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 of 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.

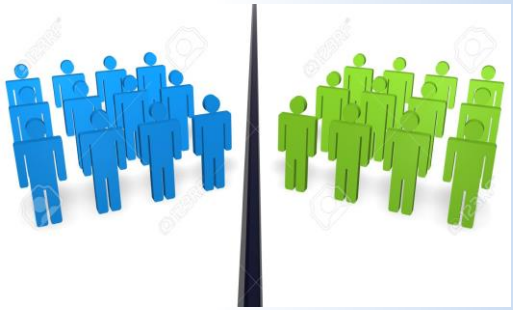
Advantages

- 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

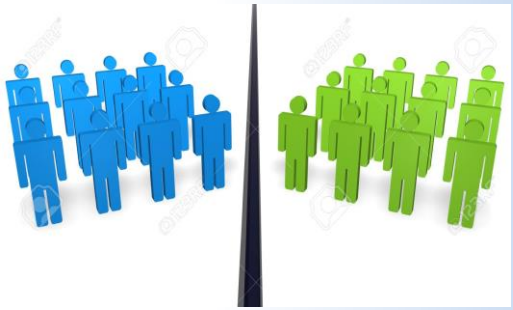


Definition

- 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

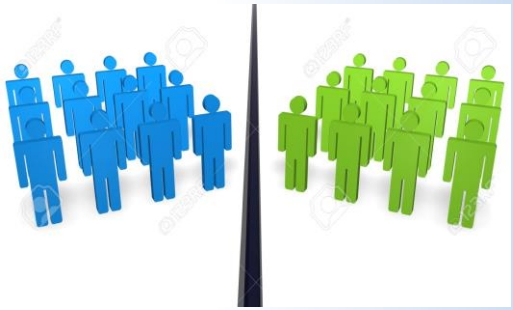


- It involves only a limited network of carefully selected reporting sites

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 ° 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 ° 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

Health event occurs

Identified by health care system

Reported to local health authority

Verification/investigation by Primary Health System

Health event reported to other systems

Analyses of health data

Dissemination of surveillance finding

Actions based on surveillance findings

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

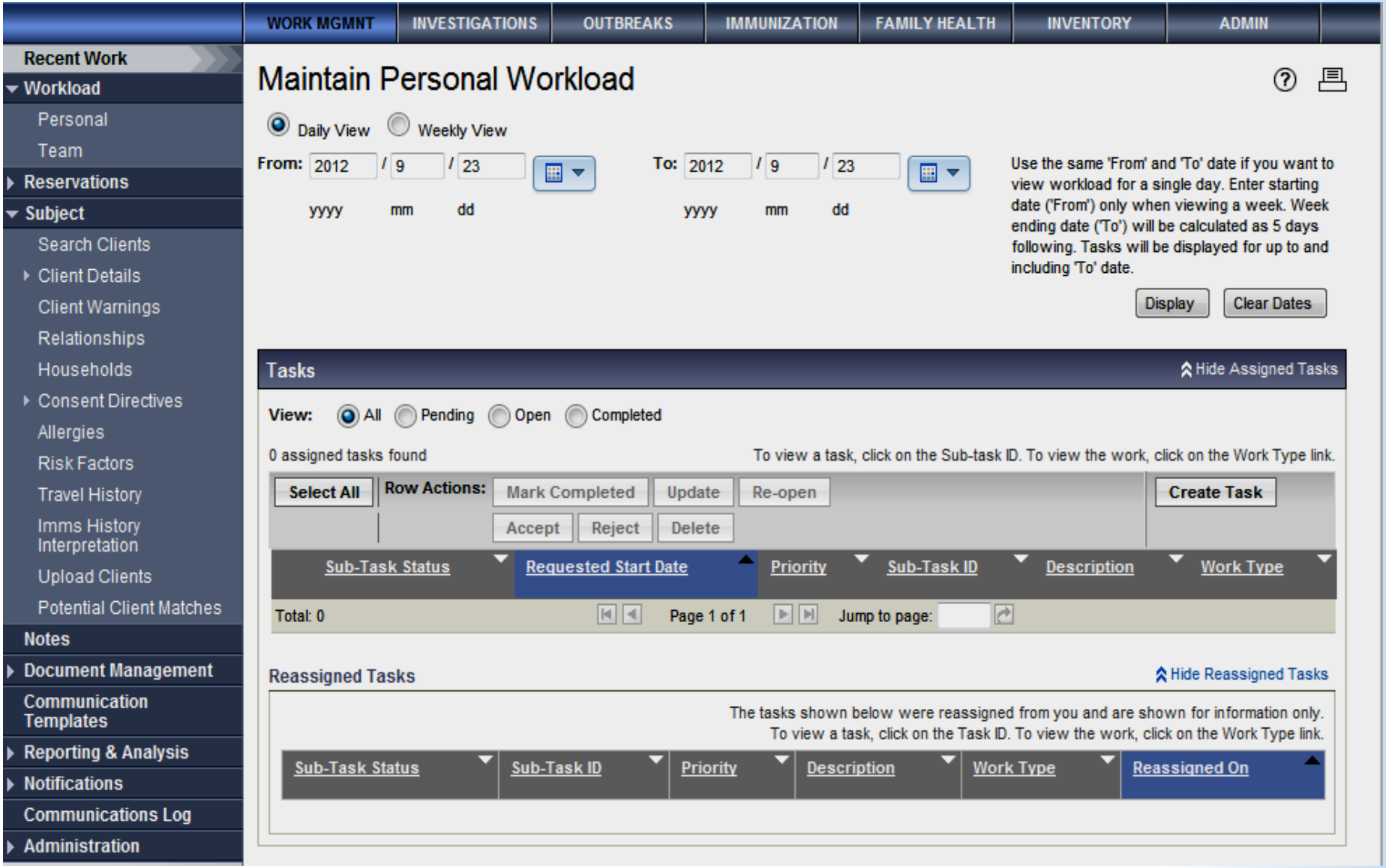
- It includes 7 modules they are:

