by automated data acquisition and generation of statistical signals (computerized algorithms), monitor disease indicators continually to detect outbreaks of disease earlier and more completely than might otherwise be possible with traditional reportable disease methods.

2.25 Complex Emergency Surveillance

Establishing objectives, creating case definitions, selecting data sources, creating straightforward research instruments, field screening the methods, creating and testing the evaluation method, creating a plan for disseminating the report or results, and evaluating the system's usefulness are the key components of disaster surveillance system planning. The requirements for surveillance change depending on whether it is pre-impact, impact, or post-impact [4, 7].

The following general framework of actions has been used to describe the role of surveillance in catastrophe situations: (for example, provision of guidelines, hazard mapping, and training for medical and rescue teams) Continuous monitoring and surveillance for priority health issues in affected populations (for instance, in India, Tamil Nadu, post-tsunami surveillance, a one-page instrument was used for daily active surveillance in displaced people at camps for 10 priority health conditions), prospective surveillance of affected persons focusing on the natural history of exposure and wellness effects, and long-term effects of stress disorders among survivors.

2.3.14 Chronic Disease Surveillance Systems

A trustworthy assessment of the burden of illness and injury, a list of the resources available for health, an evaluation of the policy environment, and data on the effectiveness of interventions as well as strategies in terms of cost are all necessary for developing and evaluating policies for improving health. Consideration of non-communicable (mainly chronic) illnesses becomes crucial in all of these domains. According to estimates from 1999, non-communicable diseases were responsible for almost 60% of global fatalities and 43% of the disease burden. According to WHO, the disease burden from non-communicable diseases will have increased by more than 60% for developing and recently industrialized nations by 2020 [28].

Even the regular collection and analysis of accurate mortality statistics in some developing nations, let alone data on illness and quality of life, has proven to be challenging. Improving life quality and fostering a more equal future for health within and between nations depend on ensuring the development, implementation, and broad use of non-communicable disease data for better resource allocation decisions. Global public health issues include hypertension, high blood cholesterol, smoking, binge drinking, obesity, and the numerous diseases these risk factors are associated with. One study found that the three risk factors of smoking, high blood pressure, as well as high cholesterol could account for roughly two-thirds to three-quarters of heart attacks and strokes. Risk factor surveillance was, until recently, mostly a practice of wealthy nations. In contrast, the WHO has recently given non-communicable illness surveillance more attention by creating tools and attempting to establish data comparability between nations. In underdeveloped nations, particularly in Africa, data on important health behaviors, such as obesity, hypertension, lipids, and diabetes, are inconsistently gathered. The Global Youth Tobacco Survey provides information on tobacco consumption [29] .

The significance of obesity as a public health problem in the United States has been established in large part thanks to surveillance data. Individual state health departments have been able to compile an obesity epidemic report using data from the CDC's BRFSS for each state. These data give an indication of how well interventions have worked to achieve the control objectives. As Jordan demonstrated when it introduced a BRFSS in 2002, the BRFSS is a useful tool for developing as well as middle-income countries. The initial survey revealed significant levels of obesity, particularly among women, along with poor levels of physical activity.

2.3.15 Economics of Public Health Surveillance System

With an estimated reduction in gross domestic product (gdp of more than US$1.0 billion in Canada and estimated earnings losses ranging from US$12.3 billion to US$28.4 billion for all of East and Southeast Asia, the SARS outbreak in 2003 serves as a stark example of the far-reaching economic effects of a lack of an efficient global public health surveillance system [29].

When utilized to eradicate illnesses like poliomyelitis, public health surveillance is seen as a worldwide public good. The cost of maintaining methods to discover the final few cases rises as eradication programs reduce the number of instances. The majority of these systems' expenses frequently fall on financially strapped developing nations. The fairness and equality of this element are called into question. For instance, when poliomyelitis becomes less common, it no longer poses a serious threat to national populations, in contrast to other illnesses, such malaria and diarrhea, which are frequently substantial sources of morbidity and death. In such nations, it would seem to be most just and practical for the international community to fund eradication campaigns, freeing up national health systems to focus on the diseases that most severely affect their populations. By utilizing the infrastructure of the eradication program to gather surveillance data for illnesses of concern to local governments, the detrimental effects of globally mandated elimination surveillance systems can be mitigated or reversed. Similar arguments can be made for early warning systems for influenza in nations that collect data for vaccine development that will help other populations yet not their own [22],[30].

Systems for monitoring public health play a crucial role in stopping the spread of disease both within and outside national borders. Despite the benefits, the private sector lacks the motivation to invest in public healthcare surveillance systems, and independent nations need on outside assistance. This situation has significant ramifications for how public health surveillance systems are paid for. Even inside national borders, the inability to quantify the advantages of monitoring systems for specific areas results in neglect by local officials, giving the national government the financial justification for funding. Although they face the largest burden of disease, newly reemerging ancient diseases, and drug-resistant pathogens, developing nations are apparently the weak point in the global monitoring network.The greatest need for surveillance systems is in these countries, but most lack both the resources and the political will to build human capacity and finance the systems. Resource constraints and intense pressure to provide care and treatment services lead public health authorities in the poorest countries to spend resources on surveillance.

Donors should help countries who were unable to invest the necessary human and material resources in capacity building because the costs and benefits of monitoring systems that cross national borders are derived from these systems [31,8, 24].

The international health community has advocated for capacity building in developing nations rather than for the consolidation of a fragmented systems at the global level as a result of this intriguing and unresolved feature of such global public goods: the solution to their adequate supply and supply rests at local, federal, and sometimes regional levels.

The costs and benefits of a number of public health interventions have been compared using conventional methodologies of economic evaluation.It is challenging to put the usage of such tools into effect because of the public good qualities of surveillance systems, with gains that are difficult to measure. However, the industrialized world has examined the economic evaluation of scientific surveillance systems to find specific disease-causing organisms by contrasting benefits and costs today and in the future. These analyses are required and have not been carried out in underdeveloped nations. The best that can be done is to evaluate the advantages and disadvantages of current or potential surveillance technologies. This analysis provides an answer to the question as to how many cases of a specific disease must be avoided by surveillance system in order for the system's cost to be precisely equal to the cost of illness.

Using conventional econometric tools, one can utilize the data on clinical outcomes from the surveillance equipment as inputs to economic analyses given spending on certain health interventions or programs. If surveillance avoids the need for spending on patient care, it also clearly results in cost savings [32, 26].

2.4 Framework

2.4.1 Global Infectious Disease Surveillance Frameworks

Government centers of excellence (for example, CDC, the French Pasteur Institutes, and FETPs) along with WHO country and regional offices also contribute to disease and health condition reporting. Military networks, such as the U.S. Department of Defense's Global Emerging

Infectious Disease System, and Internet discussion sites, such as ProMed and Epi-X also supplement the reporting networks. In 1997, WHO started the Global Outbreak Alert and Response Network, and it was formally adopted by WHO member states in 2000. The network has more than 120 partners around the world and identifies and responds to more than 50 outbreaks in developing countries each year. The International Health Regulations are the only binding international agreements on disease control. The regulations provide a framework for preventing the international spread of disease through effective national surveillance coupled with the international coordination of response to public health emergencies of global concern by using the guiding principle of maximum protection, minimum restriction. The current regulations apply only to cholera, plague, and yellow fever; they require WHO member states to notify WHO of any cases of these diseases that occur in humans within their territories and then give further notification when the territory is free of infection. The regulations are being revised to include the development of national core capacities and national focal persons who have the competencies of graduates of FETPs and allied training programs. Programs established to improve the capacity of both epidemiologists and laboratorians to collect, use, and interpret surveillance and outbreak data (for example, the collaborative WHO program in foodborne diseases called the WHO Global Salm-Surv) are also important components in developing global surveillance networks [32, 33].

2.4.2 Conceptual Reviews

The integrated disease surveillance and response (IDSR) strategy was adopted in Ghana over a decade ago, yet gaps still remain in its proper functioning. In a study conducted with objective to assess the core and support functions of the IDSR system at the periphery level of the health

system in northern Ghana, a qualitative study was conducted among 18 key informants in two districts of Upper East Region. The respondents were from 9 health facilities considered representative of the health system (public, private and mission). A semi-structured questionnaire with focus on core and support functions (e.g. case detection, confirmation, reporting, analysis, investigation, response, training, supervision and resources) of the IDSR system was administered to the respondents. The responses were recorded according to specific themes. The majority (7/9) of health facilities had designated disease surveillance officers. Some informants were of the opinion that the core and support functions of the IDSR system had improved over time. In particular, mobile phone reporting was mentioned to have made IDSR report submission easier. However, none of the health facilities had copies of the IDSR Technical Guidelines for standard case definitions, laboratories were ill-equipped, supervision was largely absent and feedback occurred rather irregular. Informants also reported, that the community perceived diagnostic testing at the health facilities to be unreliable (e.g. tuberculosis, Human Immunodeficiency Virus). In addition, disease surveillance activities were of low priority for nurses, doctors, administrators and laboratory workers. Although the IDSR system was associated with some benefits to the system such as reporting and accessibility of surveillance reports, there remain major challenges to the functioning and the quality of IDSR in Ghana. Disease surveillance needs to be much strengthened in West Africa to cope with outbreaks such as the recent Ebola epidemic [32, 34].

At the community level, surveillance activities are undertaken by local volunteers who are trained to observe and report diseases to the peripheral health facilities using simple case definitions. For example, a simple case definition of cholera for community surveillance is any person aged five years or over with lots of watery diarrhoea and sometimes vomiting profusely

as well, while in case of cholera outbreak, any person who passes watery/loose stool is a suspected case. Any person with fever and neck stiffness in the community is considered a suspected case of meningitis. These simplified case definitions aim to enhance early detection of public health threat s at the community level and prompt response from the health facility level. At the health facilities, the data are separated into out-patient, in-patient, consulting room and laboratory registers and transferred into daily summary sheets by the surveillance focal persons. The data of the summary sheets are then entered into the IDSR reporting forms and sent to the Disease surveillance and Notification officer as weekly, monthly or quarterly reports. The IDSR reports are received at the local government by the district disease control officer or health information officer who enters the data from the paper-based forms into the DHIMS. The information includes suspected cases, laboratory confirmed cases and deaths. Disease surveillance data analysis is required at all levels of the health system to determine trends and appropriate interpretation for effective response. Routinely, graphical presentations of the analyzed data are posted on the dashboards for public health education within the communities. The standard case definitions in the IDSR guidelines area set of criteria used to decide if a person has a particular disease or condition[17, 34]. There are however, several diseases with similar signs and symptoms. Thus, bio-logical specimens are required to be collected, stored and processed to achieve specific diagnoses (e.g. malaria). For suspected diseases which a periphery health facility lacks the capacity to perform laboratory tests for confirmation, specimens are sent to the district hospitals or the district health directorate for onward delivery at a designated reference laboratory (e.g. tuberculosis, meningitis). The specimens are transported from health facilities using motor bikes or pick-up vehicles where applicable. At the local government level, the specimen is transported by means of pick-up vehicle or motorbike [1, 4]while at the state level

specimens are transported mainly through the commercial transport system to the reference laboratories (e.g. Tamale Public Health Laboratory) [35,22]. At the periphery or district level, the disease surveillance officer or laboratory focal person is responsible for sending specimens to the reference laboratories. When specimens are sent to the reference laboratories, information on the name and address of the health facility as well as the name and telephone number (and e-mail address if available) of the focal person for surveillance are required for communication. The important referral laboratories in the country are the Noguchi Memorial Institute for Medical Research and the National Public Health Reference Laboratories in Accra (e.g. Polio, Ebola), and the laboratories of regional hospitals in Accra, Sekondi, Kumasi [22, 34].

2.4.3 Overall functioning of the surveillance system

The comunity informants had mixed views on the functioning of the IDSR system. Only a few (3/18) respondents said that the DHIMS2 implementation in 2012 contributed to improved disease surveillance [36]. Nearly all respondents (17/18) reported that they were not satisfied with the disease surveillance performance. Reasons included lack of community member's cooperation (e.g. delays in presentation of patients to facilities, refusal of referral for diagnostic procedures, low compliance with treatment) and inadequate staff for surveillance activities. The community members do not co-operate with the health staff in disease surveillance investigation. For example, tuberculosis cases do not comply with its treatment when given to patients. HIV (Human Immunodeficiency Virus) cases also refuse to go to War Memorial Hospital whenever they are referred for further laboratory test to confirm the diagnosis." Health Assistant, Informant

"There is inadequate staff for disease surveillance and sometimes, suspected cases delay in the communities before presenting at a health facility for diagnosis and treatment which affects early detection." Disease control: An informant stated that none of the nine health facilities possessed files of the nationwide IDSR technical guidelines, which contained the common case definitions for surveillance, regarding case identification and registration [37,38]. The majority (15/18) of the respondents agreed that health facilities had problems concerning suspected cases identification and recording. The main problems included limited laboratory capacity, discrepancies in laboratory diagnosis, perception of false results (e.g. tuberculosis diagnosis), unstable power supply, and poor recording of cases in the registers. The health facility does not have adequate reagents for laboratory test and does not have the capacity to perform lumbar puncture. Unstable power supply to power the laboratory equipment affects case identification. Although the hospital does not have a significant issue with identifying suspected cases, suspicious cases are not accurately reported in the registers. The cases that are documented in the outpatient registers with laboratory registers of the healthcare facility frequently differ. For instance, a suspected case might receive a measles diagnosis on Monday, but on Tuesday, the records might be modified to indicate meningitis instead, making it difficult to classify, record, tally, and report the case to the IDSR system [35,20].

