



Surveillance

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Learning Objectives



At the end of this lecture, you will be able to:

- 1 Define surveillance
- 2 Know the aims and uses of surveillance system
- 3 Understand the different types of surveillance systems
- 4 Recognize the elements of surveillance system
- 5 Be able to assist in establishing and evaluating a surveillance system

Session Overview

- Definition
- The Uses
- Aims
- Types
- Elements
- Evaluation
- National Examples



What is Surveillance?



The Centres for Disease Control and Prevention (CDC) defined Public Health Surveillance as

“Ongoing systematic collection, analysis, interpretation and dissemination of data regarding a health related event for use in public health action to reduce morbidity and mortality and to improve health”



What is Surveillance?



- It is the eyes (and ears) of public health
- It is a network of people and activities to keep this process
- Functions at local to international levels.



Describing Surveillance?



- Surveillance systems provide descriptive information regarding **when and where health problems are occurring and who is affected** (the basic epidemiologic parameters of time, place, and person)

The Uses of Surveillance System

1. For diseases:

➤ **Monitoring infectious (Communicable) diseases**

- Influenza, HIV/AIDS, sexually-transmitted infections

➤ **Disease outbreaks**

- Food poisoning, cholera

➤ **Non-communicable diseases**

- Lead poisoning, cancer, hypertension, diabetes.
Congenital malformation

➤ **Risk factors**

- Tobacco use, physical exercise

The Uses of Surveillance System

2. For emergencies

- Bioterrorism, chemical, radiation, natural disasters

3. For hospitals

- Nosocomial infections.

4. In the industry:

- Occupational disorders, injuries, disability pensions

5. In the military

- Diseases of the recruits



Aims of Surveillance



- **Main aim** → **disease control and prevention**
- Monitoring incidence and prevalence of diseases
- Detect outbreaks of new or old diseases.
- Descriptive epidemiology of health problems (Who, Where, When)
- Detect and quantifies the occurrence of important or potentially important health risks or outcomes (distribution, incidence and prevalence)



Aims of Surveillance



- Provides evidence and data for **health program planning**, intervention and evaluation
- monitor **changes in infectious** and environmental agents,
- **evaluate** control measures, and
- describe the **natural history** of a health event in a community that will generate hypotheses and stimulate applied research



Features of a Surveillance System



1. Practical, clear case definitions for each disease
2. Workable, uniform and continuous data collection methods
3. Rapidity of collection, analysis, interpretation and dissemination of data.

Types of Surveillance



1. **Passive surveillance**
2. **Active Surveillance**
3. **Sentinel surveillance**

Passive surveillance



WHO Definition

- Regular reporting of disease data by all institutions that see patients (or test specimens) and are part of a reporting network.
- There is no active search for cases.
- Relies on the cooperation of health-care providers — laboratories, hospitals, health facilities and private practitioners
- This is the most common type of surveillance.

Passive surveillance Cont.



- In this type of surveillance **criteria are established for reporting diseases**, risk factors or health-related events then health practitioners are notified of the requirements and they **report events** as they come to their attention.
- In most countries with a passive surveillance system, every health facility is required to send a monthly (sometimes weekly/daily) report of all cases on a standard form.

Passive surveillance Cont.



Advantages

- Simple to conduct
- Inexpensive
- Covers wide areas (whole countries or provinces)

Disadvantages

- It can be difficult to ensure completeness and timeliness of data (because it relies on an extensive network of health workers)
- Usually underestimate the true illness burden

Active Surveillance



Definition

- Collection of data from healthcare providers or institutions.
- In active surveillance the organization conducting the surveillance actively seeks the relevant information (healthcare providers are contacted and asked to provide details of any cases they have seen).

Uses of Active Surveillance



1. Active surveillance is used when there is an indication that something unusual is occurring

Example

- During outbreaks of food or food-borne pathogens
- During outbreak of measles

2. Regular outreach to potential reporters, to stimulate the reporting of specific diseases or injuries.

Active Surveillance Cont.



