Ministry of Health

GHANA HEALTH SERVICE/MINISTRY OF HEALTH

NATIONAL GUIDELINES ON SENTINEL SURVEILLANCE FOR RESPIRATORY PATHOGENS IN GHANA

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FOREWORD

Ghana instituted sentinel surveillance for influenza in 2007 as part of efforts to strengthen the disease surveillance system and to contribute to global efforts at influenza control. The implementation of sentinel surveillance with support from the United States government has been largely successful with many outbreaks identified and appropriate response measures instituted because of this surveillance system. Notable among these are senior high school outbreaks in the Ashanti region in 2017, Greater Accra region in 2018 and Eastern region in 2019.

Following the outbreak of COVID-19, recommendations on the need to expand the surveillance and testing for other respiratory pathogens have been made. In addition, the increase in the number of political administrative regions in Ghana calls for the need to establish sentinel sites in the six newly created regions. Ghana's move towards electronic Integrated Disease Surveillance and Response (eIDSR) calls for a revision of the data collection mechanisms to ensure conformity to national disease surveillance protocols. To this end, the revision of the National Influenza Surveillance Protocol to include other respiratory pathogens became important.

This revised guidelines for respiratory viruses in Ghana is aimed at providing evidence to inform public health decision making in Ghana and beyond.
The Ghana Health Service (GHS)/Ministry of Health (MOH) expects all implementing sites to strictly adhere to the guidelines to ensure availability of robust information for decision making.

The GHS/MOH will continue to support the implementation of sentinel surveillance for respiratory pathogens through the appropriate training of staff and make available logistics and reagents with support from development partners to ensure the goals of this guidelines are achieved.

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Abbreviations

ALRI	Acute Lower Respiratory Infection
ARI	Acute Respiratory Infection
AU-AIBAR	African Union- Inter African Bureau for Animal Resources
DSD	Disease Surveillance Department
FAO	Food and Agriculture Organization
GAF	Ghana Armed Forces
GHS	Ghana Health Service
GISN	Global Influenza Surveillance Network
GISRS	WHO Global Influenza Surveillance and Response System
HA	Haemagglutinin
HPAI	Highly Pathogenic Avian Influenza
HRSV	Human Respiratory Syncytial Virus
IDSR	Integrated Disease Surveillance and Response
ILI	Influenza-like Illness
MERS	Middle East Respiratory Syndrome
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
SARS	Severe Acute Respiratory Syndrome
SISA	Strengthening Influenza Surveillance in Africa Project
SORMAS	Surveillance Outbreak Response Management and Analysis System
URTI	Upper Respiratory Tract Infection
US CDC	U.S. Centers for Disease Control and Prevention
VSD	Veterinary Services Directorate
VTM	Viral Transport Medium
WCC	WHO Collaborating Centre
WHO	World Health Organization

1.0 Background

1.1 Respiratory Illnesses

Acute Respiratory Illnesses (ARIs), including influenza-like illness (ILI) and Severe-Acute Respiratory Illness (SARI) are respiratory tract infections often characterised by fever, headache, myalgia, prostration, coryza, sore throat and cough, and manifest as common cold, bronchiolitis, pneumonia and croup (1).

1.1.1 Aetiology and Epidemiology:

1.2 Respiratory Pathogens of interest

Although ARIs are caused by viruses, bacteria, fungi, mycoplasmas and rickettsia, viruses have been largely responsible for recorded epidemics. Several viruses such as adenoviruses, human metapneumovirus, enteroviruses, human coronaviruses, parainfluenza virus types 1, 2 and 3, and rhinoviruses cause mild respiratory diseases that are seldom fatal. Although human respiratory syncytial viruses (HRSV) seldom cause serious disease in older children and adults, they often cause fatal infections in infants (2). Some variants of influenza, coronaviruses, and hantaviruses are associated with severe diseases of epidemic or pandemic potential. Most viral respiratory diseases have similar clinical presentation, and the pathogens are indistinguishable without laboratory confirmation.

The emergence of new pathogenic agents causing respiratory diseases (e.g. COVID-19, MERS and SARS) and the continuous circulation of mutations of avian, porcine and human influenza viruses highlight the need for 'One-Health' approach at all levels of the health delivery system. This would foster rapid response to contain and prevent the spread of novel pathogenic agents.

Other respiratory pathogens not known to cause epidemics of pandemic potential, need to be closely monitored.

The respiratory pathogens of interest are as follows:

1.2.1 Human influenza viruses

Influenza viruses are classified into types A, B, C and D. Influenza A and B viruses can cause epidemic disease in humans, while type C viruses usually cause a mild, cold-like illness (3). Influenza D virus primarily affects cattle and are not known to infect or cause illness in humans (3). Influenza A infects multiple species, including humans, other mammals, and wild and domestic birds. Influenza A viruses can be subtyped according to the antigenic and genetic nature of their surface glycoprotein; 18 Haemagglutinin (HA) and 11 Neuraminidase (NA) subtypes (3). Many different combinations of HA and NA proteins are possible. These influenza A subtypes H1N1, H1N2, H2N2 and H3N2 have been associated with widespread epidemics in humans. The current human influenza A subtypes in circulation are H1N1 and H3N2. Influenza may occur throughout the year or seasonally.