The laboratory's capacity prevents it from testing the majority of illnesses or ailments. For instance, laboratory results for tuberculosis are frequently unreliable. Suspected sufferers declined to come back for additional examinations of suspected illnesses. In some suspected cases, confirmation can be challenging. For instance, it's challenging to confirm Yaws using the flipcharts.Most (8/9) health facilities had the capacity to also process blood/serum for case investigation. There were, however, a number of challenges on further investigation and

confirmation of suspected cases. This included unwillingness of patients to provide specimens for diagnosis confirmation, lack of transport and staff for bringing samples to the reference laboratory.52Therefore, strengthening of the IDSR system in Nigeria must include the production and distribution of all reporting tools to all operational levels. Furthermore, 14% of the respondents acknowledged that they do not know how to use the forms [39]. The reason could be because only 25% of the respondents had received training on IDSR at their current workplaces. Hence, for a surveillance system to function effectively, the different personnel involved should be adequately trained. Lack of training on the use of IDSR forms was also noted in a study done in the state within the past six years as only 8.8% of the health workers reported being trained[14]. Similar studies done in Northern, Southwest and other regions in Nigeria also noted lack of personnel capacity to detect and report cases as hindrances to the implementation of IDSR. Findings from other African countries and Jordan have also established a relationship between poor IDSR performance and lack of trained personnel. Although regular supervision is claimed to be carried out by the state, 32% of the HCWs reported the absence of supervision and monitoring from the government as their major challenge and surprisingly 42% of the facilities do not have any reporting system in place. This, among other challenges of the surveillance system, has been reported in Nigeria and Ghana in previous studies. Supportive supervision helps staffs to improve their performance. It ensures that state perform their responsibilities according to set standards. Lack of supervision, therefore, will have a negative impact on disease surveillance. Age and occupation were predictors of good knowledge of IDSR in this study. IDSR began its implementation in Nigeria about 18 years ago1. There was no organized system of disease surveillance as well as reporting before that.Appropriate forms not available for reporting, lack of a reporting system in place at the facility, no supervision and monitoring from

government, do not know who to report to, do not know how to use the reporting forms, too busy to report, data collected not used by government/other agencies, too many forms to fill, etc. were the challenges of Integrated Disease Surveillance and Response system in private health facilities[1, 40].

Health-care workers above 40 years may have found adaptation to this change difficult. This may explain the poor knowledge recorded among this age group in this study. Medical doctors have the expertise in case identification and disease transmission, and this may explain why being a medical doctor could have attributed to good knowledge of IDSR. Average patient daily load and knowledge of IDSR system predicted good practice of IDSR in this study. Health-care workers that run busy clinics daily are not likely to efficiently practice good IDSR reporting as a result of exhaustion [19, 41.] This was also reported in a study done in Nigeria where one of the obstacles to disease reporting was doctors being too busy to report. Likewise, while HCWs who hither to feel unmotivated are saddled with the responsibility of meeting the health-care needs of an oversized population, optimal performance cannot be expected. Furthermore, it is a proven fact that poor knowledge invariably translates to poor practice. It is, therefore, not surprising that respondents having poor knowledge also performed badly. This study was done in PHFs within Enugu metropolis, therefore, the findings might not be generalized to all private hospitals in Enugu State and other states in Nigeria. Furthermore, poor access to some of the private facilities was a major limitation. While some of the directors of these hospitals declined participation in the study, others requested that they be part of the study as a condition for responding to the questionnaire. Furthermore, since it was a cross-sectional study, temporal relationship cannot be established [42].

The Integrated Disease Surveillance and Response system has been used in Nigeria since 2001 to gather data on important public health issues and diseases that are prone to epidemics (IDSR). At the moment, IDSR has classified 41 diseases as "notifiable," including avian influenza in humans (AI).

A study was conducted to characterize physicians in the public sector in Nigeria's knowledge, perceptions, and practices regarding infectious disease reporting through the IDSR system, physicians' preferred sources of health information, and knowledge of AI infection in humans in the wake of an outbreak of extremely pathogenic avian influenza A(H5N1) in Nigerian poultry populaces in 2006 and one laboratory-confirmed human infection in 2007. In-person interviews were conducted with 245 doctors in six Nigerian towns during November and December of 2008. The components of the survey covered reporting procedures for avian influenza as well as other laboratory - confirmed diseases, perceived barriers to disease reporting, ways to get health-related information, and participating physicians' knowledge of avian influenza. All responders were aware that humans could contract an AI infection. Sixty-seven percent (2/3) of communicable disease had reported. The most frequent perceived barriers to reporting were a lack of infrastructure, logistics, or a reporting mechanism, as well as clinicians' ignorance of how to report or to whom. Nearly all of the doctors who took part in the survey said they now own a cell phone and use the internet at least once a week. Despite the fact that most doctors in the survey were aware of and had identified notifiable diseases, they cited numerous perceived barriers to reporting. The reporting system criteria must be explicitly explained to collaborating physicians in order to efficiently identify human AI cases and also other infectious diseases via IDSR. Perceived barriers, such as a lack of infrastructure, must also be removed.Future updates

to the reporting system should take into consideration rising internet, mobile, and email-based communication usage.

In March 2013, the present Nigerian IDSR system was formed, and 41 diseases were listed as "notifiable." These illnesses are divided into three groups: those that are epidemic-prone (such as cholera and measles), those that are intended to be eliminated (such as poliomyelitis and dracunculiasis), and other illnesses that are significant for public health (e.g malaria, AI, etc). The addition of avian influenza (AI) human illnesses to Nigeria's list of notifiable diseases, mandating that they be reported via the Integrated Disease Surveillance and Response system, was another reaction to the discovery of HPAI in birds (IDSR).All public primary, secondary, and tertiary healthcare facilities across the country use the IDSR system to identify notifiable diseases. These diseases are then reported in a chain from the healthcare facility to local government agencies (LGAs), state-level Ministries of Health, and finally the Federal Ministry of Health (FMOH), which then analyzes and disseminates IDSR data. The World Health Organization's African Region (WHO-AFRO) received a report on the first verified human case of AI on January 31, 2007, from Lagos, Nigeria. A 22-year-old woman's illness started on January 8 and ended on January 16 of that year; her mother also passed away on January 4 from a related ailment. Due to the lack of a specimen, the mother of the case-disease patient's could not be diagnosed as AI.

On December 21, 2006, both women had assisted in de-feathering a chicken that had been purchased from a chicken market in Lagos. The Federal and State Ministries of Health and Agriculture jointly looked into this matter, working with the Food and Agriculture Organization (FAO), World health organization (WHO), and the US Centre for Disease control and prevention (CDC). Up to this point, WHO-AFRO has only had one confirmed human case. Systems for

passively monitoring outbreaks, like the Nigerian Integrated Disease Surveillance and Response system, rely heavily on physician reporting (IDSR). Although the Nigerian government made investments in training, awareness-raising, and response initiatives related to disease reporting, no study has been published to date looking into how issues affecting physicians' knowledge, preconceptions, and practices related to communicable disease disease reporting, especially in the context of infection in humans with avian influenza, may be influencing those individuals' knowledge, perceptions, and practices.

Additionally, there aren't many statistics available globally addressing physician knowledge, attitudes, and practices (KAP) for notifiable disease reporting. Health information must be provided to the medical community in a timely and effective manner in order for public health officials to react rapidly to disease of a new or developing hazard. However, little is known about how doctors in settings with limited resources obtain health information, particularly regarding new or emerging diseases or threats, or about their preferred techniques for doing so.

IDSR Monitoring

Due to the discovery of HPAI in Nigerian poultry, the ongoing global HPAI pandemic, and the potential threat posed by novel avian influenza viruses like influenza A (H7N9), doctors must be familiar with the clinical range of human cases of AI and the proper channels for reporting these incidents through the IDSR in order to prevent missed cases of all these infections.

In order to determine what diseases are impacting their communities as well as the prevalence of particular diseases for elimination efforts, disease monitoring helps to evaluate the health of the populations. A number of The Task Force's projects collaborate with nations to deliver practical

field-based tools and approaches for disease surveillance and to make sure that the nation has a sustainable ability to carry out ongoing disease monitoring.The problem is that public health initiatives to combat infectious diseases need sophisticated tools to track alterations in population health status. These systems include frontline healthcare professionals with the training to anticipate disease outbreaks as well as recognize them, as well as infection-detection devices and health information management systems.

Nations around the globe lack effective disease surveillance systems, as COVID-19 showed. This could be brought on by a lack of funding, a lack of public health expertise, or old or subpar health information systems. Populations are consequently more vulnerable to diseases and pandemics like Ebola and COVID-19 that can spread uncontrollably.

I. Public health applied research as well as surveillance for assessing and improving maternal and neonatal death surveillance and response,
II. Reinforcing field epidemiology training programs,
III. Strengthening of the public health systems
IV. Detection, prevention, and elimination of non-communicable diseases.

All the activities mentioned above are required to help countries develop the Public Health Capacity for Strong Disease Surveillance [43].

Private practitioners are usually the first point of care in emerging economies because of perceived quality, lower costs, speedy care, the flexibility of payments, as well as accessibility. They already account for over 50%–80% of the out- and inpatient care in countries such as India, Brazil, China, and Nigeria among others, but their contribution to health information systems in

most countries is essentially voluntary, resulting in gross misrepresentation and underestimation of disease burdens. In Nigeria, IDSR implementation is continually faced with challenges of disease reporting, especially from the point of the health facilities where inadequate health information is generated, because the health-care workers (HCWs) appear to be reporting diseases ineffectively. Poor disease reporting by HCWs has been linked to a number of outbreaks in Nigeria throughout the years. The weaknesses within the IDSR strategy in most countries had resulted in failures in detecting epidemics, spread of diseases and associated human sufferings, and loss of lives. Based on the structure of IDSR in Nigeria, the emphasis is on public health institutions. In Enugu State, it has been stated that private healthcare facilities do not participate in disease surveillance [18, 41, 44].

Although efforts are now in place to bring the private sector on board, there is a need to assess these facilities to determine their level of involvement currently. The state government provides various forms of support on DSN to private health facilities. They include material, technical, and, in some cases, financial support. The materials provided include surveillance posters and data tools – IDSR 002, 003. “The forms are supplied to the DSNOs in the LGA who distributes to the facilities as soon as they are received from national body. Form 001 for immediate case reporting is not provided to the health facilities. It is the local government DSNO that makes use of that. On technical support, “facility surveillance focal persons are trained as often as they are visited while on the job. Besides that, the state government organizes training twice yearly for them. Financial support for DSN is provided by the WHO for acute flaccid paralysis (AFP) surveillance. This support is only available for sites designated as AFP focal sites. “WHO provides one thousand naira as financial support to the surveillance focal persons at designated facilities monthly, as a stipend. Every LGA has about 10 AFP focal sites or more: about 5–7

public and 3–4 private. There is a mixture. The main criterion for selection is based on patient load. Facilities with heavy patient load are preferred [31, 46].

In order to effectively recognize human infections to avian influenza and other diseases via the current IDSR system, reporting technical specifications need to be communicated effectively to the participating physicians, according to a study conducted in Nigeria on disease confirmation by clinicians. There was little agreement among participating doctors as to whom one should report notifiable diseases, including Avian Influenza, and doctors identified numerous barriers to reporting despite broad knowledge of Avian Influenza, including common symptoms and means of transmission. The main issues mentioned were inadequate diagnostic abilities, a shortage of reporting infrastructure, and clinicians not knowing how and to whom they should report in their hospital or district. General practitioners were less likely to cite knowledge-related challenges than clinicians working in pediatrics or internal medicine, for example. A more capable laboratory for diagnostic confirmation could reinforce the IDSR system even more by providing a different method for reporting instances to regional, state, and national health authorities. This would however still rely on doctors identifying patients for diagnostic tests [21, 45].

Physicians observed broad information availability and identified the internet, mobile phones, and email as better ways to communicate with this group for both routine updates and in times of crisis, such as an epidemic or pandemic. Internet sites were regarded by respondents of any and all levels of experience as the best information source about avian influenza, which might also serve as an indicator of the best information source for other emerging infectious diseases threats. Despite some variation in online activity by years of professional experience (both in regularity of general online use and when looking up health information), During the 2009 influenza A

(H1N1) pandemic, the World Health Organization used this method to enhance information gathering and distribution on a worldwide scale. Although they were not usually mentioned as the best way to obtain health information, doctors may be able to rapidly and inexpensively reach practically everyone of this population thanks to the prevalence of cell phones [50]. Cell phone short message services (SMS)/text messages have been identified as a key surveillance system enhancement for improving pandemic preparedness in African settings. Additionally, educational lectures/courses, as well as pamphlets, posters, and other methods of communication commonly used to inform this audience, were listed very infrequently as a best way of communicating health information or as a most useful source of Avian Influenza, and may not be as effective for future awareness campaigns [38, 51].

Timely dissemination of information such as clinical presentations and reporting procedures is an integral part of public health surveillance and outbreak response. A flexible, cost-efficient and rapid method for spreading information to physicians and public health officials is vital for the success of these event-reporting systems, especially in countries with limited resources. Electronic methods such as the internet, email distribution lists and use of cell phones have significant potential in this area and the results of this study indicate that physicians reported them to be at least as useful as traditional methods as ways to obtain health information and most useful in for learning about a newly emerging disease [52]. Since these methods can be more flexible, faster, and less expensive to use than traditional trainings, workshops, lectures and publications in traditional scientific media, further exploration of the utilization of these electronic methods for information distribution should be investigated.