- Investigations
- Outbreaks
- Immunization
- Family Health

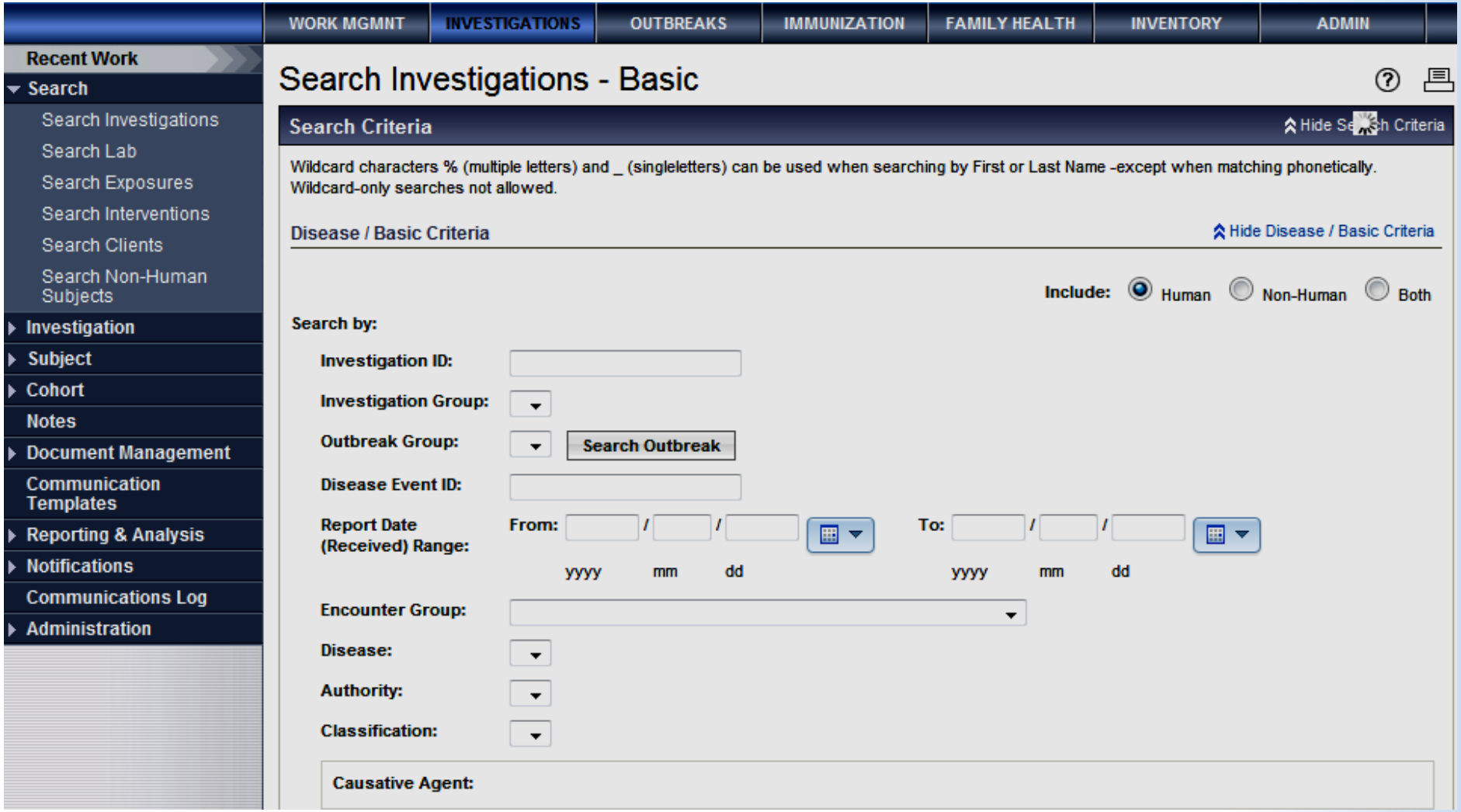
- Work Management
- Inventory
- Admin

HESN dashboard

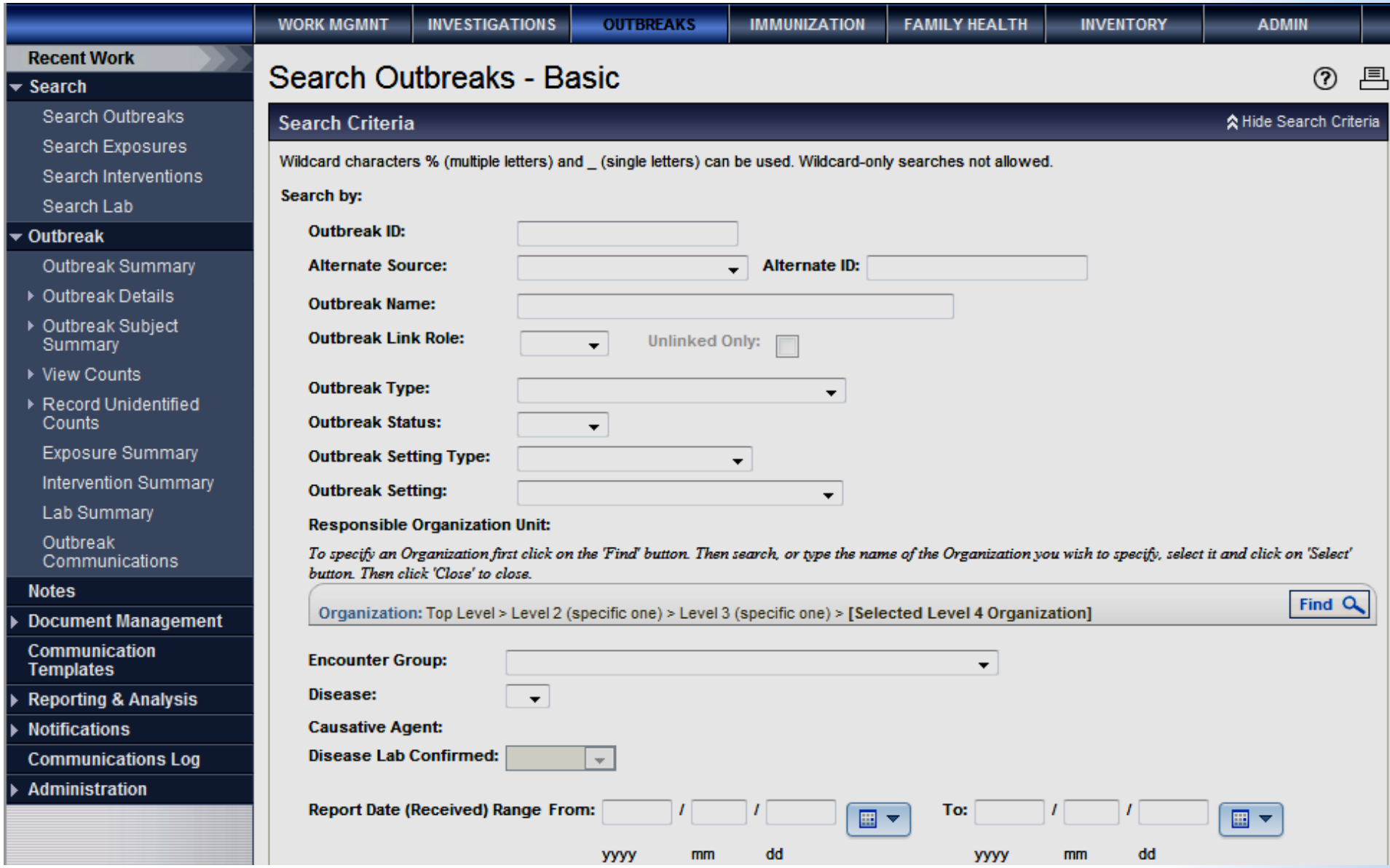
Work Management



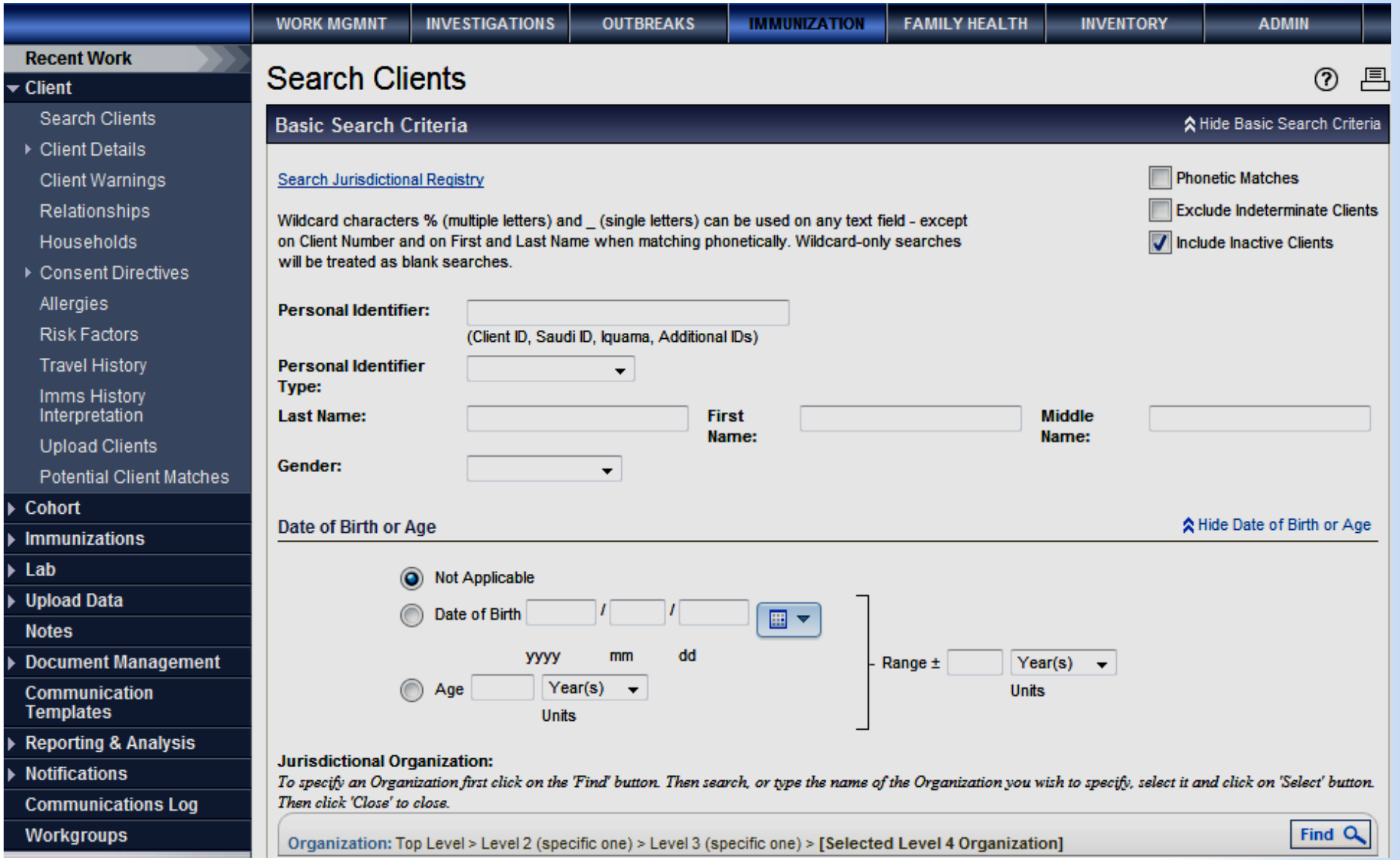
Investigation



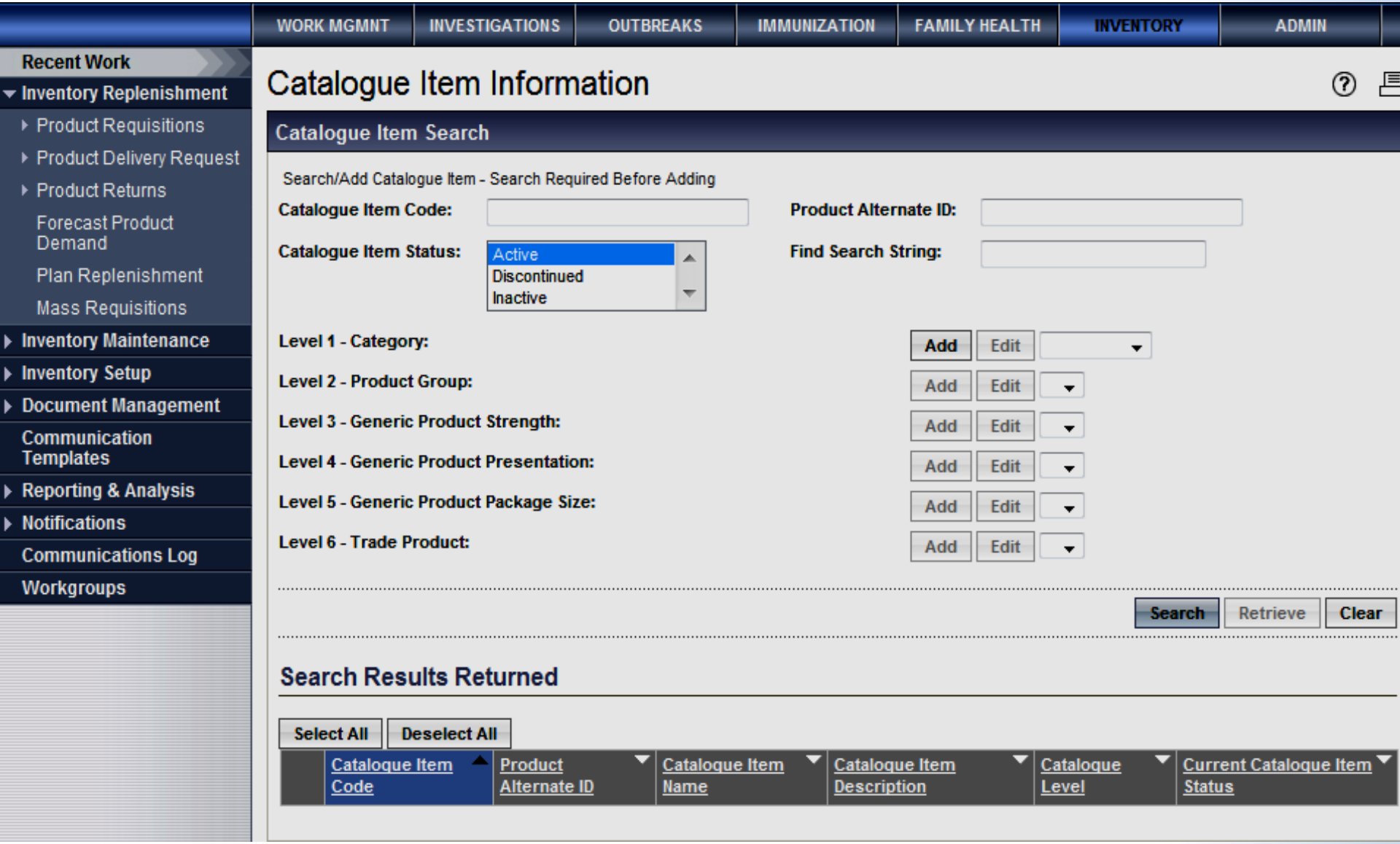
Outbreak


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



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:
Level 2 - Product Group:
Level 3 - Generic Product Strength:
Level 4 - Generic Product Presentation:
Level 5 - Generic Product Package Size:
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

Administration

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:
- ☐ History of sudden onset fever or current fever (≥38°C)
- ☐ Cough

Does the patient meet ILI case definition?
- ☐ Yes
- ☐ 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: ☐ Male ☐ Female

Nationality :

Visitor : ☐ Hajj ☐ Umrah ☐ 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:

☐ Heart disease ☐ Asthma ☐ Chronic lung disease ☐ Chronic liver disease ☐ Diabetes
☐ Neuromuscular dysfunction ☐ Chronic kidney disease ☐ Chronic hematological disorder ☐ Immune compromised
☐ Other _____
☐ Unknown

Pregnancy: ☐ Yes ☐ 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: ☐ Yes ☐ No
- Nasopharyngeal Specimen: ☐ Yes ☐ No
- Blood Specimen: ☐ Yes ☐ No

Other (specify): _____

Flu A: seasonal H1N1	☐	Pos (+)	☐	Neg (-)	Adenovirus	☐	Pos (+)	☐	Neg (-)
Flu A: seasonal H3N2	☐	Pos (+)	☐	Neg (-)	hPIV 1	☐	Pos (+)	☐	Neg (-)
Flu A: A(H1N1)pdm09	☐	Pos (+)	☐	Neg (-)	hPIV 2	☐	Pos (+)	☐	Neg (-)
Flu A: H5N1	☐	Pos (+)	☐	Neg (-)	hPIV 3	☐	Pos (+)	☐	Neg (-)
Flu A: Unsubtypeable/Novel	☐	Pos (+)	☐	Neg (-)	hMPV	☐	Pos (+)	☐	Neg (-)
Flu B	☐	Pos (+)	☐	Neg (-)	MERS-CoV	☐	Pos (+)	☐	Neg (-)
RSV	☐	Pos (+)	☐	Neg (-)	Others:	☐	Pos (+)	☐	Neg (-)

Date results reported: _ _ / _ _ / _ _ _ _

Comments:

Appendix 3: ILI Line List Data Collection set

حالات مشتبهة الأنفلونزا (ILI) المسجلة بالمركز

اسم المركز: التاريخ: رقم الأسبوع:

رقم NO	الاسم Name	رقم الهوية ID Number	العمر Age						الجنس Gender		حرارة Temp 38°	كحة Cough
			2<0	5<2	15<5	50<15	65<50	65+	ذكر M	انثى F		

المراقب الصحي:

المركز: التاريخ: رقم الأسبوع:

Appendix 5: Hospital Data Collection Form (Detailed form)

| | | |

- 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

- Three main types of Surveillance:
  1. Passive (Common)
  2. Active
  3. Sentinel

- **Main aim** → disease control and prevention

Thank
You