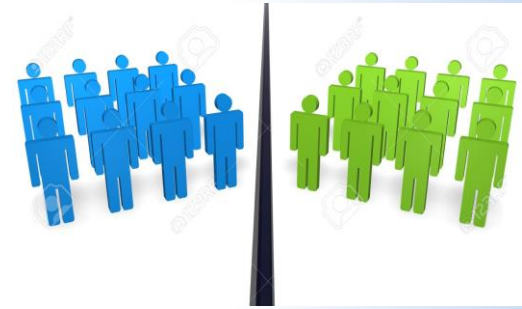
Advantages

- Produce complete data of a good quality

Disadvantages

- high use of resources (For this reason, when it is used, it is for a limited time period)

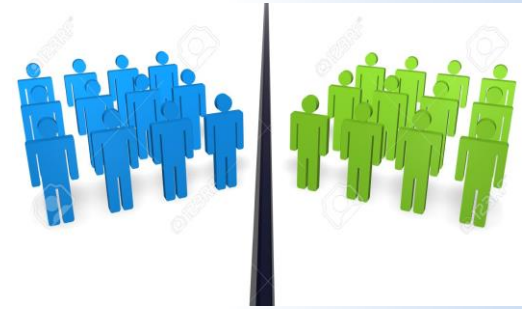
Sentinel Surveillance



Definition

- Reporting of cases of specific diseases or risk factors that may indicate that the particular preventive or therapeutic activity is not working as planned.
- It is used when high-quality data are needed about a particular disease that cannot be obtained through a passive system.

Sentinel Surveillance

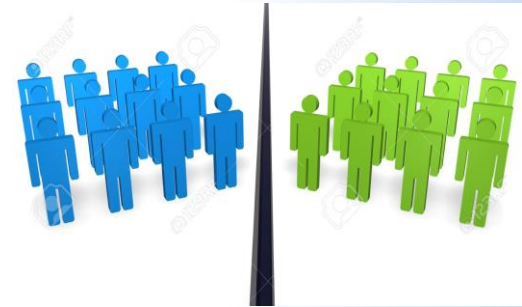


- It involves only a limited network of carefully selected reporting sites

Data collected in a well-designed sentinel system can be used to

1. signal trends
2. identify outbreaks
3. monitor the burden of disease in a community

Sentinel Surveillance



Advantages

1. Rapid
2. Economical alternative to other surveillance methods (Because it is conducted only in selected locations)

Disadvantages

1. May not be as effective for detecting rare diseases or diseases that occur outside the catchment areas

Elements of Surveillance system



1. **Case definition** : (possible, probable, confirmed)
2. **Population under surveillance** (hospitals, prisons, schools, factories, national, international)
3. **Cycle of surveillance** (recognizing health event, notifying it, information transfer, networks, action)
4. **Confidentiality** (e.g. HIV+ve)
5. **Ethics** (when research is involved)
6. **Laws** (as a service component governed by law in USA; e.g. disease notification)

Case Definition



A set of uniform criteria used to define a disease for public health surveillance

- Enable public health officials to classify and count cases consistently across reporting areas.
- It is not intended to be used by healthcare providers for making a clinical diagnosis or determining how to meet an individual patient's health needs
- Refer to standard definitions stated by WHO and CDC
- Every year, case definitions are updated

Case Definition Gradient



Low Specificity

High Specificity



Suspected

Probable

Confirmed

Example of Case Definition



Smallpox

Clinical Description

An illness with acute onset of fever $>101^{\circ}$ F followed by a rash characterized by vesicles or firm pustules in the same stage of development without other apparent cause.

Laboratory Criteria for Confirmation

- Isolation of smallpox (variola) virus from a clinical specimen, or
- Polymerase chain reaction (PCR) identification of variola DNA in a clinical specimen, or
- Negative stain electron microscopy (EM) identification of variola virus in a clinical specimen (Level D laboratory or approved Level C laboratory)

Example of Case Definition



Probable Case of Smallpox

A case that meets the clinical case definition that is not laboratory confirmed but has an epidemiological link to another confirmed or probable case.

Confirmed Case of Smallpox

A case of smallpox that is laboratory confirmed.

Working Case Definition



Smallpox Outbreak

- Anyone who meets original case definition
- Anyone with fever ($>101^{\circ}$ F) or rash who was in a confirmed exposed area during the Bioterrorism (BT) event or came in contact with a confirmed or probable case should be considered a case. (*until confirmed; if not confirmed; will be under observation and could be classified as “case”; and others as “confirmed cases”*)

Disease Notification



Who should do it?