There were no trends in understanding of notifiable epidemic infectious illnesses (including measles, polio, and AI) according to clinical expertise or years of experience, but there is still opportunity for improvement as nearly one-third of doctors incorrectly identified all three as notifiable diseases. This study employed AI knowledge as a surrogate for how well Nigerian doctors learn about new or emerging health hazards. This study demonstrated that knowledge of this emerging illness had reached all study locations after the trainings as well as media campaign that followed the HPAI H5N1 outbreak in Nigeria in the two years before to the study. Since more than 20% of doctors were unable to recognize the typical signs and symptoms of AI infection in humans, training and outreach initiatives for notifiable and emerging diseases should continue to be evaluated and modified [19, 20, 55].

To ease reporting, it should be noted that the FMOH placed surveillance personnel in public facilities, thus private hospitals without surveillance officers may have more limited infrastructure and lower levels of reporting. Regression analysis did not identify any significant multivariate predictors of key study outcomes such as identifying or reporting notifiable diseases; however, there may have been additional predictors of these outcomes that were not captured by our questionnaire. An effort was made to obtain geographic representation by selecting the most populous city from each of the six geopolitical zones; however, cities from two zones were excluded. Lagos was excluded because this region was specifically targeted for increased avian influenza and IDSR training following the human AI case in 2007 and this might have biased the study results. Port Harcourt was excluded due to security issues that prevented study activities. These security issues may have had an impact on the reporting system infrastructure and therefore the results may not be generalizable to physicians from this area [29, 17].

Although the majority of physicians surveyed, regardless of clinical capacity, hospital type, or years of experience, were knowledgeable of notifiable diseases and had reported notifiable diseases, they identified many perceived obstacles to notifiable disease reporting. In order to effectively identify AI and other infectious diseases through IDSR, reporting system requirements need to be clearly communicated to the participating physicians and perceived obstacles, such as lack of infrastructure, addressed. Future improvements to the reporting system targeting this population could benefit from increased utilization of the internet, as well as SMS and email-based communication [20 55].

2.4.4 Surveillance And Response Conceptual Framework

Substantial attention and the accompanying resources in surveillance have been devoted to the prompt and complete production of surveillance data. Although developing countries experience weaknesses in both hemispheres, more attention is needed to creating and strengthening the local capacity within developing countries to identify and manage effective responses to disease outbreaks and public health conditions of national and international concern. In some disease-specific programs, this capacity has to be imported through short-term expatriate assistance. Even when local capacity is developed, it is often specific to the disease program, making transfer of skills to other areas problematic. The failure to develop this indigenous capacity has limited the ability of developing countries to build national surveillance systems that respond to both international public health threats and local health concerns. This capability is essential to the sustained development of countries [3, 40].

The World health organization (WHO) has started consensus meetings at the national and regional levels to review and modify surveillance as well as action systems with a focus on improved epidemic preparation and epidemic response because public health monitoring and action are essential to good public health practice. They also emphasized the necessity for integration techniques to be incorporated into the reform process as well as the facilitation and standardization of surveillance and action assessments. In response to the aforementioned, the integrated Disease Surveillance (IDS) project was just recently started by the WHO Regional Office for Africa (WHO/AFRO). This initiative makes use of the conceptual framework presented in this study, which was successfully pilot tested and used by the Centers for Disease Control and Prevention, Tanzanian Ministry of Health, and WHO to create a 5-year plan of action (PoA) for the implementation of IDS in Tanzania.This methodology for public health surveillance evaluations (Phase I of IDS) has been modified by WHO/AFRO, further piloted, and later used across Africa[12, 37]. To lessen the domestic and global threat of infectious illnesses, surveillance and action reform are crucial. A review of the effectiveness of national-level public health surveillance as well as response systems has been prompted by the resurgence of health threats posed by infectious diseases, including cholera, malaria, dracunculiasis, and Streptococcus pneumonia, as well as global efforts to eradicate polio, dracunculiasis, and leishmaniasis. Infectious diseases must be closely monitored and controlled since they continue to be major contributors to morbidity, mortality, and rising cost of healthcare in many nations.These resurgent infectious disease concerns and more thorough analyses serve to highlight any gaps, errors, or delay in surveillance as well as inefficient or ineffective public healthinterventions. Many nations are aware of internal issues related to subpar performance or an absence of adequate health monitoring and intervention. At the national level, the

employment of redundant, independent vertical public health surveillance systems (e.g., one for malaria, another for tuberculosis) while retaining surveillance close to the point of action may lead to redundant staffing, unnecessary expenses, and ineffective / inefficient measures. Furthermore, because technical and monetary assistance for vertical monitoring schemes may originate from beyond a country's boundaries, some major priority diseases might get less attention. Duplicative, independent vertical monitoring systems may not necessarily prioritize the interests of developing nations[11,22, 45].

When this happens, different terms for surveillance are used, other methods, such as analysis and reporting procedures, are used, and measures are taken that overburden healthcare professionals. Poor performance and discouragement could result from this. They developed a conceptual framework wherein surveillance and action exist as interdependent processes in order to facilitate as well as standardize federal level assessments and to also provide a user-friendly approach to national level reform. This simple framework can be utilized as a model for reform in addition to being a simple mechanism for evaluating surveillance and action. The two procedures together make up an open system, which is one in which new case-patients are continuously added. Eight cores with four (4) support activities that may be easily measured using clear country-specific indicators make up this framework, according to its classification [19, 46].

In the early years of modern public health (1940 – 1960), the term surveillance was applied to the collection, analysis, interpretation, and dissemination of (health outcome-specific) data to those who need to know. Later, public health surveillance was defined as the on-going systematic collection, analysis, and interpretation of outcome-specific data for use in the planning, implementation, and evaluation of public health practice. Rephrasing the latter

meaning, surveillance data are collected at the health facility which is the first level of contact of the patient with the health system, then analyzed, interpreted, and used for action [36,9, 47].

The public health course of action) resulting first from interpretation the data are not included in surveillance per se. Few people were aware of the surveillance officers' intrinsic responsibility for preventative and control measures (i.e., the public health professionals in charge of interpreting the data obtained). However, the WHO and the global public health community recognized the significance of connecting public health surveillance with public health action as early as 1963. This conceptual framework divides public health surveillance into six main tasks:

1.Detection

2. Registration

3. Confirmation/Verification (both epidemiologic and laboratory)

4. Reporting

5. Analyses

6. Feedback/Response

Public health action consists of two primary actions:

1. Acute/ rapid (epidemic-type) responses

2. Planned or deliberate (management-type) responses.

The four supporting activities of public health surveillance and action enable the core operations of

1. Communication

2. Training

3. Supervision

4. Resource-provision

The first phase in this framework is called "case-patient detection," which is defined as "the public health situation or occurrence that identifies a (presumed) case-patient as such by public healthcare system." Case-patient detection typically takes place at the level of the health facility. The laboratory may be involved in detection, albeit it is typically done by a healthcare professional (such as a private doctor, nurse, community health workers worker, volunteer, or salaried MoH practitioner). Then, particular descriptive variables are recorded in a public health record. Case-patients might be found but not recorded [10, 14 48.]

Case-patients are either confirmed or remain unconfirmed after registration. Evaluation of epidemiological parameters and/or the findings of laboratory tests serve as confirmation.

In-depth case-patient research is required for epidemiologic confirmation in the field (for example workplace or household). Laboratory tests support or disprove registered case-patients' diagnoses. The laboratory itself can function as a primary or primary surveillance system by discovering, registering, and documenting case-patients by performing normal laboratory testing to identify new, previously unreported case-patients. Some laboratories continuously report on new health findings (e.g. antibiotic resistance). The transmission of public health surveillance data gathered from lower levels of the healthcare system (such as health facilities) to higher ones is required for the reporting of case-patient data (e.g., district or national offices) [49].

Data are examined after being received at the proper health level.In order to execute the necessary measures to prevent disease with the least amount of delay, analyses should be carried out as closely as feasible to the primary reporting level. The development of indicator targets intended for public health action as well as training in analytical techniques, including data presentation (formalized charts and graphs), are examples of initiatives to improve data analysis.

Reported data are frequently numerical. Results come from numbers analysis. The outcomes of assessments of surveillance data serve as the surveillance's benchmarks [5, 56].

To use it for public health action, however, acquired data must first be processed or translated into public health-related information and subsequently into public health messaging.

The communication of information and signals from higher levels to lower ones is known as feedback. Providing timely and consistent communications from the federal level to the level of the health institution on the premise of locally data given is only one example of a targeted intervention that might be used to address bad feedback. Despite the fact that public health action and surveillance are interdependent activities, they are connected through the input and outflow of data and information (i.e., interpretation). This translation of data into information into messages can be described as a process that is a collection of constantly in motion actions or operations with a specific objective. Never divorce public health action from the output of data, information, and messages (interpretation) obtained via surveillance. By offering public health interpretation to direct any changes in the scope or content of monitoring, public health action constantly influences public health surveillance [33,57].

End note

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CHAPTER THREE

3.0 Methodology

3.1 Research Design

3.1.1 Study area

Lagos is a state located in the south western geopolitical zone of Nigeria and it is the nation's largest urban area. It is a major financial centre and would be the fifth largest economy in Africa, if it were a country. Lagos state has 20 LGAs and 37 LCDAs.

Mushin is a suburb of Lagos city and its inhabitants are mostly Yoruba people. Continuing expansion from 1950 led to problems of overcrowding, inadequate housing, and poor sanitation. Commercial enterprise is majorly trading as it has about 10 major markets. It has nine primary health care centres, one secondary health facility, one teaching hospital and 75 private hospitals totalling 86 health facilities. Mushin lies on the railway from Lagos and shares boundaries with Shomolu, Oshodi, Surulere and Mainland local government areas. Population (2006) local government area, 1,990,300

Alimosho is a Local Government Area in Lagos State, Nigeria's Ikeja Division. According to the authorized 2006 Census, it has 3,082,900 residents, making it the largest local government in Lagos.

Currently, it is separated into numerous Local Community Development Areas (LCDA). Agbado/Oke-odo LCDA, Ayobo/Ipaja LCDA, Alimosho LG, Egbe/Idimu LCDA, Ikotun/Igando LCDA, and MosanOkunola LCDA are the six sub-divisions formed from the original Alimosho. The Egbeda/Akowonjo urban area is located inside the LGA [1].

The Alimosho was a part of the (then) western area when it was founded in 1945. The majority of people in Alimosho are Egbados. The Oro, Igunnu, and Egungun yearly festivals are notable examples of the region's rich cultural diversity. Islam and Christianity are the two primary faiths. The Yoruba language is commonly used in the neighborhood.

A general hospital, primary healthcare centers, and private health facilities are among the 225 health institutions in Alimosho LGA [1].

3.1.2 Study site

This study was carried among health workers in private and public health facilities in Mushin and Alimosho LGAs, Lagos State.

3.1.3 Study Design

A cross sectional study was used for the research.

3.2 Population of the Study

This is the personnel in charge or a member of the appointed staff who oversees surveillance in both private and public health facilities in the LGAs.

A focal person is a health worker trained to identify notifiable diseases, facilitate investigation of cases, keeps surveillance records and perform other surveillance activities at the health facility level. He/she reports to the LGA DSNO [2].

3.3 Sample and Sampling Technique

3.3.1 Sample Size Determination

To determine the sample size for study, the following formula was used:

$n = Z^2pq/d^2$

where,

n= the minimum sample size

z=the standard normal deviation (corresponding to 1.96 at 95% confidence level)

p= estimated proportion of the population who have good knowledge of surveillance and IDSR in a study carried out among similar population in Oyo state is 55.3%[23].

q= 1-p (1-0.55) = 0.45

d= acceptable margin of error which is 5% (0.05)

Therefore,

$n= (1.96)^2(0.55)(0.45)/(0.05)^2$

n=380

To get the finite population correction factor if N<10000, the following formula will be used:

nf= n/(1+n/N)

Where,

nf= n finite

n=minimum sample size (380)

N= sample population

N = 237

3.3.2 Sampling Technique

A multi stage sampling method was used to select participants.

Stage one: Selection of local governments

Random sampling technique was used to select two out of the 20 LGAs of Lagos state. Mushin and Alimosho LGAs were selected by simple random sampling [3, 4].

Stage two: **Selection of focal persons from different health facilities**

One health care worker who is either the surveillance focal person or head of facility or a designated health worker was selected from all health facilities in the selected LGAs.

3.3.3 Inclusion criteria

This is the person in charge or a member of the appointed staff who oversees surveillance activities in the designated health facilities.

A focal person is a health worker trained to identify notifiable diseases, facilitate investigation of cases, keeps surveillance records and perform other surveillance activities at the health facility level. He/she reports to the LGA DSNO.

3.3.4 Exclusion criteria

Patients and non-health workers in both private and public health facilities.

Non-focal person is a health worker trained to identify notifiable diseases, facilitate investigation of cases, keeps surveillance records and perform other surveillance activities at the health facility level. He/she reports to the LGA DSNO.

3.4 Method of data collection

3.4.1 Study Instrument

Three research assistants were recruited and trained on how to administer the questionnaire. The research assistants are youth corps members serving in Mushin LGA. They distributed the self-administered questionnaires to respondents who filled and returned to them.

3.5 Method of data analysis

Data Management and Analysis

Data collected were entered into Microsoft excel and analysed using SPSS 20 statistical software. The data analysed was presented as frequency tables, chi square test will be used to test for association between variables. Similarly, quantitative variables were described using measures of central tendency (mean and median) and measures of dispersion (range and standard deviation) as appropriate. Level of significance is set at 5% ($P < 0.05$).