In the African region, the epidemiology and disease burden of human influenza has not been adequately described. Data from Ghana shows the incidence of influenza-associated ILI to be 844 per 100,000 persons and influenza-associated SARI to be 30 per 100,000 persons (4).

In Ghana, significant outbreaks of influenza have often occurred in institutional settings, mainly from type A (H1N1pdm09). In 2021, a mixed outbreak of SARS-CoV-2 and influenza A (H1N1pdm09) occurred in a second cycle institution in Greater Accra Region, and a total of 19 cases with no mortality was recorded (5). Another outbreak of influenza A (H3N2) occurred in 2019 in three-second cycle institutions in the Eastern Region, and a total of 126 cases were notified (6). Others include the 2018 influenza A (H1N1pdm09) in a second cycle institution in

Greater Accra (104 cases, no death) (7); and the 2017 influenza A (H1N1pdm09) outbreak in a second cycle institution in the Ashanti Region (96 cases and 4 deaths) (8).

1.2.3 Avian influenza viruses

Avian influenza viruses with zoonotic potential include A(H5N1), A(H7N9), A(H7N7), A(H6N1), A(H9N2) and A(H10N8). The majority of human cases of influenza A (H5N1) and A(H7N9) virus infection have been associated with direct or indirect contact with infected live or dead poultry (9). Therefore, controlling the disease in animal sources is critical to risk reduction or elimination in humans. In Ghana, the first recorded avian influenza (HPAI H5N1) outbreak was in a small-scale poultry farm in 2007 at Kakasunanka near Michelle Camp in the then Tema Metropolis. Since then, pockets of outbreaks have been recorded across 12 regions in Ghana. From 2007-2021, approximately 783,000 birds had been affected from 197 farms. Although animal cases have been reported, no animal-human transmission has been documented in Ghana.

1.2.4 Coronaviruses

Prior to the discovery of Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV), Middle East Respiratory Syndrome Coronavirus (MERS-CoV), and SARS-CoV-2, human coronaviruses were known to cause mild respiratory diseases (causative agents in 15% – 30% of cases of the common cold), with the occurrence of the severe disease being rare (10).

There was a severe outbreak of Severe Acute Respiratory Syndrome (SARS) between 2002-2003 in China, which spread to more than 29 countries on 4 continents, infecting 8,098 people and resulting in 774 deaths (11) (9). The aetiological agent was established to be a novel coronavirus (SARS-CoV) initially transmitted from wild game.

Cases of Middle East Respiratory Syndrome (MERS) were first identified in 2012 in the Middle East region (12). MERS like SARS is a zoonotic disease caused by coronavirus. MERS-CoV is transmitted from camels or camel products (e.g. raw milk) to humans via direct or indirect exposure. However, the spread of MERS is somewhat geographically limited, with only one significant outbreak recognised outside the Middle East, i.e., the Republic of South Korea through an infected traveller (10).

In 2019, a new coronavirus disease (COVID-19) caused by SARS-CoV-2 emerged. As at the end of February 2022, almost 440 million cases and 6 million deaths had been recorded globally (13). In Ghana, 160,338 cases and 1,442 deaths had been recorded (14).

1.2.5 Human Respiratory Syncytial Virus

Human RSV (HRSV) has one serotype with two groups A and B. These two groups co-circulate in the human population, with group A being more prevalent. Human RSV is the most common viral pathogen identified in children with acute lower respiratory infection (ALRI) (15). RSV-infected patients are usually asymptomatic and clinical symptoms may vary from mild respiratory illness (cough and low-grade fever) to severe illnesses in the form of pneumonia or bronchiolitis, which is most commonly observed in infants (16).

In 2015, an estimated number of 94,600 to 149,400 child deaths globally could be attributed to RSV (15). RSV-associated ARI constitutes a significant disease burden in older adults aged ≥65 years with an estimated 5,000 to 50,000 in-hospital deaths globally (17). A study conducted in an urban setting in Ghana showed HRSV detection rate of 23% among children aged <5 years with ALRI (2).

1.2.6 Mycoplasma pneumoniae

Mycoplasma pneumoniae causes respiratory illness with estimated prevalence ranging from 2%–35% (18,19).
A South African study showed *M. pneumoniae*–positive children aged <5years were associated with severe diseases (21).

1.2.7 Group C Streptococcus pneumoniae

Group C *Streptococcus pneumoniae* rarely cause illnesses in humans. However, infections have been associated with severe respiratory diseases that require hospitalization for both children and adults (22). Hence the need to closely monitor infections to inform proper diagnosis as well as treatment.

1.3 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. However, the COVID-19 pandemic has necessitated the integration and expansion of the influenza surveillance system to cover SARS-CoV-2 and other respiratory pathogens of public health importance. 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.

