

MINISTRY OF HEALTH

**PROTOCOL FOR HUMAN
INFLUENZA SURVEILLANCE**

IN GHANA

DISEASE SURVEILLANCE DEPARTMENT

MAY 2016



MINISTRY OF HEALTH



**World Health
Organization**



ACKNOWLEDGEMENT

We are grateful to the Ghana Health Service and the World Health Organization for the technical and logistical support in the production of this document. The contribution of the following persons and institutions is gratefully acknowledged.

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The invaluable input from the NMIMR, US NAMRU-3, CDC for participating/partnering surveillance activities on Avian Influenza and logistical support for laboratory investigations is worth mentioning.

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Abbreviations

CDC -	U.S. Centers for Disease Control and Prevention
DSD -	Disease Surveillance Department
GHS -	Ghana Health Service
GISN -	Global Influenza Surveillance Network
HA -	Haemagglutinin
HPAI -	Highly Pathogenic Avian Influenza
IDSR -	Integrated Disease Surveillance and Response
ILI -	Influenza-like Illness
MOH -	Ministry of Health
NA -	Neuraminidase
NAMRU-3 -	US Naval Medical Research Unit 3
NIC -	National Influenza Centre
NMIMR -	Noguchi Memorial Institute of Medical Research
NPHRL -	National Public Health Reference Laboratory
SARI -	Severe Acute Respiratory Infection
SISA -	Strengthening Influenza Surveillance in Africa Project
VSD -	Veterinary Services Directorate
VTM -	Viral Transport Medium
WCC -	WHO Collaborating Centre
WHO -	World Health Organization

1. Background

1.1 Influenza

Influenza in humans is an acute viral respiratory tract disease often characterized by fever, headache, myalgia, prostration, coryza, sore throat and cough. Influenza is indistinguishable from other respiratory viral diseases without laboratory confirmation.

Etiology: Influenza infection is caused by single-stranded RNA viruses belonging to the Orthomyxoviridae family. The viruses are classified as influenza types A, B and C. Influenza A and B viruses can cause epidemic disease in humans, and type C viruses usually cause a mild, cold-like illness. Influenza A infects multiple species, including humans, other mammals, and wild and domestic birds. Influenza A viruses can be sub typed according to the antigenic and genetic nature of their surface glycoprotein; 16 Haemagglutinin (HA) and 9 Neuraminidase (NA) subtypes have been identified to date. Many different combinations of HA and NA proteins are possible. Only some influenza A subtypes (i.e. H1N1, H2N2 and H3N2) have been associated with widespread epidemics in humans. The current human influenza A subtypes in circulation are H1N1, H3N2 and H7N9.

Genes encoding surface glycoproteins of influenza A and B viruses mutate constantly leading to emergence of new strains with different antigenic characteristics. Minor changes in the surface genes, termed 'antigenic drift' are responsible for annual seasonal epidemics. Antigenic shift, on the other hand, can occur either through direct animal-to-human transmission or through mixing of human influenza A and animal influenza A virus genes and represents a major change in antigenicity such that very few people in a population have antibodies against the new strain. A shift may result in the appearance of a novel influenza virus that can easily be transmissible among humans, leading to a pandemic.

Epidemiology: The influenza virus spreads rapidly around the world in seasonal epidemics which result in morbidity and mortality. In temperate climates, seasonal influenza typically occurs every year in the late fall or winter, though there could be sporadic cases all year round. The reason for the seasonality is unknown but could be due to virus transmissibility resulting from favorable conditions for virus survival or increased transmission due to indoor crowding. Usually, the outbreak will reach its peak within 2-3 weeks and may last around 8 weeks in a given community (at national level, in large countries the seasonal outbreak lasts longer) although the virus may still circulate in the community for weeks before and after the onset of the outbreak. The first indication of an outbreak may be signaled by increased school absenteeism from acute respiratory diseases followed by influenza-like illness in adults. In an outbreak situation, the average attack rates range from as low as 10% to 20% in a community to as high as 50% in selected groups and in closed settings, such as nursing homes, hostels and military camps.

While sporadic cases may occur year round in the tropics and subtropics, some studies show seasonality which is associated with increased rainfall and decrease in environmental temperature. In the African Region, the epidemiology and disease burden of human influenza has not been adequately described. Recent data from Ghana indicates that sporadic cases of influenza may occur throughout the year with sporadic outbreaks as well. (WHO FLUNET Nov 2011)

Pandemic influenza: An influenza pandemic can occur only if there is efficient and sustained viral transmission of a pathogenic influenza subtype to which few people are immune. In the last hundred years, four global pandemics have occurred. The 1918 pandemic (influenza A/H1N1) is believed to have killed at least 40 million people worldwide, with the highest death rates occurring among young adults. Two other pandemics occurred in 1957 (influenza A/H2N2) and in 1968 (influenza A/H3N2), causing substantial morbidity and mortality. The most recent pandemic occurred in 2009. Unlike seasonal influenza epidemics, these pandemics caused severe disease among younger and healthy individuals.

Influenza A (H1N1) 2009 pandemic: In late April 2009, the World Health Organization (WHO) received reports of sustained human to human infections causing community-level outbreaks that were due to a new influenza A (H1N1) virus in Mexico and the United States. Unlike past pandemic influenza viruses, international travel facilitated rapid geographical spread of the new virus to all the six WHO regions in less than 9 weeks. Cases were generally initially identified in urban centers with high intensity of transmission before wider geographical spread within countries. Available data show that older teens and young adults had the highest attack rates while children less than 5 years old had highest *rates* of hospitalization. Hospitalization and fatality in young adults was higher than that for seasonal influenza. The highest mortality rates were however among the 50 – 60 year olds. The majority of cases developed uncomplicated influenza illness that resolved without antiviral treatment. Death in severe cases is caused by severe viral pneumonia. About 60-80% of severe cases had underlying conditions including pregnancy, asthma or other lung disorders, cardiovascular, diabetes, immuno-compromised, neurological disorders and obesity (Kunisaki, 2009, Yazdanbakhsh, 2009).