Scoring Method

One mark (1) was given for each correct or appropriate response to each question on the questionnaire assessing knowledge of disease surveillance, disease surveillance practice, and factors that influence disease notification. Zero points were given for any incorrect, inappropriate, or "don't know" responses (0). To create the corresponding composite scores, a total score was calculated for each of the factors studied. A maximum score of 58 was obtained for knowledge of disease surveillance by adding the results for questions 12 through 70 on the questionnaire [5].

3.6 Ethical Consideration

3.6.1 Ethical approval

Approval for the study was obtained from Lead City University, Ibadan **(LCU-REC/22/007).**

Informed consent was obtained from participants after they understand and give approval to participate in the study.

3.6.2 Informed Consent

Written informed consent was obtained from the participants as a requirement for participation in the study. Every research participant has the autonomy to withdraw his or her consent on participation at any point in the course of the study.

End Notes

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CHAPTER FOUR

4.0 Results And Discussion

Introduction

The findings from the study are presented in tabular and graphical format with explanatory text. This section is presented under the following major headings: Characteristics of the study population; overall results; answers to the research questions.

4.1 Characteristics of the study population

A total of 237 respondents were distributed. 232 were administered which is the total respondents available for this study. The 232 questionnaires were analysed by giving a response rate of 98 percent.

Table 1: Characteristics of the study population

Socio-demographic characteristics	**Frequency (Percentage) n(%)**	**Range**	**Mean±SD**
Age (Years)		19 - 60	38.66 ± 9.01
19 – 29	37 (15.9)		
30 – 39	82 (35.3)		
40 – 49	83 (35.8)		
50 -59	29 (12.5)		
Sex			

Male	20 (8.6)		
Female	212 (91.4)		
Marital Status			
Single	39 (16.8)		
Married	183 (78.9)		
Others	10 (4.3)		

The mean age of the respondents was 38.66 ± 9.01years with a range of 19 to 65 years and the highest frequency of respondents, 83(35.8%) were between the ages of 40 and 49 years. Most of the respondents (91.4%) were female. Over 70% (78.9%), of the respondents were married and just over 15% (16.8%) of the respondents were single.

Table 2: Professional and other respondent's data.

Respondent's Profession	**Frequency (Percentage) n(%)**
Local Government	
Mushin	88(37.9)
Alimosho	144 (62.1)
Type of Facility	

Public	132 (56.9)
Private	100 (43.1)
Class of facility	**(n=132)**
Tertiary	5(3.8)
General	16 (12.1)
Health center	108 (81.8)
Health post	3 (2.3)
Cadre	
Doctors	10 (4.3)
Nursing officer	106 (45.7)
Health records officer	25 (10.8)
CHOs/CHEWS	89 (38.4)
Others	2 (0.8)
Respondent Designation	
Head of facility	44 (19.0)
Focal person	161 (69.4)

Record officer	27 (11.6)
Surveillance training in the last 1 year	
Yes	171 (73.7)
No	61 (26.3)
Years of Experience (Years)	**(n= 171)**
<1	40 (23.4)
1 – 5	101 (59.1)
6 – 10	20 (11.7)
>10	10 (5.8)

Over 35% (37.9%) of the respondents were at the Mushin local government area while the remaining 62.1% were at the Alimosho local government area. Over half of the respondents (56.9%) were in government facilities out of which over four-fifths (81.8%) were in health centers. The highest percentage of respondents, 106(45.7%) were nursing officers, 89 respondents (38.4%) were CHO/CHEWs and 25 respondents (10.8%) were medical records officers. Almost 70% of the respondents (69.4%) were surveillance focal persons. Over 70% (73.7%) were trained with over half of them (59.1%) having 1 – 5 years of experience.

Table 3: Respondents' Knowledge about priority disease reporting

Agency the health facility is to report priority diseases to

Variable	Frequency (Percentage) n=232 (%)
Federal Ministry of Health	14 (6.0)
NPHCDA	27 (11.6)
Lagos state Ministry of Health	18 (7.8)
Statistics office	10 (4.3)
LGA PHC Dept	133 (57.3)
I don't know	30 (12.9)

Over half of the respondents (57.3%) were able to correctly highlight that the agency for reporting priority diseases was the LGA PHC