GISRS comprises of 153 institutions from 127 countries recognised as WHO National Influenza Centres (NICs), 7 WHO Collaborating Centre (WCCs), 13 H5 Reference laboratories and 4 Essential Regulatory laboratories. In the African Region, there are 16 NICs in 15 countries including Ghana.

1.4 The Human Sentinel Surveillance System

In Ghana, influenza sentinel surveillance has been used to collect quality information in a timely way. It has provided data on the epidemiologic characteristics of ILI and SARI and determined the proportions due to influenza and coronaviruses among suspected cases that were tested. It also has the potential to provide data on other respiratory pathogens and serve as an early warning system for outbreak detection and response.

This protocol leverages on expanding the existing influenza surveillance system to include other respiratory pathogens. In the context of integrating surveillance for influenza, coronaviruses, and other respiratory pathogens, GISRS recommends the collection of adequate number of appropriate specimens and, complete clinical and epidemiological information to meet core objectives.

1.5 Animal Disease surveillance system

Avian influenza (AI) normally spreads in birds but can also infect humans. Human infections are primarily acquired through direct contact with infected poultry or contaminated environments. Surveillance in live bird market and wild birds is one of a series of AI prevention and preparedness initiatives VSD has implemented with support from FAO and other agencies.

Surveillance for avian influenza can be implemented through the following activities:

- wild bird surveillance especially in the animal-human interface.
- surveillance in domestic poultry when clinical signs suggestive of avian influenza are reported.
- targeted surveillance in an outbreak setting.

2.0 Purpose, Justification and Objectives of the protocol

The purpose, justification and objectives of the protocol are detailed in the subsequent sections.

2.1 Purpose of the protocol

This protocol is to guide human and animal health personnel in Ghana to conduct surveillance for respiratory infections in humans and animals.
It is meant to collect epidemiological and microbiological information to support prevention and control strategies and define the seasonality of respiratory pathogens in Ghana.

2.2 Justification for Respiratory Pathogens Surveillance

In tropical and subtropical regions, there is increasing evidence that the burden of respiratory pathogens 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.
The contribution of zoonotic disease agents to the global disease burden is increasing. Analysis of human disease outbreaks in 219 countries spanning 1980 to 2013 shows 56% caused by zoonotic agents, suggesting that most of the new human infections will likely originate from wildlife or livestock, making animal reservoirs important contributors to human disease outbreaks; hence, the need for strengthening 'One-Health' capacities (24).

2.3 Objectives of the national respiratory pathogens surveillance system

The general objective is to provide information on respiratory pathogens and identify and monitor groups at high risk for severe respiratory diseases.

The specific objectives of are:

1. Monitor trends in morbidity and mortality associated with respiratory pathogens in humans and animals.
2. Identify locally circulating influenza strains, coronaviruses, and other respiratory pathogens in humans and animals.
3. Monitor health of people exposed to infected animals
4. Report emerging and re-emerging infectious diseases

3.0 Components of the national surveillance system

3.1 Human sentinel surveillance sites

Ghana has been implementing the Integrated Disease Surveillance and Response (IDSR) strategy since 2002. Priority public health diseases, conditions and events are under surveillance at all levels of the healthcare system and includes all epidemic-prone diseases. Such disease conditions have been classified as immediately reportable and includes human influenza due to a new sub-type, ILI, SARS, SARI and COVID-19.

Sentinel Surveillance is an additional source of surveillance data with particular emphasis on the identification of pathogens of concern for necessary public health response. Sentinel site staff are 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 are responsible for collecting and processing patient specimens and their dispatch to the National Influenza Centre. At the sentinel sites, outpatient- and inpatient-based surveillance are conducted.

3.2 Veterinary and Wildlife Surveillance

Regular passive and active surveillance are conducted in avian (ducks, guinea fowls, turkeys, pigeons, commercial and backyard poultry) and swine species. Veterinary and wildlife staff are responsible for the collection, transportation and processing of animal samples. Samples are tested at the Accra Veterinary Laboratory. Confirmed H5 and H7 samples are shipped to the World Organization for Animal Health (WOAH). Data generated is shared with the National Influenza Centre and the Disease Surveillance Department to facilitate a 'one health' collaboration in the management of outbreaks. The Veterinary Services Directorate also report outbreaks to regional and global bodies like African Union- Inter African Bureau for Animal Resources (AU-AIBAR), WOAH and the Food and Agriculture Organization (FAO). Feedback is provided to the farmers and other stakeholders.

3.3 Roles and responsibilities

3.3.1 Ghana Health Service

The GHS is responsible for the coordination and monitoring of implementation of respiratory pathogen surveillance in Ghana. It is also responsible for sharing weekly epidemiological reports to FluID/FluMart.

3.3.2 National Influenza Centre

The Noguchi Memorial Institute for Medical Research (NMIMR) serves as the NIC. The NIC is responsible for:

- the initial identification of influenza strains, coronaviruses, and other respiratory pathogens from respiratory specimens:
- Entering laboratory results into Surveillance Outbreak Response Management and Analysis System (SORMAS) and WHO FluNet.
- Collaborates with GHS to train sentinel site personnel on safe handling of samples.
- Forward representative influenza viral isolates and clinical specimens to the WHO collaborating centres, Atlanta and London.