Influenza A (H5N1) outbreak: In 1997, the first human influenza A (H5N1) infection was documented in Hong Kong, China when 18 cases and 6 deaths occurred before it was brought under control through swift and coordinated rapid containment. Two additional cases with one death were reported in 2003. Beginning at the end of 2003, sporadic zoonotic infections occurred associated with large outbreaks of avian influenza in poultry in several Asian countries. During the last four years the new highly pathogenic influenza virus (HAPI), A/H5N1, has spread rapidly in East Asia, North and West Africa, in central Europe and as far west as England. Between 2003 and end 2010, H5N1 outbreaks/cases among poultry and/or wild birds have been reported in the African Region specifically in Burkina Faso, Cameroon, Ivory Coast, Niger and Nigeria. If the influenza A (H5N1) virus acquires the ability to transmit easily among humans, another influenza pandemic could ensue, with the potential to kill millions of people. Human activities, including the extensive legal and illegal trade of live birds and poultry products; the relative lack of biosecurity in the poultry industry; the widespread practice of keeping poultry within households; and the presence and migration of wild birds across the African continent increase the risk of Africa being the setting for the possible

development of a human pandemic. The human cases in Africa occurred in Egypt, Djibouti and Nigeria.

1.2 WHO Global Influenza Surveillance and Response System (GISRS)

The World Health Organization envisions an effective influenza surveillance system that provides timely information in all regions of the world. Founded in 1952 by the WHO, the Global Influenza Surveillance and Response System (GISRS) is a surveillance system comprised of laboratories and collaborating centers around the world that collect and analyze specimens from patients with influenza-like illness during influenza season. The objectives of the GISRS are to protect global public health by monitoring the influenza viruses in circulation in order to make annual recommendations on influenza vaccine composition for the northern and southern hemispheres. It also functions as a global alert mechanism for the emergence of novel influenza viruses with pandemic potential.

As of Nov 2011, GISRS comprises 136 institutions from 106 countries recognized as WHO National Influenza Centers (NICs), six WHO Collaborating Centers (WCCs), 11 H5 Reference laboratories and 4 Essential Regulatory laboratories. In the African Region, there are 12 NIC's in 11 countries. The GISRS should increase its geographical coverage and interactions among the NICs and WCCs to monitor influenza and to detect newly emerging pandemic influenza strain(s). Compared with other WHO regions, the African Region has the least representation in the GISRS.

Historically global surveillance focused primarily on virological surveillance but virological data does not provide the epidemiological information needed to support influenza control strategies including the impact of the disease and persons at highest risk in a community. There is a need to better understand the epidemiology, seasonality and the disease and economic burden of influenza to target interventions.

The recent A(H1N1)pdm09 pandemic has highlighted the need for quick and reliable information to assess the severity of disease and to define risk factors for severe outcome. This requires good knowledge of occurrence of influenza-like illness (ILI) as well as severe Acute Respiratory Illness (SARI). Therefore epidemiological and virological surveillance systems need strengthening especially in Ghana.

1.3 Purpose of the protocol

The purpose of this protocol is to provide guidance to health personnel in Ghana in conducting surveillance for acute respiratory infections including influenza-like illnesses and severe acute respiratory infections.

This protocol is meant not only to focus primarily on virological surveillance but data collected should also provide the epidemiological information needed to support influenza control strategies, including the impact of the disease and persons at highest risk in a community.

There is also the need to better understand the epidemiology, seasonality of the disease and economic burden of influenza in order to target interventions.

2. Justification for Influenza Surveillance

Influenza is estimated to result annually in 5 million cases of severe illness and 250,000 to 500,000 deaths worldwide. Increased mortality during influenza epidemics is caused by pneumonia and influenza and also from cardiopulmonary and other chronic diseases (e.g. diabetes) that can be exacerbated by influenza. There is limited data regarding the burden and impact of influenza in tropical and subtropical regions. However, in these regions, there is increasing evidence that the burden of influenza disease may be substantial. In the African Region, efforts are now underway to assess the burden of the disease, including the severity, mortality and economic impact.

Before the H5N1 Avian Influenza outbreaks in 2006 in the African region, only a few countries (South Africa, Madagascar and Senegal) had been implementing influenza surveillance. The relative lack of virological data coupled with insufficient information on the magnitude of the burden of the disease has limited the Region's ability to plan and implement strategies for reducing the excess morbidity and mortality associated with influenza.

As part of enhancing the capacity of national surveillance systems to detect influenza A (H5N1), the WHO Regional Office has developed and disseminated Standard Operating Procedures to enhance influenza surveillance within the context of the Integrated Disease Surveillance and Response (IDSR) strategy. Many countries in the Region have now established epidemiological surveillance for ILI and SARI as part of IDSR. The establishment of influenza surveillance in countries with access to influenza virus testing has strengthened influenza surveillance by combining epidemiological and virological surveillance. Twenty two countries now report/provide weekly updates on circulating influenza strains to the regional office and FLUNET.

3. National Influenza Surveillance

Sentinel surveillance provides the most efficient way to collect quality information in a timely way. It also has the potential to provide more complete data about some of the epidemiologic characteristics of influenza-like illness (ILI) and severe acute respiratory infection (SARI) at a particular sentinel surveillance site and also to determine the proportions of ILI and SARI cases which are due to influenza.

One of the advantages of the sentinel surveillance approach is that it requires fewer resources by reducing the number of sites collecting laboratory specimens for influenza testing. A disadvantage is that although sentinel surveillance data may be useful for documenting trends, the data may not be generalizable to the general population if the sentinel sites are not selected in such a way as to provide data that is representative for the whole population.

Sentinel surveillance is not intended to serve as the sole method to provide an early warning of an unusual event. Therefore a sentinel surveillance system should be complemented by a more sensitive event based surveillance system covering all parts of the health care system. The detection, reporting and investigation of such unusual events are described in the IDSR guidelines.

Experiences with some disease eradication and elimination programs show that disease control and prevention objectives are successfully met when resources are dedicated to improving the ability of health officials to detect the targeted diseases, obtain laboratory confirmation of outbreaks, and use thresholds to initiate action at the district level. Building on these successes, the World Health Organization (WHO) Regional Office for Africa (AFRO) proposed a comprehensive strategy for improving communicable disease surveillance through integrated disease surveillance and response (IDSR) linking community, health facility, district and national levels in the African region.

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

The surveillance described here is intended to provide background rates and trends that will allow health care officials to interpret the importance of unusual events, such as outbreaks. This will provide health care planners with data that will help them to understand the contribution that influenza makes to the overall burden of respiratory disease and to understand the seasonality at all the administrative levels.