Fig. 1 Epidemic prone diseases

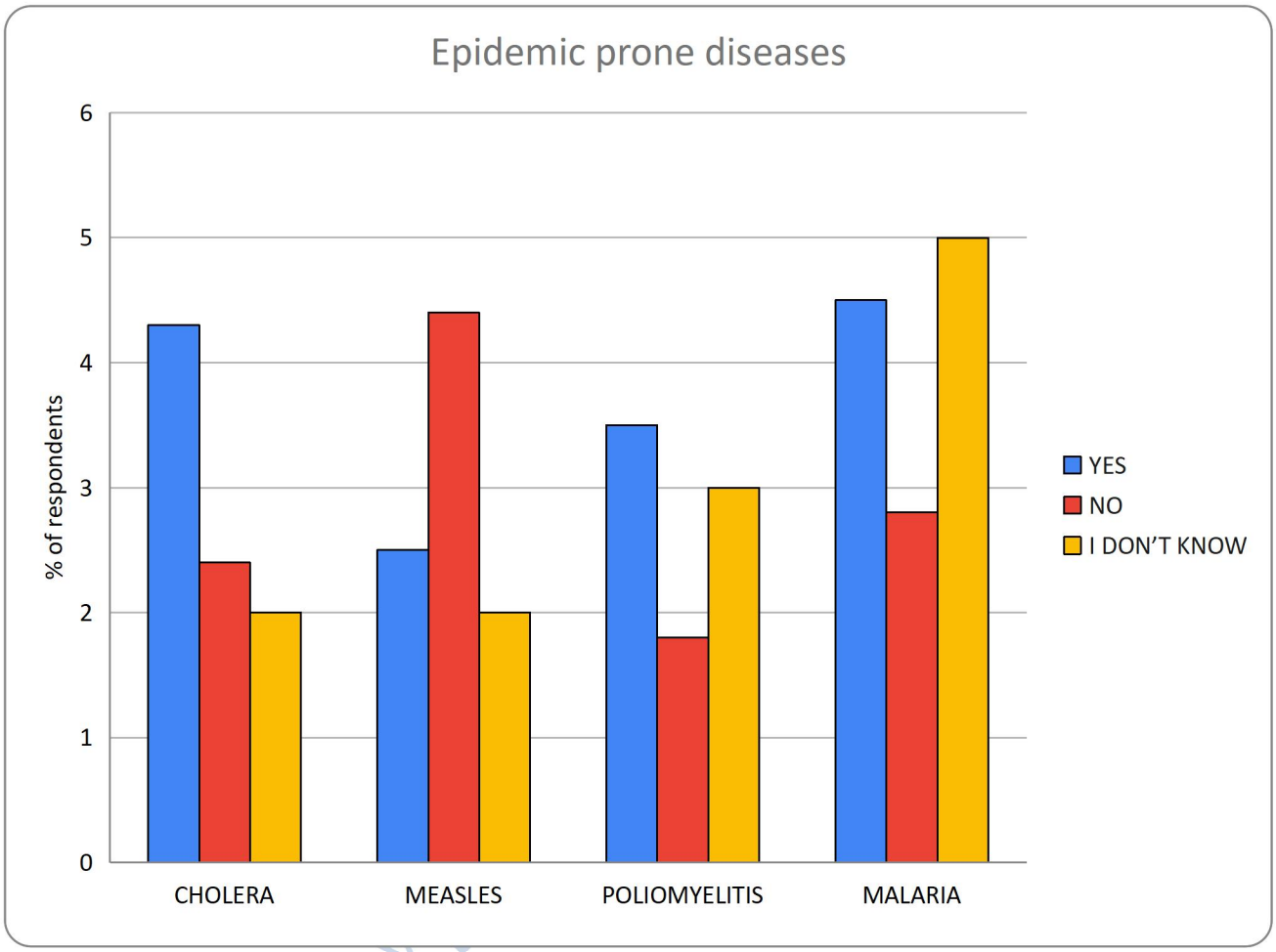


Fig. 2 Diseases Targeted for Eradication

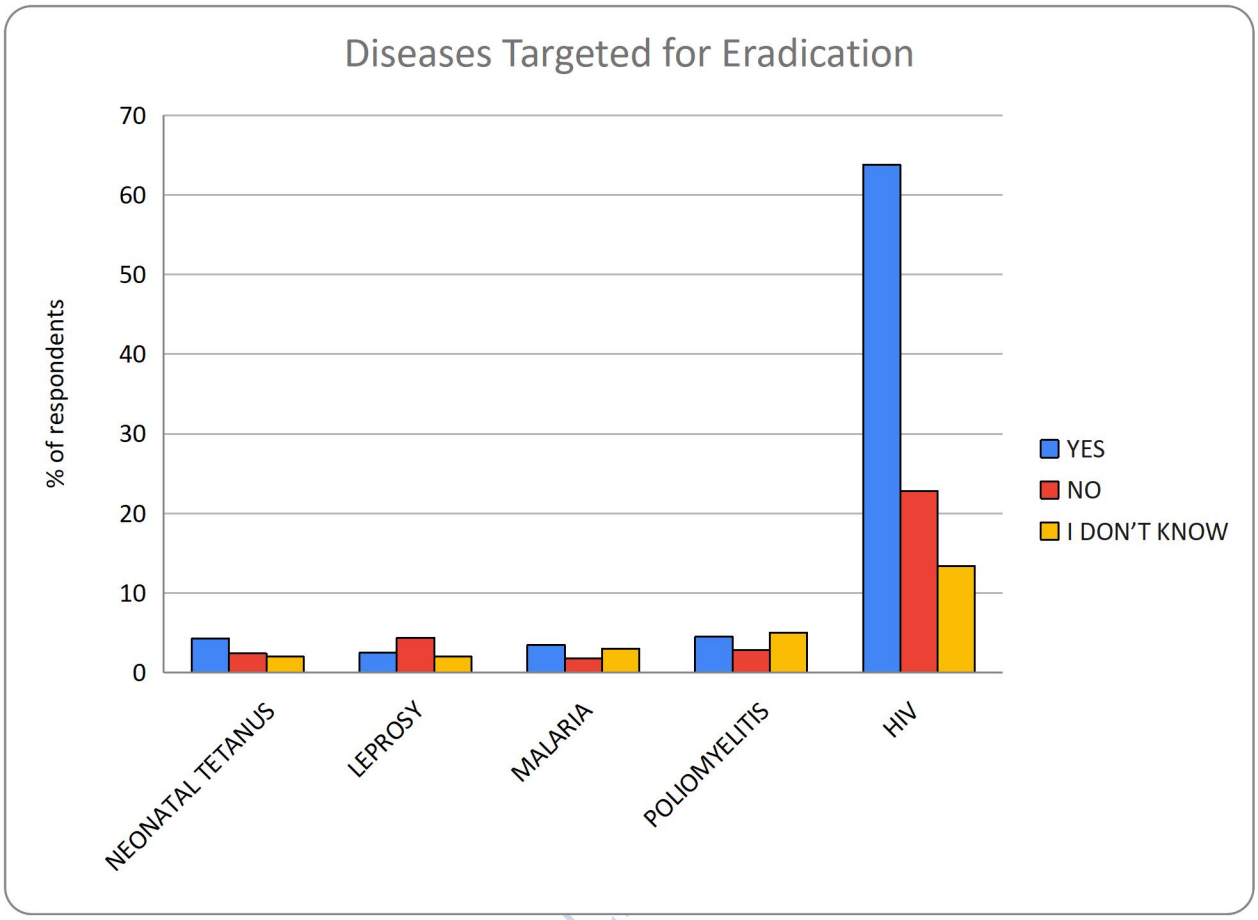


Fig. 3 Diseases of Public Health Importance

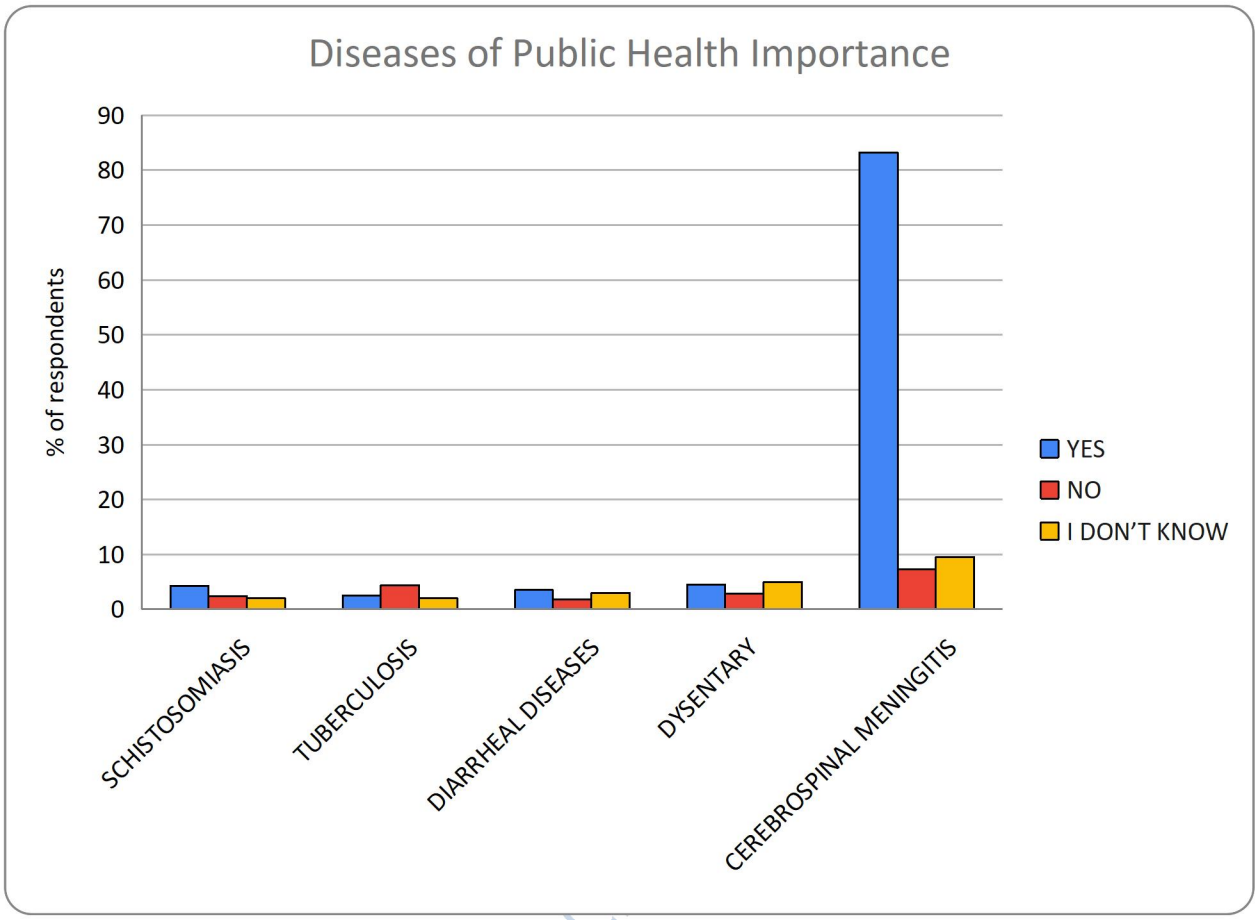


Fig 4: Diseases to be reported immediately

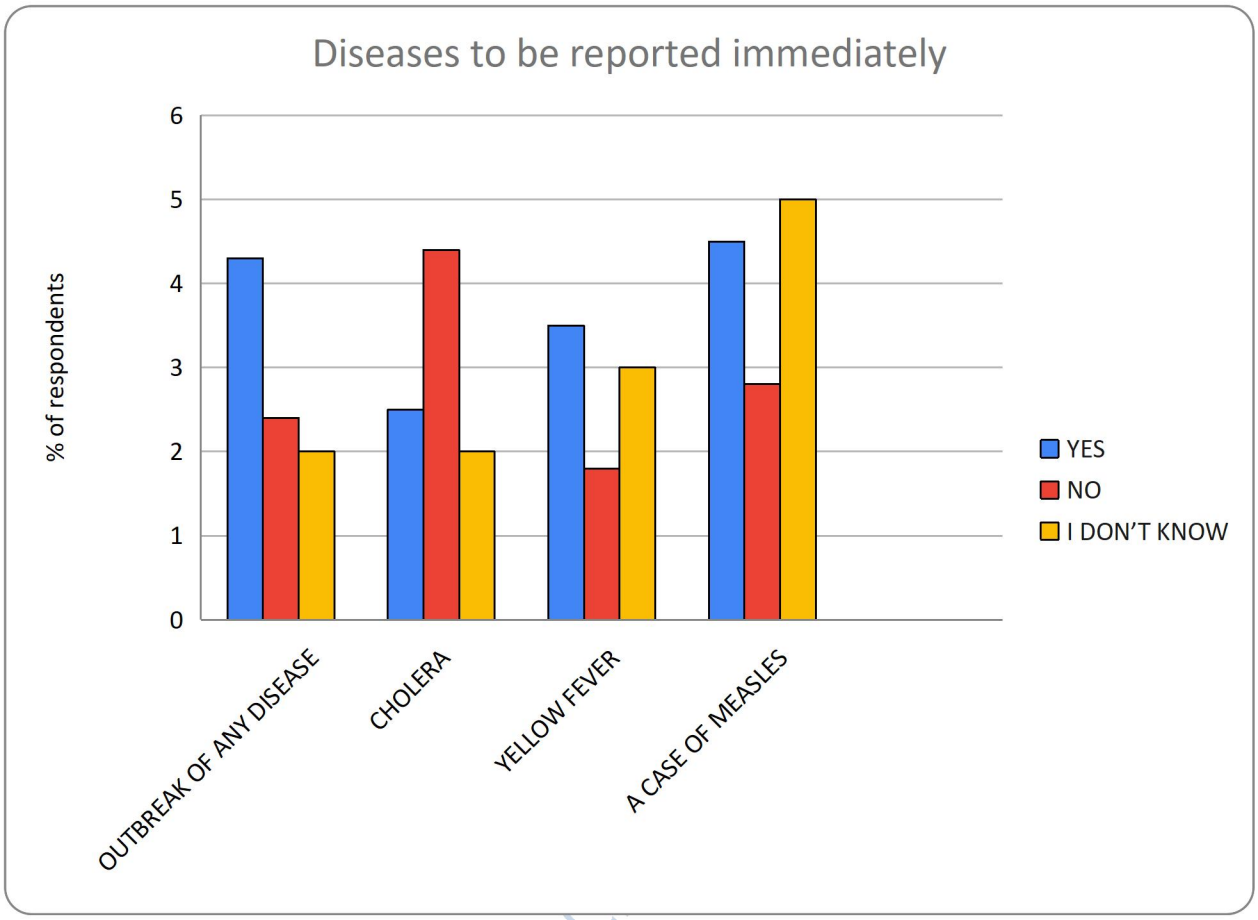


Fig 5: Diseases to be reported weekly

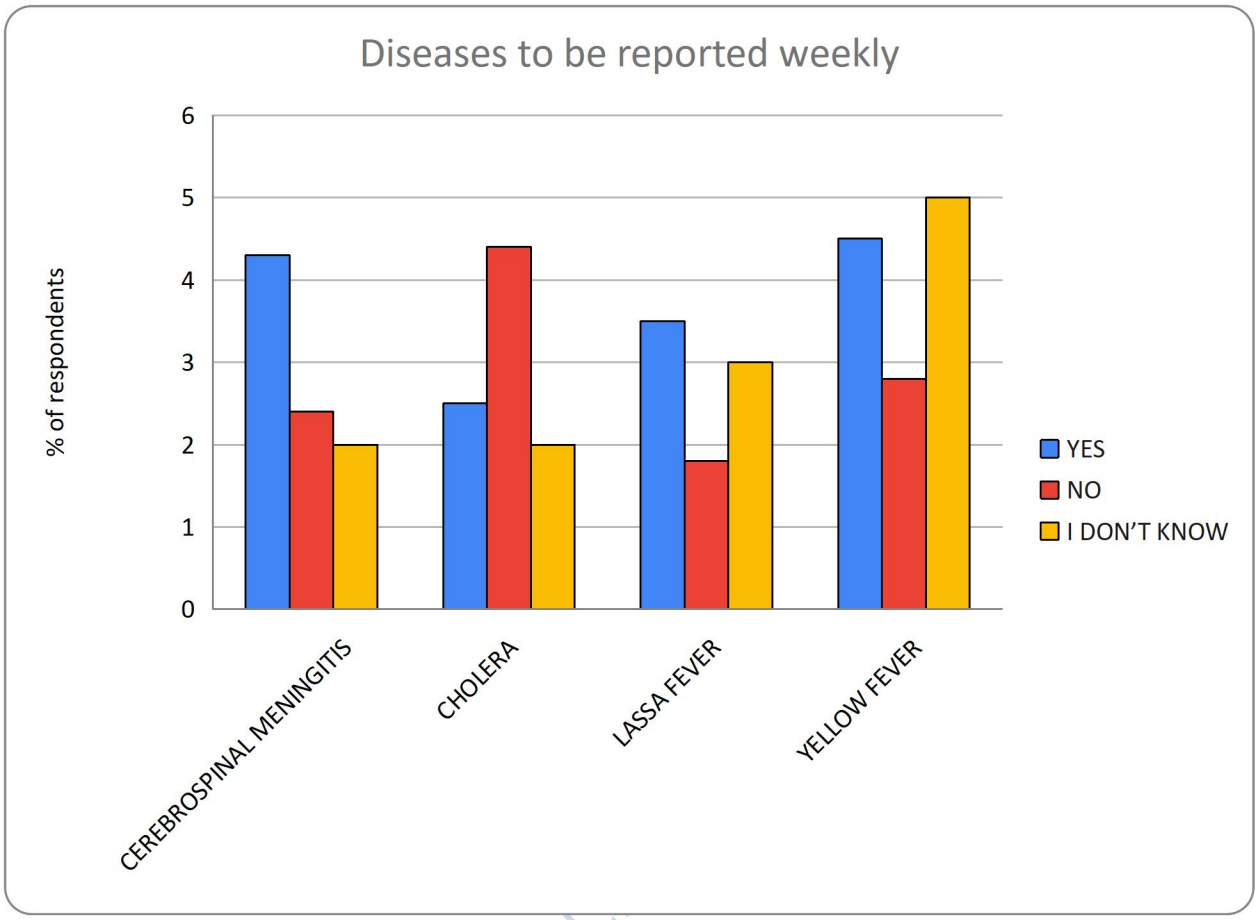
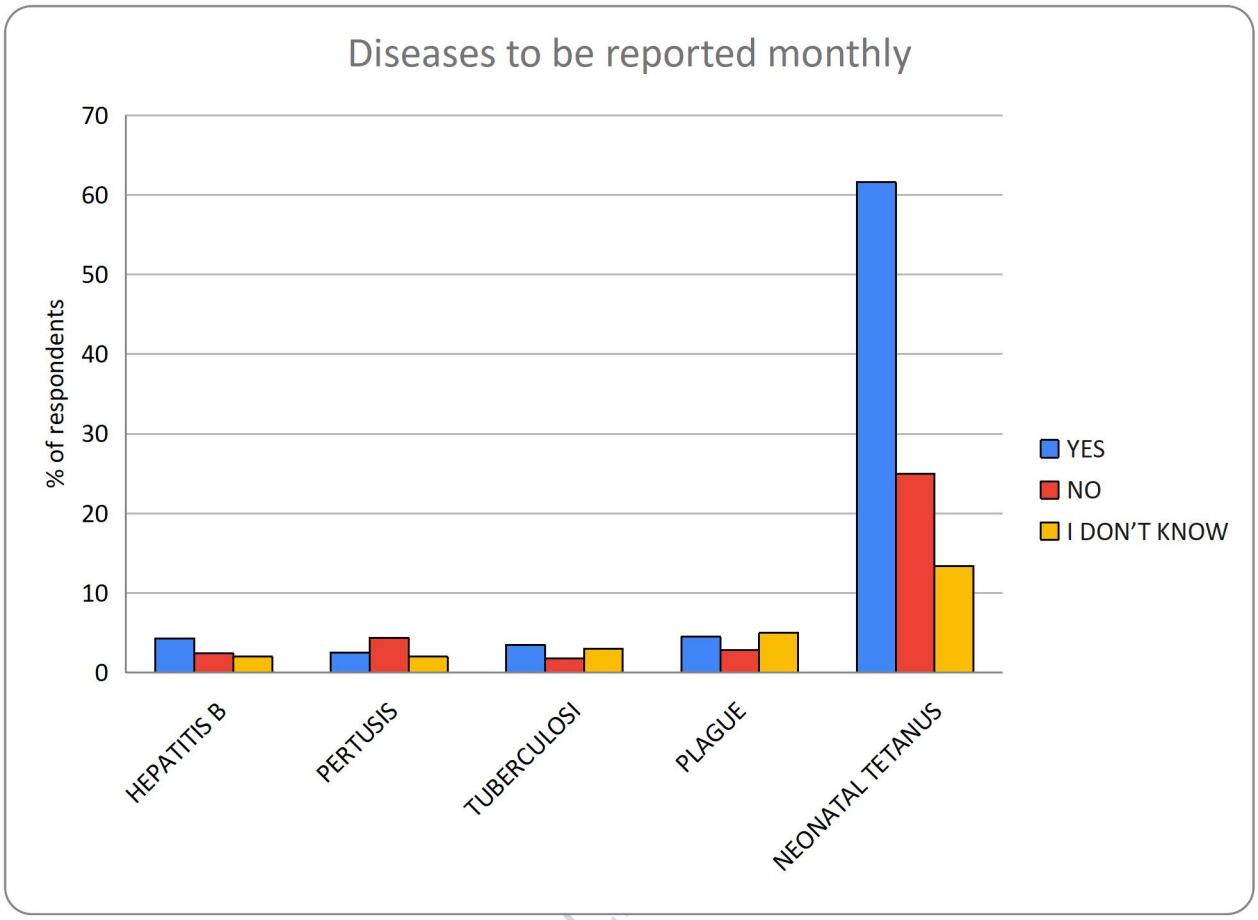


Fig 6: Diseases to be reported monthly



Over three quarters of the respondents were able to correctly highlight Cholera, Measles and Poliomyelitis as epidemic prone diseases (91.4%, 91.8% and 78.0% respectively). Less than half of the respondents (49.6% and 37.9% respectively) were able to correctly highlight that Malaria and HPV were not epidemic prone diseases. Over three quarters of the respondents were able to correctly highlight Neonatal Tetanus, Poliomyelitis, andLeprosy as diseases targeted for eradication and elimination (82.8%, 90.9%, and 75.4% respectively). Less than 30% of the respondents (28.4% and 22.8% respectively) were able to correctly highlight that Malaria and HIV/AIDS were not diseases targeted for eradication and elimination.