4.0 Methods and procedures

4.1 Case Definitions

Standard case definitions as defined by the 3rd Edition IDSR guidelines must be used by sentinel sites and other health facilities for case detection. The WHO recommends the use of ILI/ARI/SARI case definitions to detect respiratory infections.

Condition	Suspected Case definitions
ILI	Any person with sudden onset of fever (history/measured) of ≥38^0C and cough and/ or other respiratory signs with onset within the last 10 days
ARI	Any person with at least one of cough, sore throat, shortness of breath, runny nose with or without fever AND a clinician's judgement that the illness is due to an infection
SARI	Any person with sudden onset of fever (history/measured) of ≥38^0C and cough and/ or other respiratory signs with onset within the last 10 days and requires hospitalisation.
A **confirmed case of respiratory illness** is a case that meets the clinical case definition for ILI/ARI/SARI and is laboratory confirmed (laboratory results must be positive for influenza, coronaviruses, human respiratory syncytial virus, or other respiratory pathogens).	

4.2 Sampling site

Respiratory pathogens surveillance in Ghana will be conducted at the designated sentinel surveillance sites across all 16 regions in Ghana (Refer to Annex 12 for the list of all sites in Ghana).

4.3 Sampling strategy

To meet the core surveillance objectives:

- Each sentinel site will provide 5-10 ILI/ARI specimen and all SARI cases seen at the facility per week in line with GISRS recommendation. The first 5-10 ILI/ARI cases should be sampled weekly. If a patient is chosen for the sampling process but declines, the next patient should be sampled.
- NIC will source specimens from non-sentinel sites such as COVID-19 testing or treatment centres and other surveillance systems to bridge any shortfall if the required sample size is not achieved.
- When sourcing non-sentinel specimens to test for respiratory pathogens, samples should be taken from patients meeting the ILI/ARI/SARI case definitions

4.5 Human Specimen collection

Clinical specimen should be taken as soon as possible for cases that meet the case definition and sampling strategy as defined above.

All specimens should be collected by trained personnel, in accordance with SOPs (**Annex 1**):

- For all suspected cases over 5 years of age, both oropharyngeal and nasopharyngeal swabs must be collected into the same transport media to increase pathogen yield.
- For children under 5 years, nasal swabs should be collected.
- For intubated patients, an endotracheal aspirate, nasopharyngeal aspirate or bronchoalveolar lavage should be taken

All specimens collected should be stored in transport medium to avoid desiccation. Rapid Diagnostic Test kits can be used to screen on site when available and applicable.

4.6 Animal sample collection

4.6.1 Active surveillance

- This surveillance should be done quarterly every year. For healthy and sick birds, tracheal and cloacal specimen should be collected from swine and poultry.
- In an outbreak setting, tracheal and cloacal specimen should be collected from both live and dead birds. Tissue specimen and feathers can be collected from dead or live birds. Environmental samples such as wood shavings, bird droppings and water should be collected in the absence of birds.
- Oropharyngeal and nasopharyngeal specimen should be collected from farm attendants and owners to investigate possible spillovers into the human population.
- All specimen (Tissue, cloacal and tracheal swabs, feathers and environmental samples) should be collected in transport media and transported to the VSD laboratory.
- Dead birds should be sent directly to the designated VSD laboratory.

4.6.2 Passive Surveillance

- Farmers reporting morbidity among their farm animals should be duly attended to and investigated.

Note: When human cases are confirmed for avian influenza, report must be sent immediately to aid in contact tracing.

4.7 Specimen storage at sentinel site

Specimens should be kept refrigerated (+2 to 8 ^{o}C) in appropriate transport media and should be sent as soon as possible to the laboratory after data on cases have been entered electronically in SORMAS. Commercial transport media or media developed in-house can be used in accordance with WHO guidelines (25) (**Annex 2**).

Note: Specimens should not be frozen and thawed, because this results in degradation of respiratory pathogens, reducing detectability.

4.8 Specimen transport to the laboratory

Specimen should be transported to the laboratory within 48 hours on ice to maintain the cold chain. Before transportation, they should be stored in a refrigerator (+2 to 8 °C).
Triple packaging should be used when transporting specimen to the laboratory to protect specimen from damage and spillage.

The primary packaging, which contains the specimen, must be watertight. It should be wrapped in an absorbent material, placed in 2 zipped-lock bags and then in a leak-proof secondary container. Specimen submission form (**Annex 11)** should be placed in a separate zipped-lock bag (**Annex 3**).
The secondary packaging may contain several primary containers and must be watertight. This container housing the primary container as well as the accompanying documents should be placed in a tertiary container surrounded by ice packs.

4.9 Laboratory testing

Specimens received at the laboratory will be tested by real time polymerase chain reaction (RT-PCR), serology and other laboratory techniques. In addition, some of these specimens will be sequenced to determine the genomics of the pathogen.
Representative influenza specimen and isolates will be sent to the WHO Collaborating Centre (WHO-CC) for vaccine development.