3.1 Objectives of the national surveillance system

The general objective is to:

- Provide information on the contribution of influenza to the disease burden of respiratory diseases to help prioritize resources and plan public health interventions.

The specific objectives of Influenza surveillance are to:

- characterize and monitor trends in morbidity and mortality in ILI and SARI
- provides data to identify and monitor groups at high risk for severe disease
- provide information on threshold levels of ILI and SARI epidemics
- identify locally circulating influenza types and sub-types and their relationship to global and regional patterns
- detect new influenza strains
- monitor antiviral resistance of circulating influenza viruses
- provide a platform to monitor impact of control strategies
- provide information on candidate viruses for vaccine selection and production

3.2 Components of the national surveillance system

Sentinel sites: Sentinel site staff will be responsible for collecting epidemiologic and laboratory data and for sending the data to the district level for onward transmission to the Disease Surveillance Department. In addition, sentinel site staff will be responsible for collecting and processing patient specimens and sending them to the National Influenza Reference Laboratory. The sentinel sites would implement surveillance for Influenza-like Illnesses (ILI) and Severe Acute Respiratory Infections (SARI).

Outpatient-based ILI surveillance: surveillance for illnesses that meet the case definition of influenza-like illness (ILI) is implemented in designated health facilities across the 10 regions of Ghana. Clinical specimen and epidemiological data from ILI patients should be collected by trained medical personnel in accordance with the WHO guidelines. However, **ALL OTHER** health facilities (both public and private) are obliged to identify and report suspected influenza cases, especially those occurring in clusters.

Hospital-based SARI surveillance: surveillance for illness and death that meet the case definition for severe acute respiratory infection (SARI) is implemented in Ghana in specific hospitals. Clinical specimen and epidemiological data from SARI patients should be collected by trained medical personnel in accordance with the WHO guidelines.

National Influenza Centre: In Ghana, the Noguchi Memorial Institute for Medical Research (NMIMR) is the national reference laboratory for influenza. Respiratory sample collection is coordinated with the National Public Health and Reference Laboratory network (national, zonal, regional and district laboratories). NMIMR as the National Influenza Reference Laboratory, is responsible for:

- undertaking the initial identification of virus type and subtype from laboratory specimens submitted by the sentinel sites ;
- forwarding representative viral isolates and any low reacting viruses to a WHO collaborating centre;
- alerting the WHO Global Influenza Programme about any influenza isolate that cannot be readily identified using reagents provided through the WHO network;
- forwarding such an isolate to a WCC;
- forwarding specimens from suspected H5N1 cases to a WHO H5 laboratory;
- Submitting laboratory results to sentinel sites;
- Entering laboratory results into FluNet.

In addition, laboratory staff will be responsible for training hospital and other staff involved in specimen handling on biosafety measures.

Ministry of Health/Ghana Health Service/Disease Surveillance Department: The Disease Surveillance Department of the Public Health Division, Ghana Health Service (GHS) is responsible for providing oversight, coordinating and monitoring data collection, reporting,

analysis and feedback to sentinel site staff and other stakeholders. It is also responsible for analyzing the data and providing weekly reports to FLUID.

Partners

The Regional Office provides technical assistance in collaboration with the Country Office and Global Influenza Programme and other partners to ensure functioning of the network. In addition, the WHO is responsible for coordinating the provision of diagnostic kits containing polyclonal sera, monoclonal antibodies and viral antigens for relevant influenza strains on an annual basis to the national influenza centers in collaboration with partners.

The US Government provides financial, logistical and technical support to the influenza surveillance system in Ghana through NAMRU-3 and CDC. It also provides the resources needed to support specimen collection and transport and laboratory testing (e.g. reagents, specimen collection supplies, specimen transport).

3.3 Methods and procedures

3.3.1 Implementation

Influenza surveillance in Ghana is conducted by GHS, Noguchi Memorial Institute of Medical Research (NMIMR), US Naval Medical Research Unit 3 (NAMRU-3), CDC and WHO. Both ILI and SARI surveillance is implemented in Ghana. Collecting information on both ILI and SARI provides a more complete picture of the epidemiology of the disease and the differences that may occur between mild and severe cases. There are sites spread across the 10 regions of Ghana including SARI and ILI sites (Refer to Annex 11 for the list of all sites in Ghana).

3.3.2 Sampling

Coordination between the GHS (Disease Surveillance Department) and the reporting health facilities is essential for ensuring that samples are collected from cases that fit the case definition.

Hospital based SARI sentinel surveillance

Every SARI patient will be sampled and tested.

Outpatient based ILI sentinel surveillance

The **first 5** cases should be sampled and tested weekly. If a patient is chosen for testing by the sampling process but declines testing or is not tested for any other reason, the next patient with SARI or ILI should be tested.

For all other non-sentinel health facilities: Suspected cases meeting the SARI/ILI case definition should be sampled and tested, especially those occurring in clusters.

3.4 Case Definitions

Standard case definitions for influenza-like illness (ILI) and severe acute respiratory infection (SARI) as defined in the 2nd Edition of the IDSR guidelines will be used by all health facilities.

Condition	Case definitions
ILI	Any person with sudden onset of fever (history/measured) of $\geq 38^{\circ}\text{C}$ (axillary) and cough and/ or other respiratory signs with onset within the last 10 days (WHO, 2013)
SARI	Any person with sudden onset of fever (history/measured) of $\geq 38^{\circ}\text{C}$ (axillary) and cough and/ or other respiratory signs with onset within the last 10 days and requires hospitalization (WHO, 2013).
A confirmed case of influenza is a case that meets the clinical case definition and is laboratory confirmed (laboratory results must be positive for influenza virus).	

3.5 Specimen collection

It is recommended that clinical specimens be taken as soon as possible for cases that meet the sampling criteria defined in this protocol. The specimen collection for hospitalized SARI cases may occur when the patients are being assessed for admission in an emergency room or after their admission to the ward. OPD cases that meet the sampling criteria should have clinical specimens taken while they are at the health facility.

