# Screening &surveillance Lecture 3

# Screening

#### **Definition of screening**

Screening(الفحص) is process of <u>using a test</u> on apparently <u>healthy population</u> in order to <u>sort them</u> out into those who are likely to have a disease and those who are likely to be free from the disease.

The screening test may be a specific question, a physical examination procedure, a laboratory test or other methods intended to identify unrecognized disease.

#### **Types of screening:**

1- Mass screening which covers the whole population (or subset) . Needs a lot of resources.

2- **Screening high risk population** (targeted screening). selective screening which may cover those at high risk of having or developing a condition in the future. *For example, screening of obese people for early detection of diabetes. is more fruitful than mass screening.* 

- 3- **Multiple (multiphasic) screening** which involves the use of a variety of screening tests at the same time to search for several conditions.
- 4- **Case-finding** or opportunistic screening is aimed at patients who consult a health practitioner for some other purpose.

#### Screenable diseases

- Large number of asymptomatic cases
- Long preclinical phase (i.e. people tend to live with it for long time before reporting).
- Not rare (a high prevalence increases success of screening).
- Well-known natural history.
- Good tests are available to detect the disease.

• Treatment available, especially early treatment is advantageous for the diseases (otherwise, why do screening?).

#### **Characteristics of good Screening test**

The screening test itself must be <u>cheap</u>, <u>easy to apply</u>, <u>acceptable</u> to the public, <u>reliable</u> and <u>valid</u>.

A test is reliable if it provides consistent results, and valid if it correctly categorizes people into groups with and without disease, validity of a test measured by its sensitivity and specificity.

**Sensitivity**: the ability of a test to correctly identify <u>true diseased</u> persons. It is also called true positive rate.(*When the disease is present, how often does the test detect it?*)

**Specificity**: the ability of a test to correctly identify <u>true non diseased</u> persons. It is also called true negative rate. (*When the disease is absent, how often does the test provide a negative result?*)

A highly sensitive test is required for the screening of fatal disease and highly communicable disease to avoid missing any case.

A highly specific test is required for the screening of non-fatal and fairly common disease to avoid over diagnosis and flooding the health care facilities with false positive case.

The validity of a screening test is assessed **against the** results of a test known or thought to be more accurate. This test is called **standard**, **reference** or **validating test**.

Table 6.5	. Validit	y of a	screening	test
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		Disease status			
		Present	Absent	Total	
Screening test	Positive	а	b	a+b	
	Negative	с	d	c+d	
	Total	a+c	b+d	a+b+c+d	
	a = No. of true positives, $b = No.$ of false positives,				
	c = No. of false negatives, $d = No.$ of true negatives				
Sensitivity	= probability of a positive test in people with the disease = $a/(a+c)$				
Specificity	= probability of a negative test in people without the disease = $d/(b+d)$				
Positive predictive value	<ul> <li>= probability of the person having the disease when the test is positive</li> <li>= a/(a+b)</li> </ul>				
Negative predictive value	= probability of test is negati = d/(c+d)	the person not h ve	naving the disea	se when the	

Assume population of 1000people of whom 100 have disease and 900 do not have the disease, a screening test is used to identify those 100 who have the disease.as shown in the table below. **Estimate the validity of the screening test.** 

Result of	The characteris	Total	
screening	Have the disease	Do not have the disease	
Positive	80	100	180
Negative	20	800	820
Total	100	900	1000

# Surveillance

The Centers for Disease Control and Prevention (CDC) defined epidemiologic surveillance as:

the "ongoing systematic collection, analysis, and interpretation of health data <u>essential to</u> the planning, implementation, and evaluation of public health practice closely integrated with the timely dissemination of these data to those who need to know."

#### **Procedure of surveillance**

Collection of data (mainly health indicators)  $\rightarrow$  Analysis and interpretation of data (i.e. making out information from data – what are the facts behind the figures?)  $\supset \rightarrow$  Dissemination of appropriate plan in demand of changing health status  $\supset \rightarrow \supset \rightarrow$  Action for control and prevention.

#### **Types of surveillance:**

# The two common types of surveillance are passive and active surveillance **Passive surveillance**:

. *Passive surveillance* denotes surveillance in which available data on reportable diseases are used, or in which disease reporting is requested, with the responsibility for the reporting often falling on the health care provider or district health officer. This type of reporting is also called *passive reporting*.

The completeness and quality of the data reported thus largely depend on this individual and his or her staff, who often take on this role without additional funds or resources.

#### Advantages of passive surveillance

- covers a wide range of problems
- does not require special arrangement
- *it is relatively cheap*
- covers a wider area

## The disadvantages of passive surveillance

- The information generated is to a large extent unreliable, incomplete and inaccurate.
- *Most of the time, data from passive surveillance is not available on time.*
- *Most of the time, you may not get the kind of information you desire.*
- It lacks representativeness of the whole population since passive surveillance is mainly based on health institution reports.

#### Active surveillance:

Active surveillance is defined as a method of <u>data collection</u> usually on a <u>specific</u> <u>disease</u>, for relatively <u>limited period of time</u>.

It involves collection of data from communities such as in house-to-house surveys or mobilizing communities to some central point where data can be collected.

This can be arranged by assigning health personnel to collect information on presence or absence of new cases of a particular disease at regular intervals.

#### Example: investigation of out-breaks

# The advantages of active surveillance

- The collected data is complete and accurate
- Information collected is timely.

# The disadvantages of active surveillance

- *it requires good organization,*
- *it is expensive*
- *it requires skilled human power*
- *it is for short period of time(not a continuous process)*
- *it is directed towards specific disease conditions*

## There are certain conditions where active surveillance is appropriate. These conditions are:

- $\hfill\square$  For periodic evaluation of an ongoing program
- $\hfill\square$  For programs with limited time of operation such as eradication program

# In unusual situations such as:

- $\hfill\square$  New disease discovery
- $\Box$  New mode of transmission
- $\Box$  When a disease is found to affect a new subgroup of the population.
- $\hfill\square$  When a previously eradicated disease reappears

# Features of a good surveillance system

- Using a combination of both active and passive surveillance techniques
- Timely notification
- Timely and comprehensive action taken in response to notification
- Availability of a strong laboratory service for accurate diagnoses of cases

# Quiz

Q1- What are the types of screening.

- Q2- What do we mean by sensitivity and specificity of screening test.
- Q3- what are the activities carried out under surveillance.
- Q4-what are the advantages and disadvantages of main types of surveillance.

Q5-what are the Features of a good surveillance system

Q6-Define :screening , surveillance, sensitivity, specificity, validity , reliability