Over 65% of the respondents (66.4%) were able to identify schistosomiasis as a disease of public health importance. Over three quarters of the respondents were able to correctly highlight Tuberculosis, Diarrhoeal diseases and Cerebrospinal meningitis as diseases of public health (91.8%, 78.4%, 83.2% respectively). Less than one quarter of respondents (22.4%) were able to mention that dysentery diseases were not diseases of public health importance. Over 85% of respondents (86.6%, 91.4%, 90.5% and 87.5% respectively) correctly mentioned that outbreak of any disease, Cholera, Yellow Fever and Measles were diseases to be reported immediately and over three fifths of respondents (60.3%, 65.9%, 63.8%, 71.1% respectively) mentioned correctly that cases of CSM, Cholera, Lassa fever and Yellow fever were to be reported weekly.

Over 70% of the respondents highlighted correctly that Hepatitis B and Tuberculosis were diseases to be reported monthly (75.0% and 78.0% respectively), and over 60% of the respondents highlighted correctly that Pertusis and Neonatal tetanus were diseases to be reported monthly (64.2% and 61.6% respectively). Less than 20% of respondents (18.5%) were able to correctly mention that Plague was not a disease to be reported monthly.

Table 4: Respondents' awareness of IDSR

Variable	**Frequency (Percentage)** **n=232 (%)**
Know about IDSR	
Yes	203 (87.5)
No	2

Number of IDSR Reportable Diseases in Nigeria	**(n = 203)**
Correct response (40)	27 (13.3)
Wrong response	176 (86.7)

Majority of the respondents, 203(87.5%) were aware of the IDSR, though less than 15% (13.3%) of those who were aware knew the number of IDSR Reportable Diseases in Nigeria.

Table 5: Overall Knowledge of IDSR

Variable	**Frequency (Percentage) n=232 (%)**
Good	95 (40.9)
Fair	102 (44.2)
Poor	35 (15.1)

The highest frequency of respondents, 102(44.2%), had fair knowledge of IDSR, 95 respondents (40.9%) had good knowledge and 35 respondents (15.1%), had poor knowledge.

Table 6: Respondents' Practice of IDSR

Variable	Frequency (Percentage) n=232 (%)
Clinic register	
Yes	201 (86.6)
No	31(13.4)
Case form for immediate notifiable diseases	
Yes	182 (78.4)
No	50 (21.6)
Monthly reporting of priority diseases	
Yes	177 (76.3)
No	55 (23.7)
Monthly reporting form	**(n = 177)**
IDSR 003	129 (72.9)
IDSR 002	28 (15.8)
F003	20 (11.3)
Weekly reporting of	

epidemic prone diseases	
Yes	172 (74.1)
No	60 (25.9)
Weekly reporting form	**(n = 172)**
IDSR 003	44 (25.6)
IDSR 002	69 (40.1)
F003	58 (33.7)
IDSR 001	1 (0.6)
Duplicate reporting forms	
Yes	175 (75.4)
No	57 (24.6)

Over 80% of respondents (86.6%) mentioned the presence of a clinical register for keeping disease records in their facility and over three quarters of them (78.4%) recorded information about immediate notifiable diseases on a case form. Majority of the respondents (76.3%) performed monthly reporting of priority diseases out of which most of them utilized the IDSR 003 form (72.9%). A high percentage of respondents, 172(74.1%), performed weekly reporting of epidemic prone diseases, and the highest percentage of them (40.1%) utilized the IDSR 002 form. Just over 75% of the respondents (75.4%) kept duplicates of reporting forms utilized.

Table 7: Overall Practice of IDSR

Variable	Frequency (Percentage) n=232 (%)
Good	181 (78)
Poor	51 (22.0)

Over three quarters of the respondents (78.0%) had good practice of IDSR and the remaining 22.0% had poor practice of IDSR.

Table 8: Factors influencing disease notification

Variable	Frequency (Percentage) n=232 (%)
Attended IDSR training in last one year	
Yes	108 (46.6)
No	124 (53.4)
Training organizer (n = 108)	
LGA	63 (58.3)

SMOH	24 (22.2)
NPHCDA	6 (5.6)
FMOH	5 (4.6)
NGO	13 (12.0)
UNSURE	1 (0.9)
Standard case definition recording of diseases	
Yes	163 (70.3)
No	69 (29.7)
Regular supply of IDSR Forms	
Yes	153 (65.9)
No	79 (34.1)
Feedback from State or LGA	
Yes	147 (63.4)
No	85 (36.6)
Supervisory visit	

Yes	153 (65.9)
No	79 (34.1)

Less than half of the respondents (46.6%) had attended IDSR training in the past one year, and the trainings attended were mostly organized by LGA (58.3%), SMOH (22.2%) and NGO (12.0%). Just over 70% of respondents (70.3%), highlighted recording diagnoses of cases of priority diseases in the register according to the standard case definition. Over 60% of respondents mentioned that they got regular supply of IDSR reporting forrns (65.9%), and they received feedback of reported cases from the LGA or State (63.4%). In the previous six months, a greater percentage of participants (65.9%) had had a supervisory visit by the LGA surveillance team.

Discussion

Knowledge

In this study it was revealed that just above four tenths (40.9%) of the respondents had good knowledge, the highest frequency of respondents, 102 (44.2%), had fair knowledge of Integrated Disease Surveillance and Response, 35 respondents (15.1%), had poor knowledge. This finding is similar to that revealed of a similar study on the implementation of Integrated Disease Surveillance and response in private and public facilities in two local governments of Oyo State where knowledge was found to be below average irrespective of status [1] . Another study done in Yobe state concluded a poor knowledge of the reporting of notifiable diseases among health workers.

In spite of the fact that doctors often diagnosed and treated the majority of the diseases requiring routine and rapid reporting, only a small percentage (14.2%) of them were reported correctly,

according to a study on disease notification among doctors in a Nigerian Tertiary Health institution. Most of the respondents (78.0%) had good practice of IDSR and the remaining 22.0% had poor practice of IDSR. More than half of the respondents (57.3%) were able to correctly highlight that the agency for reporting priority diseases was the LGA PHC Department. A similar study in Oyo state also revealed a similar percentage of respondents (55.3%) who could highlight the proper agency for priority disease reporting [1]

Similarly, in this study, the respondents showed a good knowledge of diseases targeted for eradication and elimination with over three quarters of the respondents were able to correctly highlight Neonatal Tetanus, Poliomyelitis and Leprosy as diseases targeted for eradication and elimination (82.8%, 90.9%, and 75.4% respectively). Though a poor knowledge seen in this study that only a few of the respondents (28.4% and 22.8% respectively) were able to correctly highlight that Malaria and HIV/AIDS were not diseases targeted for eradication and elimination.

Majority of the respondents, 203(87.5%) were aware of the IDSR unlike a similar study on disease notification in Oyo where over 90% were unaware. Though awareness of IDSR was high in this study, less than 15% (13.3%) of those who were aware knew the number of IDSR Reportable Diseases in Nigeria.

A majority of the respondents also demonstrated good knowledge of the appropriate timing for reporting specific priority diseases, as seen in another similar study.

Practice

Over three quarters of the respondents (76.3%) performed monthly reporting of priority diseases out of which most of them utilized the IDSR 003 form (72.9%). Almost three quarters of the respondents, 172(74.1%), performed weekly reporting of epidemic prone diseases, and the

highest percentage of them (40.1%) utilized the IDSR 002 form. Just over 75% of the respondents (75.4%) kept duplicate copies of reporting forms utilized. A study done on the knowledge of disease notification among doctors in public hospitals in Benin revealed that only 11.9% of doctors had a good knowledge and just over one fifth (23.1%) of the doctors knew where to obtain notification forms and knew how to complete the filling (23.9%) of these forms. In another study done outside Nigeria to reveal the reasons for under reporting of notifiable conditions it was noted that the notification form was considered too complicated by over one tenth of the doctors and over half of them considered it too labourious[2]. About one fifth of them (19.5%) also either did not know the location of the tools in their facility or if one existed.

In this study, the factors that were seen to have influenced the practice of disease notification included training of respondents IDSR ($p < 0.001$), the knowledge of respondents on IDSR ($p < 0.001$), the respondents' attending of an IDSR training within the past year ($p < 0.001$), the respondents' recording of priority diseases in the register according to the standard case definition ($p < 0.001$), the supply of IDSR forms ($p < 0.001$), the presence of feedback of reported cases from the LGA or State ($p < 0.001$), and the supervisory visits from the LGA Surveillance unit within the last 6 months ($p < 0.001$).

A study done in Osun and Ekiti revealed penalties had been instituted in some local governments as reported by almost half of the respondents in the study, as a punitive measure to officers who defaulted, but this was shown not to have significantly affected their notification of priority diseases in the local government areas [3].

Over four fifths of the respondents who were trained had good practice (85.4%) compared to those who were not trained (57.4%), and a relatively higher proportion of those who were not trained had poor practice (42.6%), compared to those who were trained (14.6%).

A high proportion of respondents with good knowledge had good practice of IDSR (92.6%) and a high proportion of them with poor knowledge also had poor practice of IDSR (88.6%). A higher proportion of respondents who attended an IDSR training in the last 1 year had good practice (92.6%) compared to those who did not attend (65.3%), and a relatively higher proportion of those who did not attend had poor practice (34.7%), compared to those who attended (7.4%).

Majority of the respondents who recorded priority diseases in the register according to the standard case definition had good practice of IDSR (93.3%) and more than half of the respondents who did not make these recordings had poor practice (58.0%). Over 90% of respondents who received regular supply of IDSR forms (91.5%), received feedback of reported cases from the LGA or State (92.5%), and received supervisory visit from their LGA within the last 6 months (90.8%) had good practice of IDSR.

However, it is also noted that less than half of the respondents (49.6% and 37.9% respectively) were able to correctly highlight that Malaria and HPV were not epidemic prone diseases.

Level of reporting and factors that influence disease notification

The level of reporting notifiable diseases have increased over the years in Lagos State because of the following identified factors;

- Regular training
- Regular supply of reporting tools
- Feedback from the LGA or State
- Regular supportive supervisory visits

Effective surveillance is a crucial component of community-wide communicable disease management. Though improving, the system is still suboptimal with many areas with need for improvement. Despite the heavy importance of disease surveillance and response, notification generally suffers from some setbacks, as shown by various studies. Though awareness appears to be improving, there is lack of clarity with regards to data tools, submission responsibilities and reporting channels, causing poor feedback. There could also be some level of ignorance of the current regulations and list of notifiable diseases. More studies similar to this should be performed in various areas in the country to reveal the extent of the system deficiency and proffer timely and sustainable solutions for improvement.

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CHAPTER FIVE

5.0 Conclusion And Recommendations

5.1 Conclusion

The presence of training, respondents' knowledge of Integrated Disease Surveillance and Response, attendance at Integrated Disease Surveillance and Response training in the previous year organized by any of the various bodies, the capturing of diagnoses of cases of priority diseases in accordance with the standard case definition, and regular supply of IDSR reporting forms were all factors that were linked to the practice of IDSR.

Majority of the health workers in private health facilities had good knowledge of the IDSR system. However, there was poor practice of the use of the IDSR sysem. Some of the factors affecting disease reporting among the studied were unavailability of forms and patients' load. Refusal to release data, stock out of forms, and lack of cooperation by the private health facilities were also noted as challenges of DSN in the state. Involvement of private health facilities in IDSR implementation will help to expand the scope of IDSR in Nigeria.

Therefore, for improved practice of the IDSR system by the private health facilities, there is a need for regular provision of IDSR forms and training/retraining of the health workers on the use of IDSR system. There is also a need for all the health facilities to have a designated officer. These steps will help to stop ongoing disease outbreaks in the nation and guarantee that the IDSR system is used effectively and efficiently throughout all level of the health system, from health facilities to Local Government Areas (LGAs) to the national level. Training should be provided to support ongoing attention to the LGA level because it is here that data may be gathered for timely measures that will reduce morbidity, disability, and mortality across the nation.

5.2 Recommendation

Every sector of the healthcare system, from healthcare facilities through Local Government Areas (LGAs), states, and the federal level, should have access to an effective and functional IDSR system, according to the Integrated Disease Surveillance system. The LGA level is the focus of IDSR, where information is generated and promptly applied to reduce diseases, disability, and mortality. A nation with an operational IDSR is expected to: identify and report notifiable diseases using standard IDSR case definitions; collect and use surveillance data to notify higher authorities and mobilize local response; investigate and also verify suspected outbreaks or public health occurrences using research laboratory confirmation, as necessary; analyze and interpret data collected during epidemic outbreak and from continuous monitoring of other communicable diseases; use of relevant information from the data .

Managers must act rapidly to stem the spread of illness, for instance, if the goal is to put an end to the expansion of acute infectious disease epidemics like SARS. As a result, they require a surveillance scheme that delivers quick early warning data from hospitals and laboratories. Contrarily, health-related behaviors and chronic illnesses alter gradually. Yearly or even less frequently, managers typically check on the outcomes of initiatives to reduce harmful behaviors like smoking or chronic illnesses [3], [1,]

[4].