Samples from SARI and ILI cases should be collected by trained medical personnel, in accordance with the SOPs (see Annex 1):

- Nasal swabs for nasal secretions (from the anterior turbinate area) or nasopharyngeal aspirates or swabs are appropriate for detecting human influenza. Nasal and nasopharyngeal specimens have a higher yield for influenza virus detection in ILI cases than do oropharyngeal specimens.
- For SARI cases, if patients are intubated, endotracheal aspirate or bronchoalveolar lavage can also be used where clinically indicated.
- If there is suspicion of H5N1 infection, both an oro-pharyngeal (throat) swab and a naso-pharyngeal swab may be collected and put in the same transport media. Oro-pharyngeal (throat) swabs are currently the highest yield upper respiratory tract specimen for detecting Avian Influenza A (H5N1) virus.

NB: When Rapid Diagnostic Test kits become available, they would be incorporated into the testing regime.

3.6 Lab specimen processing at sentinel site

Specimens should be kept refrigerated (4 °C) in appropriate viral transport media and should be sent as soon as possible to the laboratory along with the data collection and investigation form. Commercial transport media or media developed at the laboratory can be used in accordance with WHO guidelines (see Annex 2).

3.7 Specimen transport from field to laboratory

It is important to properly store the specimens in viral transport medium (VTM) before sending them to a laboratory. Specimens should be transported to the laboratory within 48 hours. Before transportation, they should be stored in a refrigerator (2-8 °C). Do not freeze samples if they will thaw and be frozen again, as this will destroy the virus. Specimens should not be stored in a standard freezer because of freeze-thaw cycles. It is better to keep a sample on ice even for a week, than to allow the sample to freeze and thaw multiple times.

Three packaging layers should be used to pack specimens for transportation from the field to the laboratory in order to protect specimens from damage during transportation. The first packaging layer should be water tight, and all layers should be absorbent in case there are any leaks (see Annex 3).

3.8 Laboratory testing

The NIC (NMIMR) tests the clinical specimens to detect the virus by polymerase chain reaction (PCR) and virus isolation. The NIC forwards representative isolates from Ghana to the WHO Collaborating Centre (WHO-CC) in the UK.

The NIC reports the results of the samples back to the reporting facilities and the Disease Surveillance Department (DSD) using the case investigation form (Annex 4). The NIC summarizes the frequency and percentage of influenza viruses by type and subtype. NIC reports the virological results weekly to the DSD, WHO/AFRO and the WHO FluNet programme. The DSD will regularly report the epidemiological data on influenza to national stakeholders (including regional health administrations) and the WHO FluID programme. The Districts would subsequently be informed by the regional level. In the event of Avian/Swine influenza viruses being identified from a patient with a history of animal exposure, the Director of Veterinary Services will be informed.

3.9 Data collection

The following is amongst data to be collected for each ILI/SARI patient from whom a specimen is collected using the case-based investigation form (Annex 4) or electronically by PDA.

- Unique identifier (Epid Number)
- Sex
- Age
- Address
- Temperature
- Date of onset
- Date of specimen collection
- Date of hospitalization
- Seasonal influenza vaccine status
- Antiviral use (oseltamivir)
- History of exposure to animals (example, birds and pigs) or occupational exposure
- Co-morbidity (chronic respiratory disease, asthma, diabetic, chronic cardiac disease, chronic liver disease, chronic renal disease, chronic neurological or neuromuscular disease, Immunodeficiency, including HIV)
- Pregnancy status

Copies of the filled Case based investigation form must accompany the patient specimens to the laboratory (NIC).

For SARI, weekly, the following aggregate data should be collated by designated health facilities (See Annex 6 for the data collation form):

- Number of new SARI cases by age-group
- Number of SARI deaths by age-group
- Number of total hospital admissions for that week by age-group

For ILI, weekly, the following data should be collected (See Annex 5 for the data collation form):

- Number of new ILI cases by age-group and gender
- Number of new ILI cases sampled by age-group and gender
- Number of total outpatient consultations for that week by age-group

3.10 Data reporting

The laboratory results are communicated as quickly as possible to the originating health facilities and DSD. The SARI and ILI weekly report is sent by Wednesday of the following week to DSD, WHO and other stakeholders such as VSD, CDC and NAMRU 3.

International reporting helps to inform all countries where and what subtypes of influenza are circulating. It allows contributing to the composition of the seasonal vaccine. Weekly national aggregated data on ILI, SARI cases and deaths (including denominators) and virological information should be reported to WHO regional and global platforms such as Fluid and FluNet.

In addition to the quantitative information, WHO recommends that a qualitative assessment of influenza activity through 4 indicators (Annex 8):_geographical spread, trend in the activity, the intensity of acute respiratory disease, and the impact on the health care system. The judgment can be based on a set of sources:

- The quantitative information from the sentinel sites
- Absenteeism rates from schools or work places
- Use of pharmaceuticals for symptomatic relief of respiratory disease
- Outpatient or emergency department visits for acute respiratory illness
- Vital statistics indicating respiratory disease as cause of death
- Formal and informal reports from district health authorities or health care providers

Each sentinel site would feed all epidemiological and laboratory information into the District Health Information Management System (DHIMS) that would be accessible to all administrative levels. The sentinel site would update the laboratory information accordingly when received.

3.11 Data analysis by health facilities and DSD

Virological and epidemiological aggregated information should be analyzed on a weekly basis. The minimum analysis should have:

- Graph of weekly SARI cases per total number of hospitalizations at the health facilities by age group
- Graph of weekly ILI cases per total number of outpatient consultations at the sentinel site by age group
- Number and sex of SARI/ILI patients tested and proportion positive, by influenza type and subtype
- Number of sentinel sites reporting (national level)

DSD should provide a summary of the data weekly to all stakeholders. The data should be presented with break down by sex. Annually case-based information on risk factors and other data should be collated and analyzed to understand better the groups at risk for severe outcome and guide the control strategies for the coming year.

3.12 Feedback

Feedback is an essential component of any surveillance system. By providing feedback to all participants in the surveillance system (e.g. clinicians, sentinel site, laboratory, MOH, WHO), each participant will have a better understanding of the usefulness of the data. Feedback could include analysed results (e.g. trends in SARI and ILI cases) and other information. It is recommended that weekly reports be sent to all stakeholders.

3.13 Monitoring and evaluation

Performance indicators are used to measure quality of influenza sentinel surveillance. To evaluate the efficiency and success of the system, a number of process indicators and outcome indicators have been established. See Annex 9 for a set of indicators to be used. In addition the CDC national inventory of core capabilities for pandemic influenza preparedness and response should be applied every year. The yearly national surveillance review should include an appraisal of influenza activities to ensure protocol adherence to achieve data quality.

