

Babylon University – College Of Medicine  
Department of Community Medicine

*Lectures in Community Medicine  
For 4<sup>th</sup> Stage Students  
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## Lecture 4

# Screening and Epidemiological Surveillance

### **Epidemiological Surveillance**

- *Why do it?*
  - Can help discover and control the transmission of infectious diseases
  - Prevention and control programs can be planned and implemented

- *What is it?*

**Definition** - ongoing & systematic collection, analysis & interpretation of data related to health, disease & conditions.

Two types:

- **Passive Surveillance** – uses available data or reporting from health care provider or regional health officer.
- **Active Surveillance** – periodic field visits to health care facilities to identify new cases.

The present approach is the survey.

### **Screening**

**Definition** - use of quick and simple testing procedures to identify and separate persons:

Who have a disease from those that do not.

*OR*

Who are apparently (appear to be) well, but who may be at risk of a disease, from those who probably don't have the disease.

Screening is the process by which unrecognized diseases or defects are identified by tests or other tools that can be applied rapidly, screening test sort out apparently healthy people from those who have the disease. In language screen is large sieve use for separate large stones, so screening test is one which sift out people with one particular characteristic in which we are interested from a large number with out it.

**Types of screening:**

- 1- **Mass screening** involves the whole population.
- 2- **Multiple or multi-phasic screening**, using of a variety of screening tests on the same occasion.
- 3- **Targeted screening** of group with specific exposure e.g. workers in lead foundries.
- 4- **Case finding or opportunistic screening** is restricted to patients who consult health practitioner for some other purpose.

**Tools for screening:**

- **Questions**
- **Examinations**
- **Lab. Tests**
- **X ray**

**Two Important Objectives of screening**

- To distinguish between people in the population who have the diseases and those who do not.
- To determine how good the test is in separating populations of people with and without the disease in question.

**Analytical Tests include both:**

- **Screening Tests**
- **Diagnostic Tests**

**Comparison between screening and diagnostic tests:**

<b>Diagnostic Test</b>	<b>Screening Test</b>
Done on those with disease	Done on apparently healthy
Used on individual	Used on groups
More accurate	Less accurate
More expensive	Less expensive
Abases for treatment	Not abases for treatment

**Criteria for instituting a screening program:**

- These criteria should be met before a screening program is instituted.
- Criteria for diseases suitable for screening :
  - 1- The disease should be a high priority public health problem (serious, high prevalence incidence and high case fatality rate)
  - 2- has long latency period (subclinical, period between the beginning of pathology and the first sign and symptoms of overt disease)
  - 3- Natural history understood.
  - 4- there should be enough facilities for further diagnosis and sustainable treatment.

**Criteria for suitable screening test:**

- 1- Simple (easy to be performed)
- 2- Cheap
- 3- Not harmful (safe)
- 4- Acceptable
- 5- Reliable
- 6- Valid

**Terms Related to Screening Tests:**

**Validity:** relates to accuracy (correctness)

**Reliability - repeatability:** repeatable test is the test that gives same results if it is repeated at any times on the same individual under the same conditions, so repeatability is the percent agreement between multiple results.

*Sources of variations in repeatability of test results:*

- 1- variations in characteristics being measured, e.g. blood pressure may be affected by posture, psychic conditions, and emotion etc... so measurements of blood pressure for the same person may vary from time to time.
- 2- Variation due to observer (testers), intra or inter observer variations this may be affected by lack of training or lack of experience.
- 3- Variations due to instruments and methods (any measuring procedures, mechanical. Biochemical tests or questionnaires may cause variations e.g. microscope may be old, sphygmomanometer, weight balance may be not precise .

*Measures to improve repeatability of tests :*

- 1- Clear operational definition of variables.
- 2- Good training of data collectors.
- 3- Standardizations of questions and tests.
- 4- Data collectors should not be changed.
- 5- Use of good and calibrated instruments.

**Sensitivity:** ability of a test to identify those who have disease.

**Specificity:** ability of a test to exclude those who don't have disease.

An important public health consideration, particularly in screening free-living populations, is:

*How good is the test at identifying people with the disease and without the disease?*

In other words:

*If we screen a population, what proportion of people who have the disease will be correctly identified?*

<b>POPULATION</b>		
<b>Test Results</b>	<b>With Disease</b>	<b>Without Disease</b>
<b>Positive</b>	<b>True Positive (TP)</b>	<b>False Positive (FP)</b>
<b>Negative</b>	<b>False Negative (FN)</b>	<b>True Negative (TN)</b>

$$\text{Sensitivity} = \frac{\text{True positives}}{\text{True positives} + \text{False negatives}} = \frac{\text{True positives}}{\text{All persons with the disease}} \times 100$$

$$= \frac{\text{TP}}{\text{TP} + \text{FN}}$$

$$\text{Specificity} = \frac{\text{True negatives}}{\text{True negatives} + \text{False positives}} = \frac{\text{True negatives}}{\text{All persons without the disease}} \times 100$$

$$= \frac{\text{TN}}{\text{TN} + \text{FP}}$$

Percent false negatives = % of people with the disease who were not detected by the test.

$$= \frac{FN}{FN + TP} \times 100$$

Percent false positives = % of people without the disease who were incorrectly labeled by the test as having the disease.

$$= \frac{FP}{FP + TN} \times 100$$

### Predictive Values

$$\text{Positive PV} = \frac{\text{True Positives}}{TP + FP} \times 100 = \%$$

$$\text{Negative PV} = \frac{\text{True Negatives}}{TN + FN} \times 100 = \%$$

### Exercise No.1

Calculate the validity (sensitivity and specificity) and the positive and negative predictive values of a new screening test for evaluation of typhoid fever administered to 1000 persons in certain village 100 persons are confirmed by a confirmatory test (gold standard test or bone marrow culture) and 900 proved to be healthy .The new test was found positive in 95 of the 100 people with the disease as well as in 45 of the people who do not have the disease.

Screening test results	Confirmatory test		
	Disease +ve	Disease -ve	
Test +ve	a 95 TP	b 45 FP	a+b 140
Test -ve	c 5 FN	d 855 TN	c+d 860
	a+c 100 TP+ FN	b+d 900 FP+TN	a+b+c+d 1000