A surveillance program to track the impact of a tuberculosis control program on the populace, for instance, might only yield data every between one and five years using a series of health and

demographic surveys. The basic notion is that different information systems are required for different public health objectives and the actions required to attain them.The kind of action that can be taken, when or how regularly the action needs to be taken, what information is needed to perform as well as monitor such activity, and when or how often that information is needed, should all be taken into consideration when choosing the type of questionnaire or health information scheme.Controlling a disease is the goal of information gathering, analysis, and dissemination [7,8]. (If no action is taken, collection and analysis shouldn't be permitted to use up resources. The essential tenet of public health monitoring is that it should be planned and executed to give decision-makers accurate (correct) information as soon as feasible at the lowest cost possible. Giving up accuracy makes sense to increase timeliness and free up resources that may be used for public healthcare interventions because managements are unlikely to have to make adjustments to address minor discrepancies between areas. Based on the potential public health activities, the utility of the surveillance datacan be seen as immediate, yearly, and archive [8, 9].

5.3 suggestions for the study

The following suggestions that could promote improvement are based on the study's findings:

Although, the assessment of the level of IDSR knowledge in focal persons is high, partnership with non-governmental organizations and other private corporations is also encouraged to intensify training of health workers and improve existing knowledge of IDSR especially among surveillance focal persons.

The importance of disease notification and the process for disease control and health planning could be included in the curriculum of undergraduate training of all health professional courses to increase the knowledge and practice of IDSR in health facilities.

Posters, fliers, manuals and other media resource materials on IDSR protocol should be distributed to health facilities regularly through their focal persons.

In order to further improve reporting rate, reporting forms also should be made available consistently and made easier to interpret and utilize.

Supervisory visits should be seasonally made to public and private health facilities to enhance effectiveness and re-evaluation of the level of reporting in each facility.

Commendation should be given to health facilities that perform at exemplary levels to encourage consistent good performance in the practice of IDSR

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Knowledge and attitude of disease surveillance and notification officers towards integrated disease surveillance and response strategy in priority health facilities in Lagos and Oyo States. T.A Onajole 2022

APPENDIX

List of Nigeria IDSR notifiable diseases, conditions and public health events

Table 1

Categories of notifiable diseases	Notifiable diseases
Epidemic prone diseases	*Cholera, Diarrhoea with blood (Shigella Sd1), Measles, Meningitis, Viral haemorrhagic fevers (Lassa, Ebola Virus Disease), Human influenza caused by a new Subtype, yellow fever, Severe Acute Respiratory Syndrome (SARS), Smallpox, Dengue fever, Anthrax, Severe Acute Respiratory Illness (SARI)*
Diseases targeted for eradication and elimination	*Acute Flaccid Paralysis (AFP)/poliomyelitis, Dracunculiasis, Leprosy, Neonatal tetanus, Lymphatic filariasis, Tuberculosis*
Other diseases of public health important	*Diarrhoea in children less than 5years of age, Pneumonia in children less than 5years of age, Human Immunodeficiency Virus (HIV)/ Acquired Immune Deficiency Syndrome (AIDS), malaria, Onchocerciasis, Sexually transmitted infections (STIs), Trypanosomiasis, Buruliulcers, Asthma, Diabetes mellitus, epilepsy, High blood pressure, Sickle cell disease, Malnutrition, plague, Trachoma, typhoid, Hepatitis-B, Pertussis, Human rabies, Schistosomiasis, Noma*

Table 2

The Integrated Disease Surveillance and Response (IDSR) reporting forms and their uses[2]

IDSR forms	Uses
IDSR 001A (case-based reporting form) and IDSR 001B (Laboratory request form)	*These forms are used for immediate reporting of suspected individual cases of epidemic prone diseases and other events with potential public health emergencies of international concern and diseases targeted for elimination and eradication*
IDSR 001C (Line list form)	*This form is used for reporting case based information of notifiable diseases when several cases occur during a short period of time especially during disease outbreaks*
IDSR 002 (Weekly summary reporting from)	*For routine reporting of the total number of cases of all notifiable diseases and deaths resulting from these diseases weekly*
IDSR 003 (Monthly summary reporting form)	*For routine reporting of the total number of cases of all notifiable diseases and deaths resulting from these diseases monthly*

Figure 7

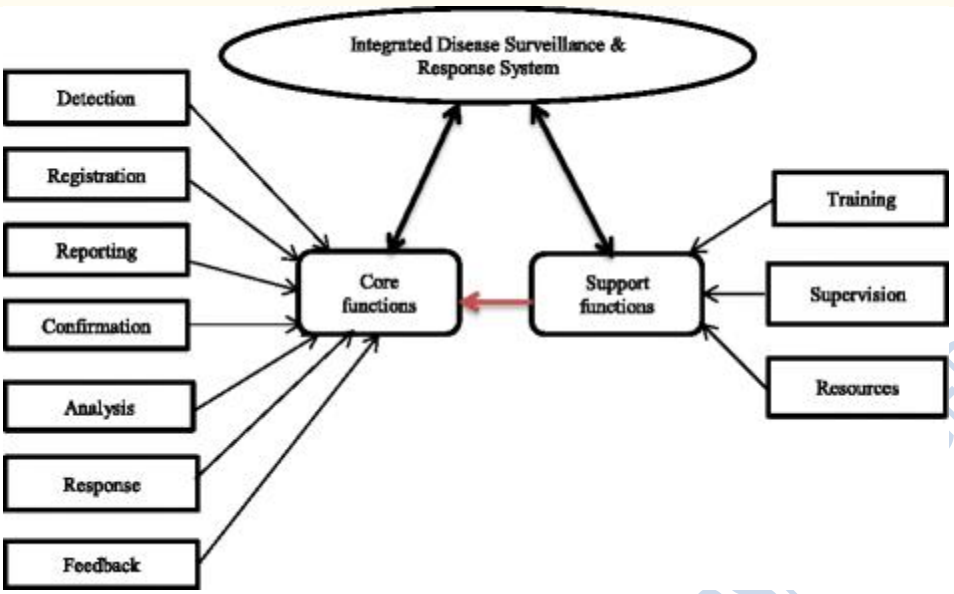


Figure 7 Integrated disease surveillance components

Source: Health surveillance system/researchgate.net

Figure8

Annex 4: Immediate case based reporting form

Modified from IDSR 001

REPORTING HEALTH FACILITY	REPORTING LGA
IDENTIFICATION NUMBER:	

Immediate/ Case-based Reporting Form

From Health Facility/Health Worker to LGA health team

Cholera	Dracunculiasis	Neonatal Tetanus	Measles	Meningitis	HPAI	Viral Hemorrhagic Fever e.g. Lassa fever	Yellow Fever	Others/specify

Date form received at SMOH or the national level: / / (Date/Month/Year)				
Name of Patient:				
Date of Birth (DOB): / / (Date/Month/Year)	**Age (If DOB unknown):**	Year	Month (if <12)	Day (NNT only)
Sex:	M=Male F=Female			
Patients Address:	**Urban**	**Rural**		
Settlement/Village				
Ward	**LGA**	**State:**		
Exact residential address:				
Modified from IDSR 001	If applicable or If the patient is neonate or child, please write full name of mother and father of the patient			
Date Seen at Health Facility: / /	**Date Health Facility notified LGA/:** / /	**Date of Onset:** / /		
Number of vaccine doses received:	9=unknown For cases of Measles, NT (TT in mother), Yellow Fever, and Meningitis (For Measles, TT, YF- by card & for Meningitis, by history)			
Date of last vaccination	/ / (Measles, Neonatal Tetanus(TT in Mother) Yellow Fever, and Meningitis only)			
Close contact with infected poultry	1=Yes 2=No			
Close contact with suspected or confirmed case of Avian influenza	1= Yes 2=No			
Associated with an outbreak?	1=Yes 2=No			
In/Out Patient	1=Inpatient	2=Outpatient		
Outcome	1=Alive	2=Dead	9=Unknown	

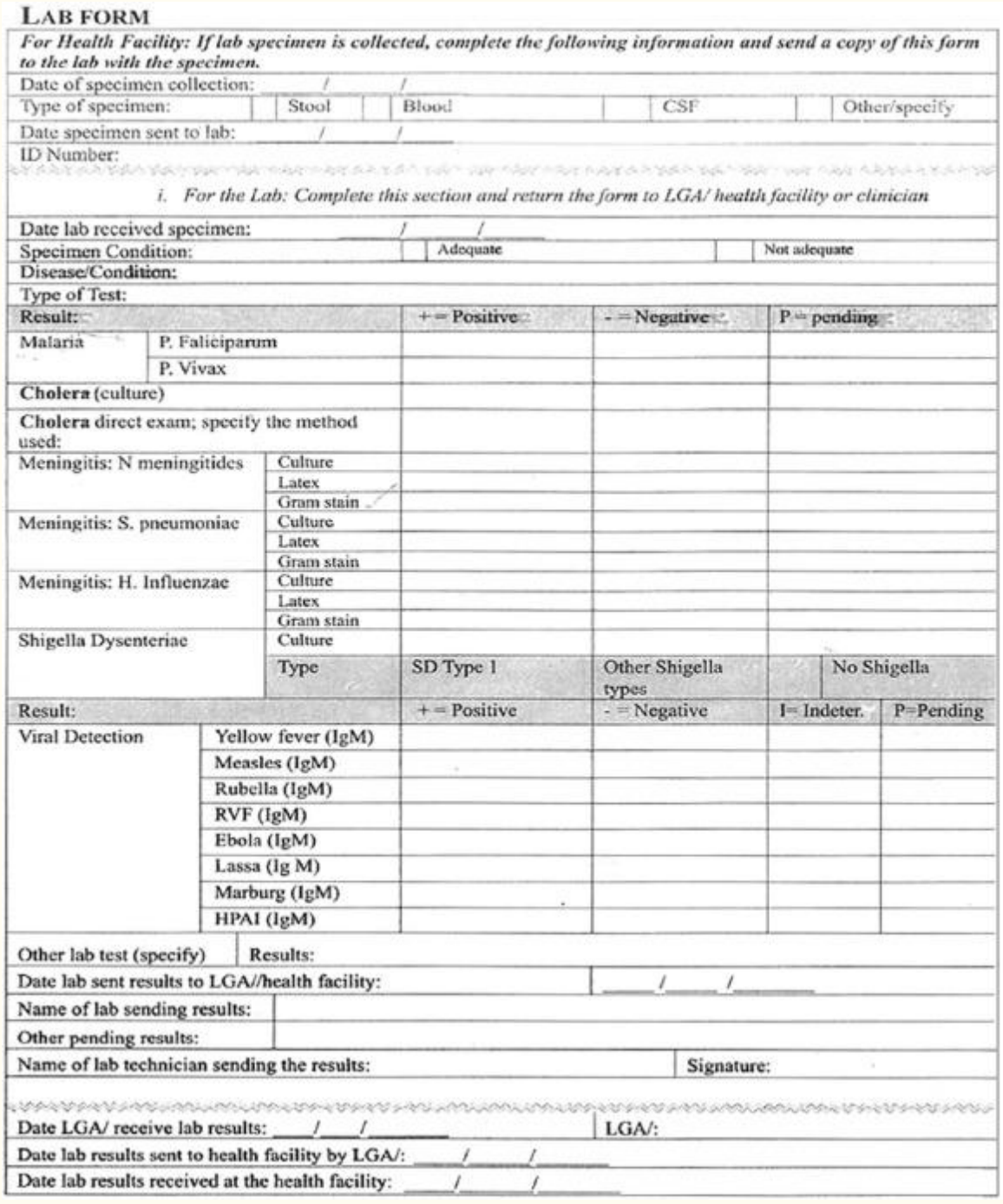
Final Classification of case	1=Confirmed	2=Probable	3=Discarded	4=Suspect	
Final Classification for Measles	1= Laboratory Confirmed	2= Confirmed by Epidemiological linkage	3= Clinical Compatible	4=Discard	5=Suspect with lab pending

Person completing form **Name:** **Title:** **Address:**	**Signature:**
Date form sent to LGA/: / / (Date/Month/Year)	

Figure 8

The Integrated Disease Surveillance and Response (IDSR) 001A form-immediate case-based reporting form for immediate reporting of notifiable diseases (it should be noted that this form is sent immediately to the Local Government Area (LGA) Disease Surveillance and Notification Officer at the LGA Primary Health Care Department) after completion for prompt action[2]

Figure 9



LAB FORM

For Health Facility: If lab specimen is collected, complete the following information and send a copy of this form to the lab with the specimen.