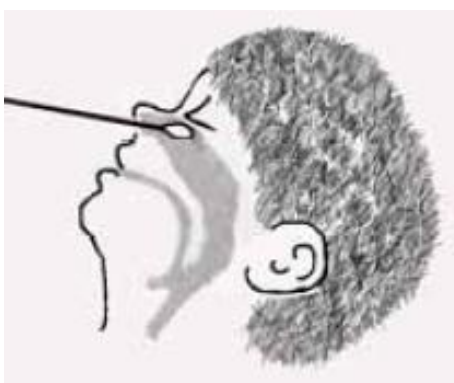
Annex 1: Techniques for Collecting Respiratory Samples

Standard precautions should always be followed and barrier protections applied during sample collection.

Nasal swabs with nasal secretions (from the anterior turbinate area) or nasopharyngeal aspirates or swabs are appropriate for detecting human influenza A and B. **Posterior-pharyngeal (throat) swabs are currently the highest yield upper respiratory tract specimen for detecting A (H5N1) (unlike human influenza).*** Naso-pharyngeal swabs may be collected if necessary. Swabs used for RT-PCR testing must be Dacron or rayon. **DO NOT** use cotton swabs or calcium alginate swabs or swabs that have wooden shafts since these may have inhibiting substances for PCR testing.

(a) Nasal swabs

Insert a **dry polyester or Dacron swab** into the nostril in line with the palate. Advance the swab tip past the vestibule (anterior nares) to the nasal mucosa (approximately 2–3 cm from the nostrils in adults) and gently rotate to collect nasal secretions from the anterior portions of the turbinate and septal mucosa.

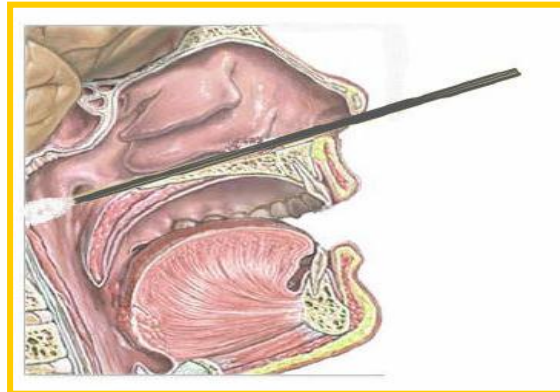


Introduce the swab into the tube that contains the transport medium: If a commercial medium is used, place the swab in the transportation tube and press the bottom of the tube in order to liberate the medium or put pressure on the padding at the bottom. If a laboratory-prepared medium is used, cut any leftover rod off the swab so that only the part that adheres to the swab remains in the tube. Close the tube with the cover. Swabs should always be kept moist during shipping.

(b) Nasopharyngeal swabs

Insert a dry rayon or polyester swab into the nostril and back to the nasopharynx. The swab should be slid straight into the nostril with the patient's head held slightly back. The swab is inserted following the base of the nostril towards the auditory pit and will need to be inserted at least 5–6 cm in adults to ensure that it reaches the posterior pharynx. **DO NOT** use rigid shafted swabs for this sampling method—a flexible shafted swab is essential.

* WHO, collecting, preserving, and shipping specimens for the diagnosis of avian influenza A (H5N1) virus infection. Guide for field operations (WHO/CDS/EPR/AFRO/2006), Geneva, World Health Organization, 2006.

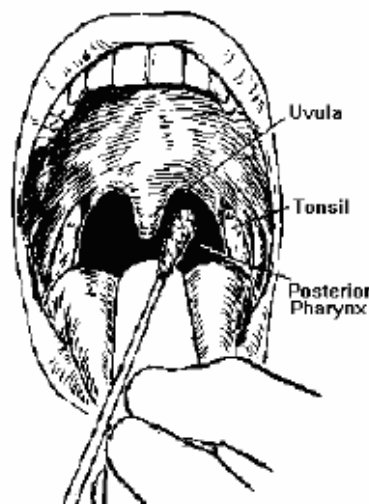


- Leave the swab in place for a few seconds
- Slowly remove the swab while slightly rotating it.
- Put tip of swab into vial containing VTM, breaking applicator's stick.
- A second swab should be used for the other nostril and put into a second tube. This can serve as the second sample from the patient.

Note: Nasopharyngeal sampling is an invasive process that can cause considerable distress to the patient.

(c) Posterior pharyngeal swabs (throat swabs)

- Hold the tongue down with a tongue depressor.
 - Use a sweeping motion to swab the posterior pharyngeal wall and tonsil pillars. Have the patient say "aahh" to elevate the uvula. Avoid swabbing the soft palate and do not touch the tongue with the swab tip. (**Note:** This procedure can induce the gag reflex.)
- Put the swab into VTM.



Annex 2: Viral Transport Media

Viral transport medium, abbreviated as VTM, is used in the collection of samples for viral isolation and testing. VTM prevents the specimen from drying out, and it also prevents bacteria and fungi from growing.

VTM can be made in a lab or purchased commercially. There are several different types of viral transport media. The choice of which VTM to use should depend on whether the samples are being collected from animals or humans, and the testing to be done with the sample. There is VTM for collection of animal specimens, VTM for viral isolation from human specimens, and VTM for molecular testing. Each has slightly different recipes, and it is important NOT to use phosphate-based media when VTM is used for molecular testing. If VTM is not available, 100% ethanol can be used for molecular testing.

It is important to correctly store VTM. If VTM is made in the laboratory, place 2 to 3 milliliters of VTM into sterile collection vials. The vials can be stored in the freezer at -20 °C until use. The vials can be stored for short periods of time at 4–6 °C.

Keep records of when the VTM was made, and do not use vials if the liquid becomes cloudy, as this is a sign of contamination.

For specimens in VTM:

- Transport to laboratory as soon as possible.
- Store specimens at 4 °C before and during transportation within 48 hours.
- Store specimens at -70 °C beyond 48 hours.
- Do not store in standard freezer—keep on ice or in refrigerator.
- Avoid freeze-thaw cycles. It is better to keep on ice for a week than to have repeat freezing and thawing.