1. Physicians
2. Laboratories
3. Hospitals
4. Countries to CDC , WHO

Disease Notification



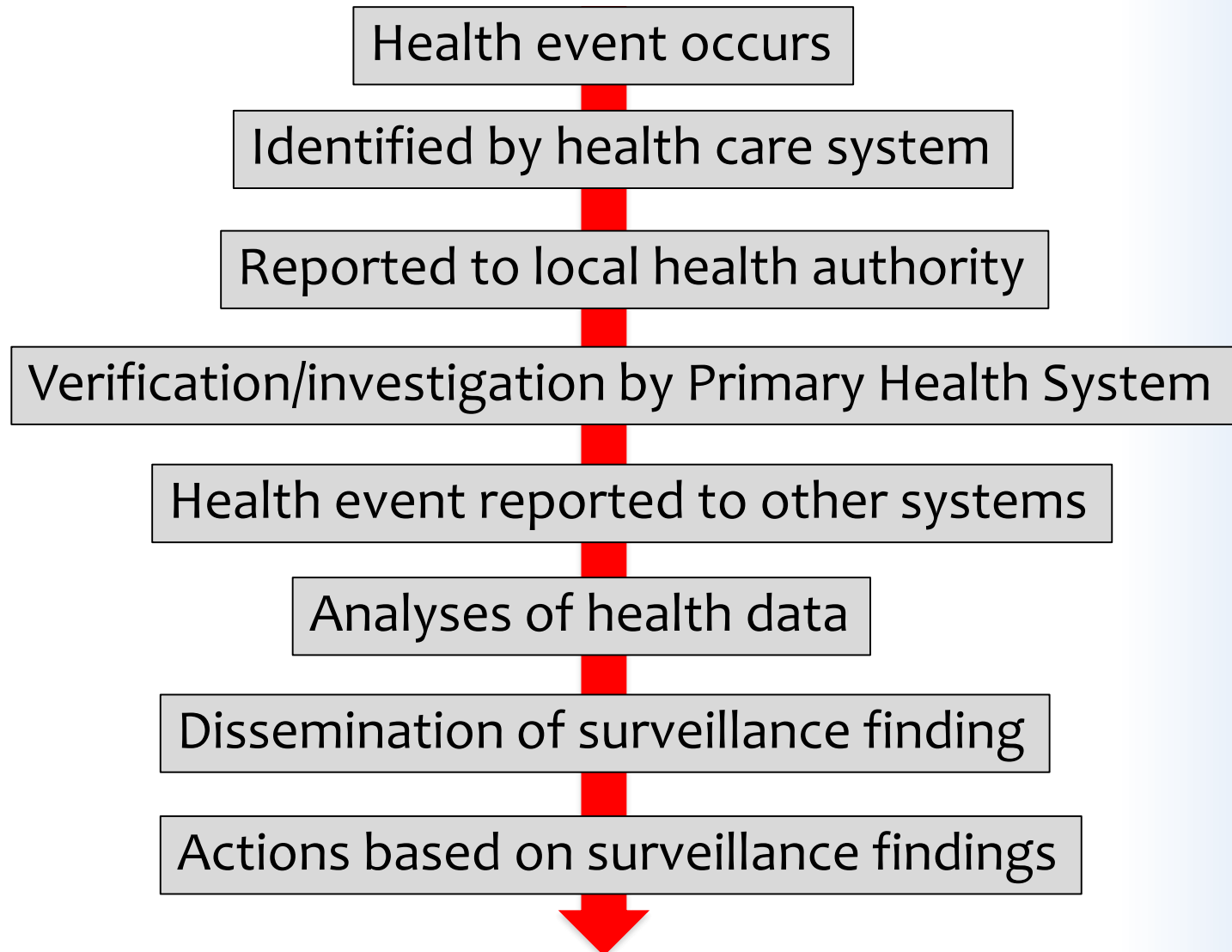
- Instituted for rapid application of prevention measure
- List of diseases vary by country
- Information on form includes diagnosis, date of onset, age, sex, and place of residence; may contain symptoms, Treatment given, and precautions

Validity of notification data



- Seeking of medical care is not constant
- Distance to the nearest hospital
- Cost and distance to travel
- Media reports will increase the number of people reporting to the hospital e.g. dengue fever
- Public awareness will increase the incidence