4.10 Data collection

Data for each patient with a suspected respiratory infection selected for laboratory investigation will have to be entered electronically (SORMAS). In addition, a hard copy of the case-based investigation form (**Annex 4**) can be completed and kept at the facility for their records. Data should include:

- Unique identifier (Epid Number)
- Patient name and contact information
- Sex
- Age
- Address
- Temperature
- Date of onset of symptoms
- Date of specimen collection
- Date of hospitalisation (for SARI patients)
- Seasonal influenza vaccine status
- COVID-19 vaccination status
- Contact with sick or dead animals (wild or domestic, example, birds and pigs).
- Risk factors for severe disease: Co-morbidity (chronic respiratory disease, asthma, diabetes, chronic cardiac disease, chronic liver disease, chronic renal disease, chronic neurological or neuromuscular disease, Immunodeficiency, including HIV), Pregnancy status
- Travel history
- Type of test Case outcome

Reporting facilities must ensure that case-based investigation form for respiratory infection is completed in SORMAS, and samples are accompanied by corresponding barcode and/or the patient's name and Epid number.

For ILI, weekly, the following data should be collected (See Annex 5 for the data collation form) and entered on District Health Information Management System (DHIMS-2):

- 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 and gender

For SARI, weekly, the following aggregate data should be collated by designated health facilities (See Annex 6 for the data collation form) and entered on DHIMS-2:

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

For ILI use outpatient acute respiratory tract infections.
For SARI use inpatient acute respiratory tract infections.
List all diagnoses that constitute ILI.

4.11 Data reporting

Timely and regular reporting of sentinel surveillance data helps to ensure that the information is available to policymakers and health care providers and will also improve the data quality and consistency of reporting from sentinel sites.

The laboratory results (for cases already on SORMAS) are updated as quickly as possible on SORMAS, which will be accessible to the originating health facilities and DSD. Additionally, E-mails, WhatsApp messages, Telephone calls, etc. may be used to communicate laboratory results when necessary.

The Weekly ILI and SARI Reports are entered on DHIMS-2 by Monday of the ensuing week. Weekly national aggregated data on ILI and SARI cases and deaths (including denominators) and virological information should be reported to WHO regional and global platforms such as FluID and FluNet.

In line with WHO recommendations, a qualitative assessment of influenza activity through 4 indicators (Annex 8) will be undertaken:

1. geographical spread
2. trend in the activity
3. the intensity of acute respiratory disease
4. 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 workplaces
- 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 directorates or health care providers

4.12 Data analysis by health facilities

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

- Graph of weekly SARI cases per total number of hospitalisations 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)

SORMAS has in-built basic statistical analysis tools that can be used.

Note: Similar analysis can be done for other pathogens identified.

Annually, case-based information on risk factors and other data should be analysed to understand better the groups at risk for severe outcome and guide the control strategies for the coming year.

4.13 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. The Ghana Weekly Epidemiological Report is one such tool for providing feedback to all relevant stakeholders on the status of surveillance for respiratory pathogens in Ghana.

4.14 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.

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Annexes

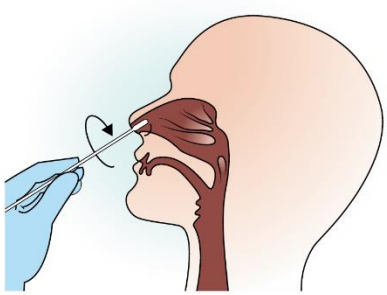
Annex 1: Techniques for Collecting Respiratory Samples

Universal precautions and infection prevention control measure should always be followed. Nasopharyngeal and oropharyngeal swabs should be collected and combined into one vial. Dacron or rayon swab should be used.

NB: 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.

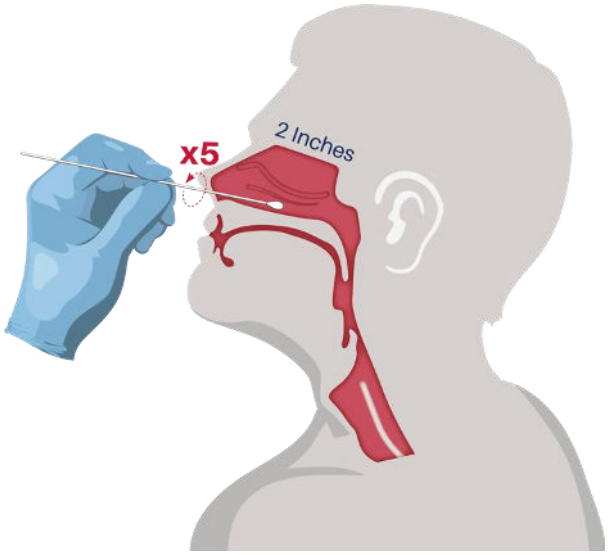


Insert the swab into the tube that contains the transport medium and cut excess shaft off. Cover lid tightly and store.