Annex 3: Specimen Packing and Transport

Send specimens in viral transport medium (VTM) to the laboratory as soon as possible. It is important to properly store them before sending to a laboratory. Table A gives the different storage and shipment conditions that can be used and which methods are recommended (based on the likelihood of obtaining a positive A/H5N1 result on laboratory analysis).

Table A: Suitability of various storage and shipment conditions for different specimen types

Storage/shipment Conditions	Swabs or other specimens in VTM for isolation of virus	Swabs or other specimens in VTM for PCR	Swabs in ethanol for PCR*	Blood serum for virus isolation	Blood serum for PCR	Blood serum for antibodies
-70 °C or dry ice or Liquid N ₂	SR	SR	N/A	SR	SR	SR
-20 °C	NR	A	N/A	NR	A	SR
+4 °C	A**	A	A	A	A***	A
Room temperature	NR	A	A	NR	A**	A**
Dried blood sport on filter paper	N/A	N/A	N/A	N/A	A	A

SR = strongly recommended method A = Adequate method NR = Not recommended N/A = Not applicable

* Where refrigeration is not available ** for up to 7 days storage *** for up to 4 days storage

If specimens will be transported within 48 hours, store them at 4 °C both before *and* during transportation.

If specimens cannot be transported to the laboratory within 2 days, store them at -70 °C. If this cannot be done, keep the specimens on ice or in the refrigerator as long as necessary.

DO NOT put specimens in a standard freezer as this will damage them.

It is also very important to avoid freeze-thaw cycles. Do not freeze samples if they will thaw and be frozen again, as this will destroy the virus. It is better to keep a sample on ice even for a week, than to allow the sample to freeze and thaw multiple times.

When the specimens are ready to be packed for transportation from the field to the laboratory, it is necessary to use three packaging layers.

Primary container: The primary packaging, which contains the specimen, must be watertight. Example: Vacutainer with adhesive tape around screw cap. Use screw-cap conical test tubes or cryovials. Do not use Eppendorf tubes, with tape or parafilm around cap.

Secondary container: The secondary packaging may contain several primary containers. The secondary packaging must also be watertight. Examples of watertight secondary containers include ziplock plastic bags, a conical 50ml test tube, and screw-cap containers. **Absorbent material** must be placed between the primary and secondary container. The quantity should be sufficient to absorb all liquid in the shipment. Examples would include paper towels, cotton balls, filter paper, etc.

If dry ice is needed to keep samples frozen, it should be put between the secondary and tertiary packaging. Styrofoam and cardboard both allow dry ice vapor to escape, so dry ice must be placed only OUTSIDE the secondary packaging. Packaging dry ice inside impermeable, screw-cap containers may cause the shipment to explode.

Outer shipping container: The tertiary packaging (outside) must protect the inside packaging to avoid breakage or perforation under normal transport conditions. Corrugated cardboard is the usual choice. Remember that Styrofoam boxes, plastic bags, or paper envelopes are unacceptable outer containers for shipping biological materials.

Just as it is important to keep specimens cold during storage, it is important to keep specimens cold during *transportation*. Try to keep specimens at 4 °C. A cooler filled with ice packs can be used for this purpose, but do not use dry ice unless the specimens are double-bagged and airtight; carbon dioxide from the dry ice can inactivate the virus.

Be sure to coordinate the shipment with the laboratory. In all specimen shipments, include an itemized list of specimens, with specimen identification numbers and instructions for the laboratory.

Annex 4: SARI / ILI case based data collection form

INFLUENZA CASE INVESTIGATION FORM – GHANA

Fill in the Blank Space or Tick the box as appropriate

Case Id Number: GHA - _____ - _____ - _____ - _____ Date Received by National level
Region District Year Onset Case Number (Disease Surveillance Department): ____/____/____

1. Reporting Details

Region _____ District _____

Sub-district _____ Health Facility _____

Date Notified ____/____/____ Date Investigated ____/____/____

i. 2. Demographic Details

Name of patient _____ Sex Male, Female
Date of birth ____/____/____ Age Years _____ OR Months _____
(If DOB is unknown) (If <1 year)
Name of Village/Suburb Town/ City _____ Address (Location) _____
Occupation _____ Residence Urban Rural
Contact phone number of suspected case _____

3. Signs and Symptoms

Date of onset ____/____/____ (dd/mm/yyyy)
Fever/Body temp >38°C Yes No Unknown Cough Yes No Unknown Others (specify) _____
Sore throat Yes No Unknown Difficulty in Breathing Yes No Unknown _____

4. History of Admission

Date first seen at a health facility for this disease ____/____/____
Admitted to Hospital (in-patient)? Yes No Unknown
Name of Health Facility _____ District where Health Facility located: _____
Date of admission (in-patient) ____/____/____
Date person discharged from hospital ____/____/____
Termination date of hospital stay ____/____/____
Admitted to intensive care unit Yes No Unknown

5. Exposure to Risk Factors

Previously vaccinated against Influenza? Yes No If Yes, specify year of vaccination _____
List places visited during the past 7 days

Visited places with known lab confirmed pandemic influenza cases within 7 days prior to the onset of disease? Yes No

Contact with suspected or confirmed Influenza patient(s)? Yes No

Contact with sick or dead animals (wild or domestic)? Yes No

Risk factors for severe disease: Pregnant Diabetic Immuno suppressed Other(s), specify _____

6. Laboratory Investigation Results

Type of specimen taken Oropharyngeal Nasopharyngeal Serum Plasma

Positive viral culture for influenza A(H1N1) Yes No Unknown

Positive real time RT-PCR for influenza A(H1N1) Yes No Unknown

4-fold rise in A(H1N1) virus-specific antibody titre in paired serum samples Yes No Unknown

Other influenza viruses: [Please Specify; A(H5N1), A(H3N2), B virus, C virus, Negative, Pending, Others (specify)]

7. Treatment

State treatment administered _____

8. Final Outcome

Final Outcome Recovered, Deceased, Lost to follow-up Transferred Out Still under treatment

Date final outcome established ____/____/____ If person died, date of death ____/____/____

9. Final classification Confirmed Probable Suspected or under investigation Not a case

Other comments and remarks:

Contact details of Investigator

Name _____ Title _____

Institution/Unit _____ Address _____

Telephone _____ E-mail _____

Date of last update (dd/mm/yyyy): _____

*In case of animal exposure and positive for influenza A (Avian/Swine) virus specify the type of animal involved to help Veterinary Services to direct resources to undertake targeted surveillance in such animals. This would also guide the laboratory (NIC) to choose the testing algorithm to start with.