Timeliness of disease Notification



Steps in Surveillance Analysis



- Data quality
- Descriptive analysis
 - Time
 - Place
 - Persons
- Generate hypothesis
- Test hypothesis

Descriptive Analysis of Time



- Graphical analysis
- Requires aggregation on appropriate time unit
- Choice of the time variable
 - Date of onset
 - Date of notification
- To describe trend, seasonality, and residuals
- Use of rates when denominator changes over time

Evaluation of Surveillance System



1. Is the system detecting what it is supposed to detect?
The surveillance system data need to be compared with data produced by another detection mechanism
2. Is the system producing data in time for appropriate responses?
3. Can the system cope with changes?
The disease or our knowledge may be changing quickly. A surveillance system should adopt to such changes (flexibility)

Evaluation of Surveillance System Cont.



4. Is the system as simple and cheap as possible?
5. Are the public health responses timely and appropriate?

Any system that does not lead to appropriate responses is flawed.

Example of National Surveillance Systems



- **Health Electronic Surveillance Network”
(HESN) to control and manage infectious
diseases and epidemics online**

HESN

- It includes 7 modules they are:

WORK MGMNT

INVESTIGATIONS

OUTBREAKS

IMMUNIZATION

FAMILY HEALTH

INVENTORY

ADMIN

- Investigations
- Outbreaks
- Immunization
- Family Health

- Work Management
- Inventory
- Admin

HESN dashboard

Kingdom of Saudi Arabia

Threshold Notifications: 0
Jurisdiction Notifications: 0

Rabah Mohammad: superuser for
Ministry of Health

Help Contact Us My Account Logout

WORK MGMNT INVESTIGATIONS OUTBREAKS IMMUNIZATION FAMILY HEALTH INVENTORY ADMIN

Welcome to HESN

HESN is a comprehensive on-line communicable disease surveillance system. It supports the identification, management and control of infectious diseases and outbreaks that pose a threat to the public's health.

Specify your Service Delivery Location (SDL).

Service Delivery Location: Ministry of Health

SDL Time Zone: AST

Personal WorkLoads

View all your assigned work tasks

Reporting

Specify and view client specific and aggregate reports.

Document Management

Add, update, delete and search for electronically attached documents.

Notifications

Create and view jurisdiction and threshold notifications.

[View Jurisdiction Notifications](#)
[View Threshold Notifications](#)

 **Need Help ?**
Contact information for the [HESN Help Desk](#)

September						
S	M	T	W	T	F	S
26	27	28	29	30	31	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	1	2	3	4	5	6
2011			2012		2013	

 **External Reference Links**
LINKS WILL OPEN A NEW WINDOW

NoRefLinkMsgKey
No Reference Link has been added

Investigation

WORK MGMNT

INVESTIGATIONS

OUTBREAKS

IMMUNIZATION

FAMILY HEALTH

INVENTORY

ADMIN

Recent Work

Search

Search Investigations

Search Lab

Search Exposures

Search Interventions

Search Clients

Search Non-Human
Subjects

Investigation

Subject

Cohort

Notes

Document Management

Communication
Templates

Reporting & Analysis

Notifications

Communications Log

Administration

Search Investigations - Basic



Search Criteria

Hide Search Criteria

Wildcard characters % (multiple letters) and _ (singleletters) can be used when searching by First or Last Name -except when matching phonetically.
Wildcard-only searches not allowed.

Disease / Basic Criteria

Hide Disease / Basic Criteria

Include: Human Non-Human Both

Search by:

Investigation ID:

Investigation Group:

Outbreak Group:

Disease Event ID:

Report Date (Received) Range: From: / / To: / /
yyyy mm dd yyyy mm dd

Encounter Group:

Disease:

Authority:

Classification:

Causative Agent:

Outbreak

WORK MGMNT

INVESTIGATIONS

OUTBREAKS

IMMUNIZATION

FAMILY HEALTH

INVENTORY

ADMIN

Recent Work

Search

- Search Outbreaks
- Search Exposures
- Search Interventions
- Search Lab

Outbreak

- Outbreak Summary
- Outbreak Details
- Outbreak Subject Summary
- View Counts
- Record Unidentified Counts
- Exposure Summary
- Intervention Summary
- Lab Summary
- Outbreak Communications

Notes

Document Management

Communication Templates

Reporting & Analysis

Notifications

Communications Log

Administration

Search Outbreaks - Basic



Search Criteria

Hide Search Criteria

Wildcard characters % (multiple letters) and _ (single letters) can be used. Wildcard-only searches not allowed.