(b) Nasopharyngeal swabs

Gently clean out visible nasal mucus and lightly tilt patient's head back to straighten the passage from the nose to the nasopharynx. Prior to insertion, measure the distance from the corner of the nose to the front of the ear and insert the shaft **only half this length**.

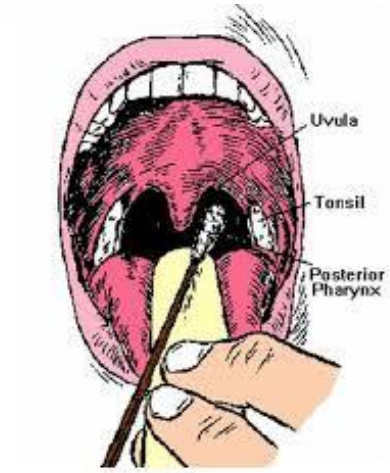
Insert the swab provided along the medial part of the septum, along the floor of the nose, until it reaches the posterior nares; rotating the swab gently. Rotate the swab several times to dislodge the columnar epithelial cells and place swab in the *same* collection tube with the oropharyngeal (OP) swab. Break the applicator stick off near the tip and tighten the cap.



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

(c) Oropharyngeal swabs (throat swabs)

- Use the sterile OP swab supplied.
- Hold the tongue down with a tongue depressor if available or have the patient say "aaaaaahh" to elevate the uvula. Avoid the tongue and tonsils as well as 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 (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.

It is important to correctly store VTM. The vials can be stored for short periods of time at 2–8 ºC.

For specimens in VTM:

- Transport to laboratory as soon as possible.
- Store specimens at 2-8 °C before and during transportation within 48 hours.
- Do not store in 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 packaging and transport

Send specimens in VTM to the laboratory as soon as possible.
If specimens cannot be transported immediately after collection, store them at 2-8 °C and during transportation.

DO NOT put specimens in a freezer as this will damage them.
It is also very important to avoid freeze-thaw cycles.

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

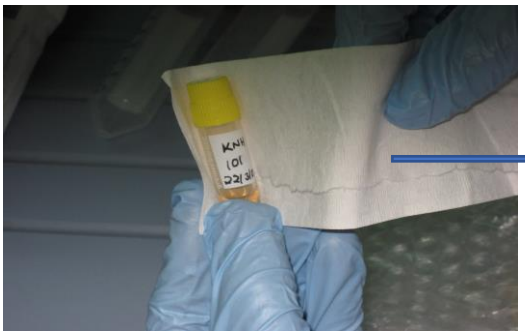
Primary container: The primary packaging, which contains the specimen, must be watertight. Example: VTM tubes containing swabs. **Absorbent material** must be wrapped around primary container to absorb any spillage. The quantity should be sufficient to absorb all liquid in the shipment. An example Is a paper towel. This package should be place in 2 zipped-lock bags and subsequently into the secondary container.

Secondary container: The secondary packaging may contain several primary containers and must also be watertight and hardy/robust.

Tertiary container: The tertiary container will contain the secondary container and must also be watertight and hardy/robust. It must be able to withstand shocks.

The ice chest must contain frozen ice packs to maintain cold chain.


Ice chest/specimens carrier
Tertiary container
Secondary container
Primary Container
Zipped-lock bag
Ice packs


Absorbent material

Annex 4: Case based-data collection form

ILI/SARI AND OTHER RESPIRATORY INFECTIONS CASE INVESTIGATION FORM – GHANA

Fill in the Blank Space or Tick √ the box □ as appropriate
ILI□ SARI □ ARI □

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 _____/_____/_____**

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 _____Phone number of suspected case _____

3. Signs and Symptoms

Date of onset _____/_____/_____ (dd/mm/yyyy)

Fever/Body temperature ≥38°C ☐Yes ☐No **Cough** ☐Yes ☐No

Sore throat ☐Yes ☐No **Difficulty in Breathing** ☐Yes ☐No

Headache ☐Yes ☐No **Runny nose** ☐Yes ☐No

Others (specify) _____

4. History of Admission

Date first seen at a health facility for this disease _____/_____/_____ (dd/mm/yyyy)

Admitted to Hospital (in-patient)? ☐**Yes** ☐ **No**

Admitted to intensive care unit ☐**Yes** ☐**No**

Name of Health Facility_____ District where Health Facility located: _____

Date of admission (in-patient) _____/_____/_____ (dd/mm/yyyy)

Date person discharged from hospital _____/_____/_____ (dd/mm/yyyy)

5. Exposure to Risk Factors

Previously vaccinated against Influenza? ☐Yes ☐No **If Yes**, specify type and year of vaccination _____

Previously vaccinated against COVID-19? ☐Yes ☐No **If Yes**, specify type and year of vaccination _____

List places visited during the past 14 days

_____

Visited places with known lab confirmed pandemic influenza cases within 7 days prior to the onset of disease? ☐Yes ☐No, **if Yes, Specify place:**