Annex 5: Ghana National Influenza Surveillance System

Weekly Aggregated Data form for ILI

Region: _____ District: _____

Sentinel Site: _____

Year: _____

Reporting Week : _____

Week Beginning Monday: _____

Week Ending Sunday: _____

	28 days		1 - 11mths		1 - 4yrs		5 - 9yrs		10 - 14yrs		15 - 17yrs		18 - 19yrs		20 - 34yrs		35 - 49yrs		50 - 59yrs		60 - 69yrs		70+		Total				
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F			
A. Number of new ILI cases																													
B. Number of new ILI cases sample																													
C. Number of total outpatients visits																													
D. Proportion of ILI (%) = A/C																													

Select one option that applies					
Geographical spread:	No activity	Localized	Regional	Widespread	No information available
Trend in the activity:(;);	Increasing	Unchanged	Decreasing	No information available	No information available
The intensity of acute respiratory disease:	Low or Moderate	High	Very high	No information available	No information available
The impact on the health care system	Low	Moderate	Severe	No information available	No information available

Annex 6: Ghana National Influenza Surveillance System
Weekly Aggregated Data form for SARI

Region: _____ District: _____
 Sentinel Site: _____
 Year: _____
 Reporting Week : _____
 Week Beginning Monday: _____
 Week Ending Sunday: _____

	28 days		1 - 11mths		1 - 4yrs		5 - 9yrs		10 - 14yrs		15 - 17yrs		18 - 19yrs		20 - 34yrs		35 - 49yrs		50 - 59yrs		60 - 69yrs		70+		Total		
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
A. Number of new SARI cases																											
B. Number of new SARI cases sampled																											
C. Number of total hospital admissions																											
D. Number of SARI deaths this week																											
E. Proportion of SARI (%) (= A/C)																											

Select one option that applies					
Geographical spread:	No activity	Localized	Regional	Widespread	No information available
Trend in the activity:(;);	Increasing	Unchanged	Decreasing	No information available	
The intensity of acute respiratory disease:	Low or Moderate	High	Very high	No information available	
The impact on the health care system	Low	Moderate	Severe	No information available	

Annex 7: Qualitative indicators to be reported to WHO by national level

- **Geographical spread**

Geographical spread refers to the number and distribution of sites reporting influenza activity.

- **No activity:** no laboratory-confirmed case(s) of influenza, or evidence of increased or unusual respiratory disease activity.
- **Localized:** limited to one administrative unit of the country (or reporting site) only.
- **Regional:** appearing in multiple but <50% of the administrative units of the country (or reporting sites).
- **Widespread:** appearing in $\geq 50\%$ of the administrative units of the country (or reporting sites).
- No information available: no information available for the previous 1-week period.

- **Trend**

Trend refers to changes in the level of respiratory disease activity compared with the previous week.

- **Increasing:** evidence that the level of respiratory disease activity is increasing compared with the previous week.
- **Unchanged:** evidence that the level of respiratory disease activity is unchanged compared with the previous week.
- **Decreasing:** evidence that the level of respiratory disease activity is decreasing compared with the previous week.
- No information available.

- **Intensity**

The intensity indicator is an estimate of the proportion of the population with acute respiratory disease, covering the spectrum of disease from influenza -like illness to pneumonia.

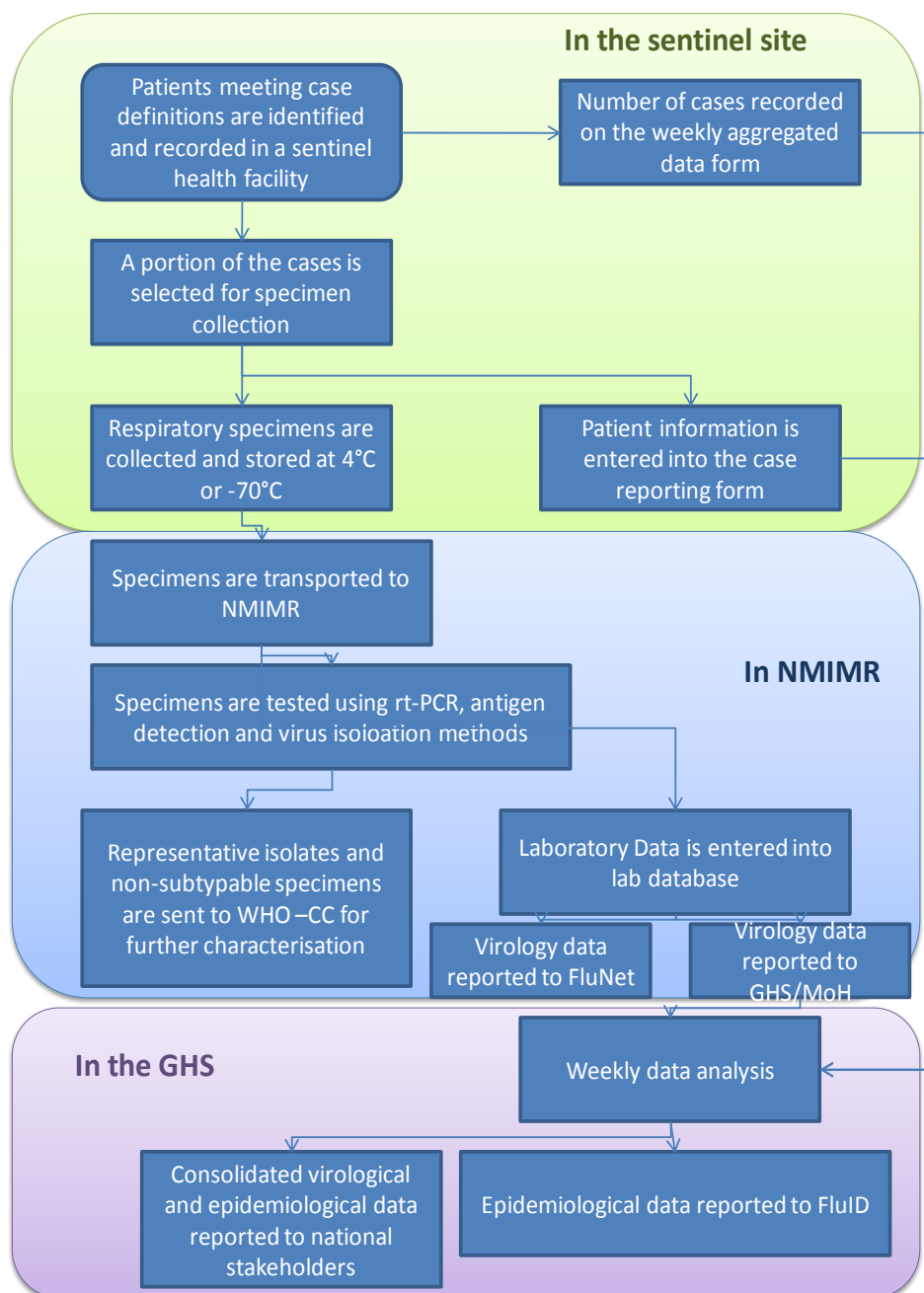
- **Low or moderate:** a normal or slightly increased proportion of the population is currently affected by respiratory illness.
- **High:** a large proportion of the population is currently affected by respiratory illness.
- **Very high:** a very large proportion of the population is currently affected by respiratory illness.
- No information available.