Search by:

Outbreak ID:

Alternate Source: **Alternate ID:**

Outbreak Name:

Outbreak Link Role: **Unlinked Only:**

Outbreak Type:

Outbreak Status:

Outbreak Setting Type:

Outbreak Setting:

Responsible Organization Unit:

To specify an Organization first click on the 'Find' button. Then search, or type the name of the Organization you wish to specify, select it and click on 'Select' button. Then click 'Close' to close.

Organization: Top Level > Level 2 (specific one) > Level 3 (specific one) > [Selected Level 4 Organization]

Find

Encounter Group:

Disease:

Causative Agent:

Disease Lab Confirmed:

Report Date (Received) Range From: / / **To:** / /

yyyy mm dd yyyy mm dd

Immunization

WORK MGMNT

INVESTIGATIONS

OUTBREAKS

IMMUNIZATION

FAMILY HEALTH

INVENTORY

ADMIN

Recent Work

Client

Search Clients

Client Details

Client Warnings

Relationships

Households

Consent Directives

Allergies

Risk Factors

Travel History

Imms History

Interpretation

Upload Clients

Potential Client Matches

Cohort

Immunizations

Lab

Upload Data

Notes

Document Management

Communication
Templates

Reporting & Analysis

Notifications

Communications Log

Workgroups

Search Clients



Basic Search Criteria

Hide Basic Search Criteria

[Search Jurisdictional Registry](#)

Wildcard characters % (multiple letters) and _ (single letters) can be used on any text field - except on Client Number and on First and Last Name when matching phonetically. Wildcard-only searches will be treated as blank searches.

- Phonetic Matches
- Exclude Indeterminate Clients
- Include Inactive Clients

Personal Identifier:
(Client ID, Saudi ID, Iqama, Additional IDs)

Personal Identifier Type:

Last Name: **First Name:** **Middle Name:**

Gender:

Date of Birth or Age

Hide Date of Birth or Age

- Not Applicable
- Date of Birth / /
- yyyy mm dd
- Age Year(s)
- Units
- Range ± Year(s)
- Units

Jurisdictional Organization:

To specify an Organization first click on the 'Find' button. Then search, or type the name of the Organization you wish to specify, select it and click on 'Select' button. Then click 'Close' to close.

Organization: Top Level > Level 2 (specific one) > Level 3 (specific one) > [Selected Level 4 Organization]

Find

Inventory

WORK MGMNT

INVESTIGATIONS

OUTBREAKS

IMMUNIZATION

FAMILY HEALTH

INVENTORY

ADMIN

Recent Work

Inventory Replenishment

- Product Requisitions
- Product Delivery Request
- Product Returns
- Forecast Product Demand
- Plan Replenishment
- Mass Requisitions

Inventory Maintenance

Inventory Setup

Document Management

Communication Templates

Reporting & Analysis

Notifications

Communications Log

Workgroups

Catalogue Item Information



Catalogue Item Search

Search/Add Catalogue Item - Search Required Before Adding

Catalogue Item Code:

Product Alternate ID:

Catalogue Item Status:
Active
Discontinued
Inactive

Find Search String:

Level 1 - Category:

Add Edit

Level 2 - Product Group:

Add Edit

Level 3 - Generic Product Strength:

Add Edit

Level 4 - Generic Product Presentation:

Add Edit

Level 5 - Generic Product Package Size:

Add Edit

Level 6 - Trade Product:

Add Edit

Search Retrieve Clear

Search Results Returned

Select All Deselect All

Catalogue Item Code	Product Alternate ID	Catalogue Item Name	Catalogue Item Description	Catalogue Level	Current Catalogue Item Status
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Administration

WORK MGMNT

INVESTIGATIONS

OUTBREAKS

IMMUNIZATION

FAMILY HEALTH

INVENTORY

ADMIN

System Administration

System administration tasks are grouped into categories. Click on a text link to navigate to the area of interest.