_____

Contact with a person with symptoms of respiratory diseases? ☐Yes ☐No

Contact with a person with confirmed respiratory disease? ☐Yes ☐No

***Contact with sick or dead domestic animals?** ☐Yes ☐No

***Contact with sick or dead wild animals?** ☐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

PCR for influenza A(H1N1) ☐ Positive ☐ Negative

PCR for influenza COVID-19 ☐ Positive ☐ Negative

GeneXpert for COVID-19 ☐ Positive ☐ Negative

Antigen for COVID-19 ☐ Positive ☐ Negative

Antibody for COVID-19 ☐ Positive ☐ Negative

Other Respiratory Pathogens: [Please Specify] _____

(IF POSITIVE FOR COID-19, ALERT DSD, DISTRICT AND REGION OF RESIDENCE)

7. Treatment

State treatment administered

_____

8. Final Outcome

Final Outcome ☐Recovered ☐Deceased ☐Lost to follow-up ☐Transferred Out

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

9. Final classification

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 to any pathogen of zoonotic potential virus, specify the type of animal involved in comments/remarks to help VSD 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 (OPD Acute Respiratory Illness)

Region: _____ District: _____

Sentinel Site: _

Year: _

Reporting Week:_____

Week Beginning Monday: _____ Week Ending Sunday:_____

	28 days		1 -		1 - 4yrs		5 - 9yrs		10 -		15 -		18 -		20 -		35 -		50 -		60 -		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																										
B. Number of new ILI cases sampled																										
C. Total Number of outpatient 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**	
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 6: Ghana National Influenza Surveillance System

Weekly Aggregated Data form for SARI (In-Patient Acute Respiratory Illness)

District: _____

Region: _____

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+		To tal	
	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. Total Number of 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**	**Wide spread**	**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 ≥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.

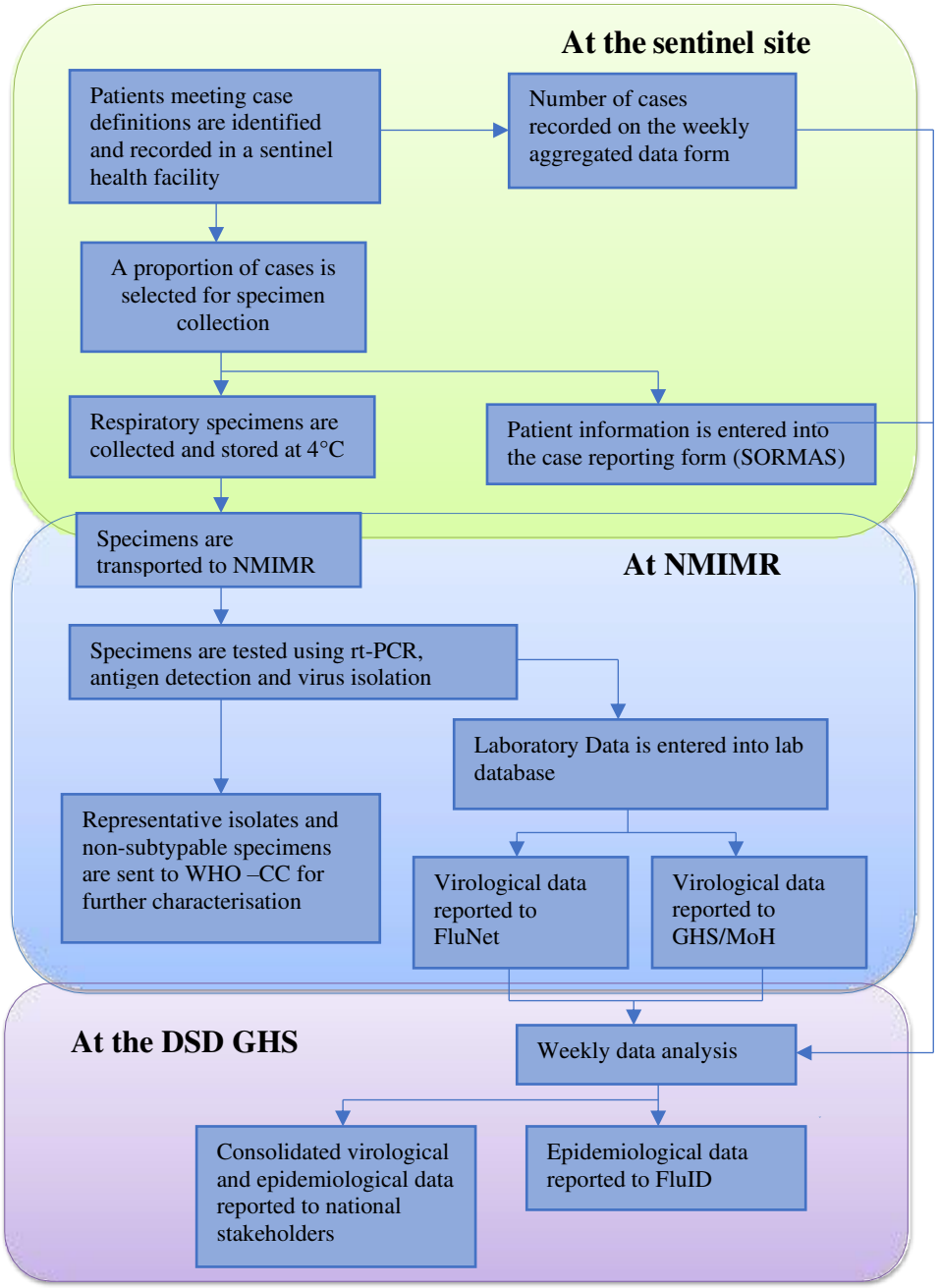
- **Low or moderate**: a normal or slightly increased proportion of the population is currently affected by respiratory illness.
- **High**: a large proportion of the population is currently affected by respiratory illness.
- **Very high**: a very large proportion of the population is currently affected 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.