- **Impact**

Impact refers to the degree of disruption of health-care services as a result of acute respiratory disease.

- **Low:** demands on health-care services are not above usual levels.
- **Moderate:** demands on health-care services are above the usual demand levels but still below the maximum capacity of those services.
- **Severe:** demands on health care services exceed the capacity of those services.
- No information available.

Annex 8: Ghana Influenza Surveillance System Flow Chart



Adapted from: A practical guide to harmonizing virological and epidemiological influenza surveillance. WHO WPRO, 2008

Annex 9: Monitoring and Evaluation indicators

Indicator	Target	Achievement
Timeliness		
Several time intervals are appropriate for routine measurement as quality indicators. These include the duration of time from:		
Weekly data reporting from the sentinel site to the next administrative level (follows the epidemiological weekly format for IDSR)	Week begins on Monday and ends on Sunday	
Period of specimen collection at facility until shipment to laboratory	Within 1 week	
Period of result availability in laboratory to reporting to referring site/ physician	Within 48 hours	
Metrics		
Percentage of time that a site achieves target for timeliness	=> 80%	
Completeness		
Percentage of reports received from each site with complete data	=> 90%	
Percentage of reported cases that have specimens collected	=> 95%	
Audit		
Proportion of cases that fit the case definition	=> 90%	
Epidemiologic data are correctly and accurately abstracted	=> 95%	
Proportion of cases with adequate specimen (surveillance and laboratory satisfied)	=> 80%	
Proportion of sentinel sites with sampling procedures done uniformly without evidence of bias	= 100%	
Data to be followed and observed for aberrations over time		
Number of ILI and SARI cases reported by month for each site	-	
Number of specimens (for ILI and SARI) submitted by month for each site for each condition	-	
Percentage of specimens that are positive for influenza	-	
Number and percent of ILI and SARI cases tested	-	

Annex 10: General considerations for site selection

- Ideally, sites should represent the population of interest. For ILI sentinel sites, general outpatient clinics or acute care facilities represent a wide range of patients. For SARI sentinel sites, general or community hospitals are preferred to specialty care or referral hospitals in order to provide an unbiased selection of cases.
- The sentinel sites should represent a wide cross-section of ethnic and socioeconomic groups and the different climatic regions in the country, to capture the epidemiological characteristics of influenza.
- If possible, the sentinel site should be selected from a location where denominators are available; estimates of the service population or where rates of total consultations or admissions are easy to obtain. And where the service population is representative of groups of national interest such as urban, rural or national representation.
- It is recommended that a country prioritize the collection of quality surveillance data from one or two sentinel sites at the beginning and then gradually expand to other sites. Adequate piloting and evaluation should be performed before adding any new sentinel sites.
- Patient volume should be adequate to allow meaningful monitoring of respiratory disease trends and evaluation of risk factors but not so high as to be overwhelming or unmanageable. Very low volume facilities will likely provide too few cases to allow meaningful interpretation. On the other hand, facilities with huge, unmanageable patient volumes will make interpretation of data very difficult due to the inability to understand what fraction of the total is being captured, to systematically select cases in an unbiased way, or to understand the representativeness of the data.
- Feasibility; in terms of commitment and motivation of the sentinel site staff; a site's ability to routinely collect, manage, and report surveillance data; and capacity to collect, store, and transport lab specimens are important factors to consider when selecting a sentinel site.

Annex 11: List of the current influenza sentinel sites in Ghana

N	Site	Type	Ownershi	Town	Region
1	Naval Sick Bay	ILI	Military	Sekondi	Western
2	2 MRS	ILI	Military	Sekondi	Western
3	Airforce Medical Centre	ILI	Military	Sekondi	Western
4	Manhean Health Centre	ILI	GHS	Tema	Greater
5	Tema General Hospital	ILI/SARI	GHS	Tema	Greater
6	Tema Polyclinic	ILI	GHS	Tema	Greater Accra
7	37 Military Hospital	ILI/SARI	Military	Accra	Greater
8	Achimota Hospital	ILI	GHS	Accra	Greater
9	4 MRS	ILI	Military	Kumasi	Ashanti
10	Bolgatanga Hospital	ILI	GHS	Bolgatanga	Upper east
11	Wa Hospital	ILI	GHS	Wa	Upper west
12	3 MRS	ILI	Military	Sunyani	Brong Ahafo
13	Cape Coast Hospital	ILI/SARI	GHS	Capecost	Central
14	Koforidua Hospital	ILI/SARI	GHS	Kofirudua	Eastern
15	Ho Regional Hospital	ILI/SARI	GHS	Ho	Volta Region
16	Kumasi South Hospital	ILI/SARI	GHS	Kumasi	Ashanti
17	Effia Nkwanta Regional Hospital	ILI/SARI	GHS	Takoradi	Western
18	6 MRS	ILI	Military	Tamale	Northern
19	Tamale Teaching Hospital	SARI	GHS	Tamale	Northern
20	7 MRS	ILI	Military	Ho	Volta
21	Ketu South District Hospital	ILI	GHS	Aflao	Volta
22	Sunyani Municipal Hospital	ILI	GHS	Sunyani	Brong Ahafo

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