INDICES

- Manage Organizations
- Manage Providers
- Manage Service Delivery Locations
- Risk Factor Categories

SECURITY MANAGEMENT

- Manage Permissions Sets
- Manage Permissions
- Manage Roles
- Manage System Accounts
- Upload User Accounts
- Manage User Accounts
- View Audit Log

TERMINOLOGY

- Manage Vocabulary Domains
- Manage Value Sets
- Manage Code Sets

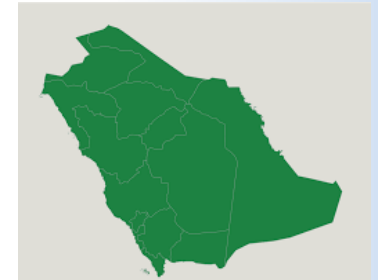
GENERAL / MISCELLANEOUS

- Manage Reference Links
- Manage Batch Schedule
- Config. Services Properties List

TEMPLATES

- Manage User Defined Forms

Example of National Surveillance Systems



Influenza Surveillance In Saudi Arabia (ISSA)

•Objectives of influenza surveillance

The goal of influenza surveillance is to minimize the impact of the disease by providing useful information to public health authorities, which will help in planning appropriate control and intervention measures, allocate health resources, and make case management recommendations

Appendix 2: ILI Data Collection set

Case definition											
ILI case Definition: beginning at the last 10 days, did the patient experience: <input type="checkbox"/> History of sudden onset fever or current fever ($\geq 38^{\circ}\text{C}$) <input type="checkbox"/> Cough		Does the patient meet ILI case definition? <input type="checkbox"/> Yes <input type="checkbox"/> No IF "No", DO NOT CONTINUE									
Other suspected disease: _____											
ID number: _____		Date of First Interview: _____									
Demographic Information											
Primary Health Care: Patient's name: (family name), (given name(s))		Gender: <input type="checkbox"/> Male <input type="checkbox"/> Female									
Nationality : _____		Visitor : <input type="checkbox"/> Hajj <input type="checkbox"/> Umrah <input type="checkbox"/> Other reason _____									
Date of birth (Gregorian)		or age: Years _____ Months (1-12) _____ (Gregorian)									
Address: (Village/District/Governorate)		Contact Telephone Number: _____									
Clinical History											
Date of symptom onset Temperature at first review: ____ °C Chronic medical conditions: <input type="checkbox"/> Heart disease <input type="checkbox"/> Asthma <input type="checkbox"/> Chronic lung disease <input type="checkbox"/> Chronic liver disease <input type="checkbox"/> Diabetes <input type="checkbox"/> Neuromuscular dysfunction <input type="checkbox"/> Chronic kidney disease <input type="checkbox"/> Chronic hematological disorder <input type="checkbox"/> Immune compromised <input type="checkbox"/> Other _____ <input type="checkbox"/> Unknown											
Pregnancy: <input type="checkbox"/> Yes <input type="checkbox"/> No											
Did the patient receive influenza antiviral within the last 14 days?											
Vaccination for influenza in the last 6 months:											
Specimen Collection											
Nasopharyngeal swab collected?		Throat swab collected?	Date of specimen collection:								
Specimen Laboratory Form											
ID number: _____		Hospital: Date specimen collected: __/__/____ Date of shipment: __/__/____ Ward/Department: _____									
Date Lab received specimen: __/__/____											
Type of specimen - Oropharyngeal Specimen: <input type="checkbox"/> Yes <input type="checkbox"/> No - Nasopharyngeal Specimen: <input type="checkbox"/> Yes <input type="checkbox"/> No		- Blood Specimen: <input type="checkbox"/> Yes <input type="checkbox"/> No Other (specify): _____									
Flu A: seasonal H1N1	<input type="checkbox"/>	Pos (+)	<input type="checkbox"/>	Neg (-)	<input type="checkbox"/>	Adenovirus	<input type="checkbox"/>	Pos (+)	<input type="checkbox"/>	Neg (-)	<input type="checkbox"/>
Flu A: seasonal H3N2	<input type="checkbox"/>	Pos (+)	<input type="checkbox"/>	Neg (-)	<input type="checkbox"/>	hPIV 1	<input type="checkbox"/>	Pos (+)	<input type="checkbox"/>	Neg (-)	<input type="checkbox"/>
Flu A: A(H1N1)pdm09	<input type="checkbox"/>	Pos (+)	<input type="checkbox"/>	Neg (-)	<input type="checkbox"/>	hPIV 2	<input type="checkbox"/>	Pos (+)	<input type="checkbox"/>	Neg (-)	<input type="checkbox"/>
Flu A: H5N1	<input type="checkbox"/>	Pos (+)	<input type="checkbox"/>	Neg (-)	<input type="checkbox"/>	hPIV 3	<input type="checkbox"/>	Pos (+)	<input type="checkbox"/>	Neg (-)	<input type="checkbox"/>
Flu A: Unsubtypeable/Novel	<input type="checkbox"/>	Pos (+)	<input type="checkbox"/>	Neg (-)	<input type="checkbox"/>	hMPV	<input type="checkbox"/>	Pos (+)	<input type="checkbox"/>	Neg (-)	<input type="checkbox"/>
Flu B	<input type="checkbox"/>	Pos (+)	<input type="checkbox"/>	Neg (-)	<input type="checkbox"/>	MERS-CoV	<input type="checkbox"/>	Pos (+)	<input type="checkbox"/>	Neg (-)	<input type="checkbox"/>
RSV	<input type="checkbox"/>	Pos (+)	<input type="checkbox"/>	Neg (-)	<input type="checkbox"/>	Others:	<input type="checkbox"/>	Pos (+)	<input type="checkbox"/>	Neg (-)	<input type="checkbox"/>
Date results reported: __/__/____											
Comments: _____											