Annex 8: Ghana Respiratory pathogens 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 cases received from each site with complete data in SORMAS	=100%	
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 Sentinel site selection

- Sites should represent the population of interest. General outpatient clinics or acute care facilities represent a wide range of outpatients. General or community hospitals are preferred to specialty care or referral hospitals in order to provide an unbiased selection of inpatient 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 and other respiratory diseases.
- 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.
- 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.
- 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: Respiratory sample submission form

GHANA HEALTH SERVICE

RESPIRATORY SAMPLE SUBMISSION FORM

REGION…… DISTRICT……

HEALTH FACILITY……DATE……

NAME OF OFFICER……..…….PHONE #.....

NO.	SURNAME, FIRST NAME	BARCODE (PASTE)	LAB ID
1	Name: Sex: Age: Residence: Tel No:		
2	Name: Sex: Age: Residence: Tel No:		
3	Name: Sex: Age: Residence: Tel No:		
4	Name: Sex: Age: Residence: Tel No:		
5	Name: Sex: Age: Residence: Tel No:		

Annex 12: Current Respiratory Pathogens sentinel sites in Ghana

No	**Site**	**Type**	**Town**	**Region**
1.	Goaso Municipal Hospital	ILI/SARI	Goaso	Ahafo
2.	4 Medical Reception Station	ILI	Kumasi	Ashanti
3.	Kumasi South Hospital	ILI/SARI	Kumasi	Ashanti
4.	Sunyani Municipal Hospital	ILI/SARI	Sunyani	Bono
5.	3 Medical Reception Station	ILI	Sunyani	Bono
6.	Kintampo Municipal Hospital	ILI/SARI	Kintampo	Bono East
7.	Cape Coast Teaching Hospital	ILI/SARI	Cape Coast	Central
8.	Eastern Regional Hospital	ILI/SARI	Koforidua	Eastern
9.	Manhean Polyclinic	ILI	Tema	Greater Accra
10.	Tema General Hospital	ILI/SARI	Tema	Greater Accra
11.	Tema Polyclinic	ILI	Tema	Greater Accra
12.	37 Military Hospital	ILI/SARI	Accra	Greater Accra
13.	Achimota Hospital	ILI/SARI	Accra	Greater Accra
14.	Shai-Osudoku District Hospital	ILI/SARI	Dodowa	Greater Accra
15.	Prampram Polyclinic	ILI	Prampram	Greater Accra
16.	Legon Hospital	ILI/SARI	Legon	Greater Accra
17.	Army Recruit Training School Medical Centre	ILI	Shai Hills	Greater Accra
18.	Greater Accra Regional Hospital	ILI/SARI	Ridge	Greater Accra
19.	Walewale Municipal Hospital	ILI/SARI	Walewale	North East
20.	6 Medical Reception Station	ILI	Tamale	Northern
21.	Tamale Teaching Hospital	ILI/SARI	Tamale	Northern
22.	Airborne Force Medical Centre	ILI	Tamale	Northern
23.	Jasikan District Hospital	ILI/SARI	Jasikan	Oti
24.	Sawla-Tuna-Kalba District Hospital	ILI/SARI	Sawla	Savannah
25.	Bolgatanga Hospital	ILI/SARI	Bolgatanga	Upper East
26.	War Memorial Hospital	ILI/SARI	Navrongo	Upper East
27.	Wa Regional Hospital	ILI/SARI	Wa	Upper West
28.	7 Medical Reception Station	ILI	Ho	Volta
29.	NAVTRAC Medical Centre	ILI	Sogakope	Volta
30.	Ketu South District Hospital	ILI/SARI	Aflao	Volta
31.	Ho Teaching Hospital	ILI/SARI	Ho	Volta
32.	Western Naval Command Medical Centre Sick	ILI	Sekondi	Western
33.	2 Medical Reception Station	ILI	Sekondi	Western
34.	Airforce Medical Centre	ILI	Sekondi	Western
35.	Effia-Nkwanta Regional Hospital	ILI/SARI	Sekondi	Western
36.	Wiawso Municipal Hospital	ILI/SARI	Sefwi	Western North

Annex 13: Geographical Location of sentinel sites in Ghana