Date of specimen collection: ____/____/____

Type of specimen:		Stool		Blood		CSF		Other/specify

Date specimen sent to lab: ____/____/____

ID Number:

i. For the Lab: Complete this section and return the form to LGA/ health facility or clinician

Date lab received specimen: ____/____/____

Specimen Condition:		Adequate		Not adequate

Disease/Condition:

Type of Test:

Result:		+ = Positive	- = Negative	P = pending
Malaria	P. Faliciparum			
	P. Vivax			
Cholera (culture)				
Cholera direct exam; specify the method used:				
Meningitis: N meningitides	Culture			
	Latex			
	Gram stain			
Meningitis: S. pneumoniae	Culture			
	Latex			
	Gram stain			
Meningitis: H. Influenzae	Culture			
	Latex			
	Gram stain			
Shigella Dysenteriae	Culture			
	Type	SD Type 1	Other Shigella types	No Shigella

Result:		+ = Positive	- = Negative	I= Indeter.	P=Pending
Viral Detection	Yellow fever (IgM)				
	Measles (IgM)				
	Rubella (IgM)				
	RVF (IgM)				
	Ebola (IgM)				
	Lassa (Ig M)				
	Marburg (IgM)				
	HPAI (IgM)				

Other lab test (specify)	Results:
Date lab sent results to LGA//health facility:	____/____/____
Name of lab sending results:	
Other pending results:	
Name of lab technician sending the results:	Signature:

Date LGA/ receive lab results: ____/____/____ LGA/:

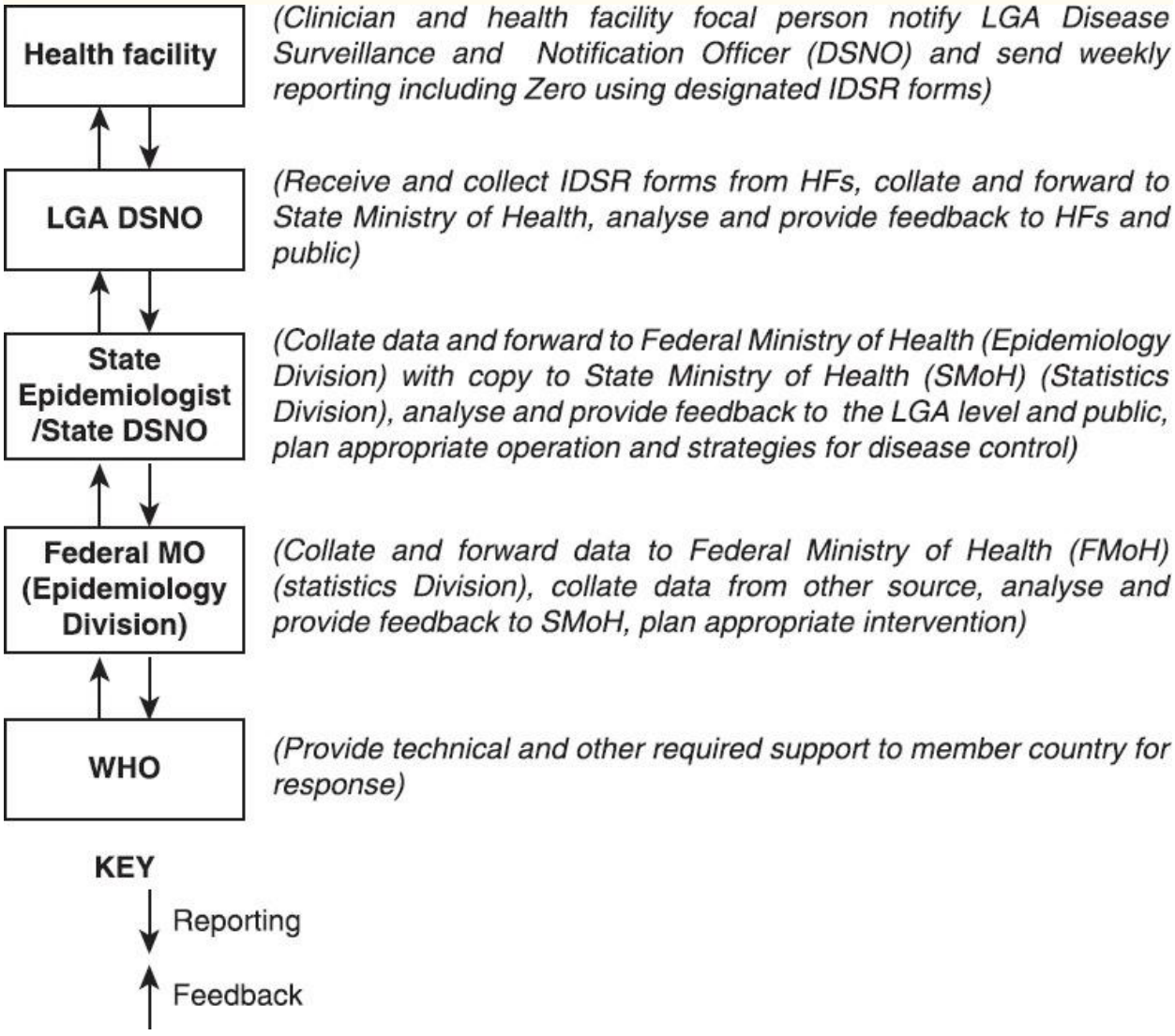
Date lab results sent to health facility by LGA/: ____/____/____

Date lab results received at the health facility: ____/____/____

Figure 9

The Integrated Disease Surveillance and Response (IDSR) 001B form-Lab request form for immediate reporting of notifiablediseases[2]

Figure 10



Respondent Informed Consent Form

Title of Research: Disease surveillance practices by public and private health facilities in two local government areas in Lagos State.

Name and Affiliation of researcher: This study is being conducted by Oyeyiola, ChristianahOlubukola, a postgraduate student of the Department of Public Health, Lead City University, Ibadan.

Introduction: Disease surveillance is an epidemiological practice by which the spread of disease is monitored in order to establish patterns of progression. The main role of disease surveillance is to predict, observe and minimize the harm caused by outbreak, epidemic, and pandemic situations, as well as increase knowledge about which factors contribute to such circumstances. The knowledge about the notification of disease is very important for the reporting of notifiable diseases. However, the knowledge of reporting requirements and responsibilities among health care personnel has not been examined adequately as a cause of under-reporting.

Purpose of Research: This study aims to determine the knowledge and practice of IDSR by surveillance focal persons in two LGAs in Lagos State.

Procedure of Research: Your opinion will be sought using a structured questionnaire which will be interviewer administered, there are no wrong or right answers.

Potential Benefits: This study gives each participant the opportunity to assess their level of knowledge of surveillance and its practice. The result of the study will be made available to Lagos state epidemiology department and the selected LGAs to help improve surveillance activities.

Potential Risk: The study is questionnaire based and thus, does not expose the participants to any harm.

Confidentiality: All information obtained from this study will be coded and no name recorded. This cannot be linked to you in any way. Your name or any identifier will not be used in any publication or reports from this study.

Willingness to participate: Your participation in this research is entirely voluntary and if you choose not to participate, no punishment will be attached to your decision. You will not be paid any fees for participating in this research. You can choose to withdraw from this research at any time.

What happens to research participants when research is over: The researcher will inform you of the outcome of this research through the LGA. There is no conflict of interest.

Statement of person obtaining informed consent: I have fully explained the research to the respondent and given sufficient information about the risk and benefit to make an informed decision.

Date ---------- Signature----------

Statement of person giving consent: I agree to participate in this research. I know that my participation is voluntary. I know enough of the purpose, method, risk and benefit of the research to judge that I want to take part in it. I understand that I may opt out of the research at any time.

Date ---------- Signature----------

Questionnaire

Dear respondent,

This questionnaire is designed to determine the knowledge and practice of surveillance focal persons or facility heads in selected LGAs on surveillance activities. The information obtained will be used for my dissertation which is part of the award of Master in Public Health. The information given will be treated with confidentiality.

Please, provide honest answers to the questions below.

Thank you.

Oyeyiola, ChristianahOlubukola

SECTION A: Identification And Demographic Data

Serial number: ----------

1. Name of local government ----------

2. Name of Health Facility----------

3. Type of facility

(a) Public facility (b) Private facility

4. Class of facility

(a) Tertiary Hospital (b)General Hospital (c) Health Center (d) Health Post

5. Category of respondent

(a) Doctor (b) Nursing Officer (c) Medical Records Officer (d) CHO/CHEW

6. Designation of respondent

(a) Head of facility (b) Surveillance focal person (c) Records Officer

7. Sex of respondent

(a) Male (b) Female

8. Age of respondent as at last birthday----------

9. Marital Status of respondent

(a) Single (never married) (b) Married (c) Divorced/ Widowed/ Separated

10. Have you been trained as a surveillance focal person? (a) Yes (b) No

11. For how long (in years) have you been working as a focal person in this health facility? ------

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SECTION B: Knowledge About Integrated Disease Surveillance And Response

12. .The report of priority diseases from Health Facilities when made, should be to

Which of the following agents of government?

Federal Ministry of Health

National Primary Health Care Development Agency

Lagos State Ministry of Health

Statistic Office

LGA PHC Department

The following are epidemic prone diseases?

13. Cholera (a) Yes (b) No (c) Don't Know

14. Measles (a) Yes (b) No (c) Don't Know

15. Poliomyelitis (a) Yes (b) No (c) Don't Know

16. Malaria (a) Yes (b) No (c) Don't Know

17. HPV (a) Yes (b) No (c) Don't Know

The following diseases are targeted for eradication and elimination

18. Neonatal Tetanus (a) Yes (b) No (c) Don't Know

19. Leprosy (a) Yes (b) No (c) Don't Know

20. Malaria (a) Yes (b) No (c) Don't Know

21. Poliomyelitis (a) Yes (b) No (c) Don't Know

22. HIV/AIDS (a) Yes (b) No (c) Don't Know

The following diseases are categorized as Diseases of Public Health Importance

23. Schistosomiasis (a) Yes (b) No (c) Don't Know

24. Tuberculosis (a) Yes (b) No (c) Don't Know

25. Diarrhoea diseases (a) Yes (b) No (c) Don't Know

26. Dysentary diseases (a) Yes (b) No (c) Don't Know

27. Cerebrospinal meningitis (a) Yes (b) No (c) Don't Know

The following diseases are to be reported immediately

28. Outbreak of any disease (a) Yes (b) No (c) Don't Know

29. Cholera (a) Yes (b) No (c) Don't Know

30. Yellow fever (a) Yes (b) No (c) Don't Know

31. A case of measles (a) Yes (b) No (c) Don't Know

Which of the following categories of diseases are to be reported weekly?

32. CSM (a) Yes (b) No (c) Don't Know

33. Cholera (a) Yes (b) No (c) Don't Know

34. Lassa fever (a) Yes (b) No (c) Don't Know

35. Yellow fever (a) Yes (b) No (c) Don't Know

Which of the following categories of Diseases are to be reported monthly?

36. Hepatitis B (a) Yes (b) No (c) Don't Know

37. Pertusis (a) Yes (b) No (c) Don't Know

38. Tuberculosis (a) Yes (b) No (c) Don't Know

39. Plague (a) Yes (b) No (c) Don't Know

40. Neonatal Tetanus (a) Yes (b) No (c) Don't Know

41. Do you know about Integrated Disease Surveillance and

Response? 1 = Yes (a) Yes (b) No (c) Don't Know

43. How many diseases are reportable under the IDSR in Nigeria? ----------

The following are reporting data forms/tools used in IDSR

44. DSN 001 (a) Yes (b) No (c) Don't Know

45. DSN 002 (a) Yes (b) No (c) Don't Know

46. IDSR 001a (a) Yes (b) No (c) Don't Know

47. IDSR 001b (a) Yes (b) No (c) Don't Know

48. IDSR 001c (a) Yes (b) No (c) Don't Know

49. IDSR 002 (a) Yes (b) No (c) Don't Know

50. IDSR 003 (a) Yes (b) No (c) Don't Know

51. Line list (a) Yes (b) No (c) Don't Know

52. The recommended case definition for a suspected case of Cholera is

(a) A patient aged 2years or less with severe dehydration or death from acute

watery diarrhea

(b) Passage of 2 loose or watery stool in the last 24hours in children less than

5years with or without dehydration

(c) A patient age 5 years or more, with severe dehydration or death from acute watery diarrhea

53. In the recommended case definition for a suspected case of poliomyelitis, acute flaccid paralysis should be reported in which of these age groups?

(a) 0 – 5years (b) 0 – 10years (c) 0 – 15years (d) 1 – 5years

54. Which of the following can cause AFP?

(a) Fall (b) Injection neuritis (c) Birth disorder affecting the leg or hand

55. AFP is best reported within ---------- of onset

(a) Two weeks (b) two months (c) six months

56. AFP should be notified to the DSNO

(a) At the end of the month (b) Immediately (c) At the end of the week

SECTION C: Practice Of IDSR

57. Do you have a Clinical register for keeping records of diseases in your facility?

(Confirm this)

(a) Yes (b) No

58. Do you record information about immediate notifiable diseases on a case form? (confirm this)

(a) Yes (b) No

60. Do you report priority diseases to the LGA monthly?

(a) Yes (b) No

61. Which form do you use for monthly report? ----------

(a) IDSR 003 (b) IDSR 002 (c) F003

62. Do you report epidemic prone diseases to the LGA weekly?

(a) Yes (b) No

63. Which form do you use for weekly report? ----------

(a) IDSR 003 (b) IDSR 002 (c) F003

64. Does the facility keep duplicate copies of reporting forms?

(a) Yes (b) No

(Confirm this)

SECTION D: Factors That Influence Disease Notification

65. Have you attended training on IDSR in the last one year?

(a) Yes (b) No

66. If yes, who organized the training

(a) LGA (b) SMOH (c) NPHCDA (d) FMOH (e) NGO

67. Are diagnoses of cases of priority diseases recorded in the register according to the standard case definition?

(a) Yes (b) No (confirm this)

68. Do you have regular supply of IDSR reporting forms for priority diseases?

(confirm this)

(a) Yes (b) No

69. Do you receive feedback of reported cases from your LGA or State?

(a) Yes (b) No

70. Have you had a supervisory visit from the LGA surveillance unit within the last 6 months? (a) Yes (b) No

THANK YOU

Bio-data

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Academic and professional qualifications

2012 Bsc Health Education
University of Lagos, Akoka, Lagos.

2006 Diploma in Community Health
Lagos State College of Health Technology, Yaba, Lagos

2009 West African Secondary School Certificate
St Michaels' College, Egbeda, Lagos.

2003 First School Leaving Certificate
St Michaels' Model school, Egbeda, Lagos.

2008 till date Lagos State Ministry of Health
Disease Surveillance and Notification Officer
Mushin LGA