Appendix 5: Hospital Data Collection Form (Detailed form)

HBIS ID		Hospital name:												
Comp	Year	Month	Hospital ID	Patient ID	Department (Medicine=1; Pediatrics=2)					Date				
					Unit (Inpatient=1; Outpatient=2)					Time (use 24 hr. time format)				
Name								Age (YY-MM)						
Household head								Sex (Male=1; Female=2)						
Village / Pura / Mahalla								Health care worker (Yes=1; No=2)						
Union / Ward								Poultry worker (Yes=1; No=2)						
Upazila / Thana								Poultry raising (Yes=1; No=2)						
District								Local Travel within 7 days (Yes=1; No=2)						
Phone number								Where?						
International travel within 30 days (Yes=1; No=2)								Where?						
Date of admission (DD-MM-YY)					Date of discharge (DD-MM-YY)									
Provisional diagnosis														
Outcome								Fully recovered=1; Partially recovered=2; Remains hospitalized=3; Transferred=4; Death=5; Unknown=9						
Symptoms (Yes=1; No=2, Unknown=9)				Date of onset				Was fever subjective or measured? (Subjective=1, Measured=2)						
								If measured, record in (in °F):						
								Other symptoms (Yes=1; No=2)				Date of onset		
Fever				Others 1										
Cough				Others 2										
Difficulty breathing				Others 3										
Sore throat				Symptoms for <5 yrs. (Yes=1; No=2)				Date of onset						
Running nose				Chest indrawing										
Headache				Stridor in a calm child										
Diarrhea				Being unable to drink										
Chills				Lethargy or unconsciousness										
Body ache				Vomits everything										
Hemoptysis				History of convulsions										
Pleuritic chest pain														
Medical History								Has any doctor told you have lung disease? (Yes=1; No=2)						
Do you smoke? (Regularly=1; Sometimes=2; In past=3; Never=4)								Are you pregnant? (Women only) (Yes=1; No=2)						
Has any doctor told you have heart disease? (Yes=1; No=2)								Visited OPD with current illness? (IPD only) (Yes=1; No=2)						
History of underlying or chronic illness (Check all that apply): <input type="checkbox"/> Asthma <input type="checkbox"/> Malaria <input type="checkbox"/> HIV/AIDS <input type="checkbox"/> Diabetes <input type="checkbox"/> COPD(Chronic bronchitis/emphysema) <input type="checkbox"/> Hypertension <input type="checkbox"/> Cancer <input type="checkbox"/> other underlying or chronic illness (Specify)														
History of pneumonia in the prior 30 days: 1=Yes; 2=No; 9=Unknown														



Summary

- Surveillance is an **important tool** for public health
- It is **defined** as an “**Ongoing systematic collection, analysis, interpretation and dissemination of data regarding a health related event for use in public health action to reduce morbidity and mortality and to improve health**”
- Routine surveillance data are available in regular reports by national and international sources all over the world



Summary

- Three main types of Surveillance:
 1. Passive (Common)
 2. Active
 3. Sentinel
- Main aim → disease control and prevention

