AL MUSTAQBAL UNIVERSITY

College of Pharmacy / Fourth Stage

Public Health

(L 5) SCREENING TESTS

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Prevention – Brief Overview

Prevention occurs at three levels.

The first level is **primary prevention**. These are preventive measures that are undertaken to prevent the onset of illness and injury. This is done through the elimination of causal risk factors or by increasing resistance to the condition. An example of primary prevention is childhood vaccination against infectious disease.

Secondary prevention entails measures that lead to early diagnosis and prompt treatment of illness or injury. Here we try to interrupt the disease process by detecting and treating it before symptoms emerge. For a test to have the "screening" characteristic it must be done in the non-symptomatic phase of the disease. Cancer screening is an example of secondary prevention.

Tertiary prevention involves measures aimed at minimizing disability after disease symptoms have appeared. Cardiac rehabilitation following a diagnosis of heart failure is an example of tertiary prevention.

Screening Defined

as the presumptive identification of an **unrecognized disease** or defect through **tests, exams, or other procedures** that can be applied **rapidly and easily**. Screening tests differentiate **apparently healthy persons** who may have a disease from those who probably don't have the disease.

Screening is widely considered the bedrock of **secondary prevention**.

Periodic health screening can lead to **early detection** and diagnosis of a disease. This early detection then leads to earlier treatment with a goal of decreasing mortality and morbidity related to that disease.

In the case of infectious diseases, screening can also **break the chain of transmission** and prevent development of new cases.

Screenings can be **cost-effectiv**e if the disease is common enough and the test is accurate enough.

In the world of medicine, there are two types of tests that are commonly used to detect diseases and medical conditions: **screening tests** and **diagnosing tests**. Both types of tests are important, but they serve different purposes and have unique advantages and disadvantages.

A screening test is a medical test or procedure performed on **a large group of people** to identify those who may have a certain disease or condition, but with **no symptoms or signs** of the disease. These tests are usually simple, non-invasive, and cost-effective. Screening tests can include physical exams, lab tests, imaging tests, and other procedures.

The purpose of a screening test is to detect a disease or condition early, when it is easier to treat or manage, and to prevent the spread of the disease to others.

Examples:

Blood tests include complete blood count (CBC), blood glucose test, cholesterol test, and liver function test.

Pap Smears and Mammograms

A diagnosing test
is a medical test performed to **confirm** or **rule out** a suspected diagnosis in **a patient** who is showing **symptoms** of a particular disease or condition. These tests are typically more **specific** and **accurate** than screening tests, as they are designed to detect the presence or absence of a specific disease or condition in the patient.

Examples:

Biopsy: A sample of tissue is removed from the patient and examined under a microscope to determine if cancer cells are present.

Blood tests: These can be used to detect the presence of certain diseases or conditions, such as HIV, diabetes, or thyroid disorders.

Imaging tests: These include X-rays, CT scans, and MRI scans, which can be used to detect abnormalities in the body, such as tumors or fractures.

Advantages of Screening Tests

Early Detection Screening tests can detect diseases before symptoms appear, allowing for early intervention and better outcomes.

Cost-Effective: Screening tests are often less expensive than diagnosing tests.

Public Health: as part of preventive care, can be used to identify and control infectious diseases, contributing to overall public health.

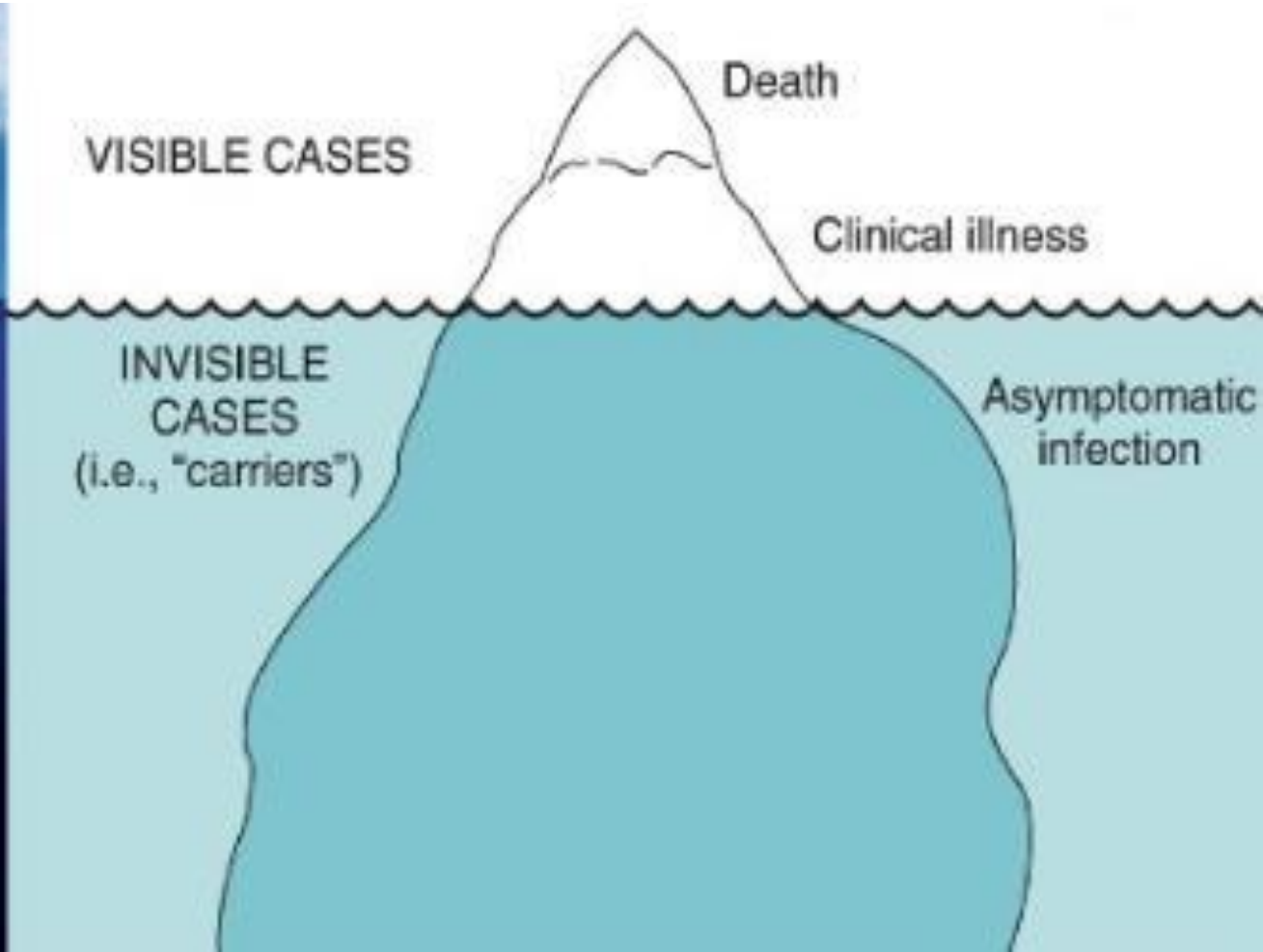
Advantages of Diagnosing Tests
Accuracy: Diagnosing tests are generally more accurate than screening tests.

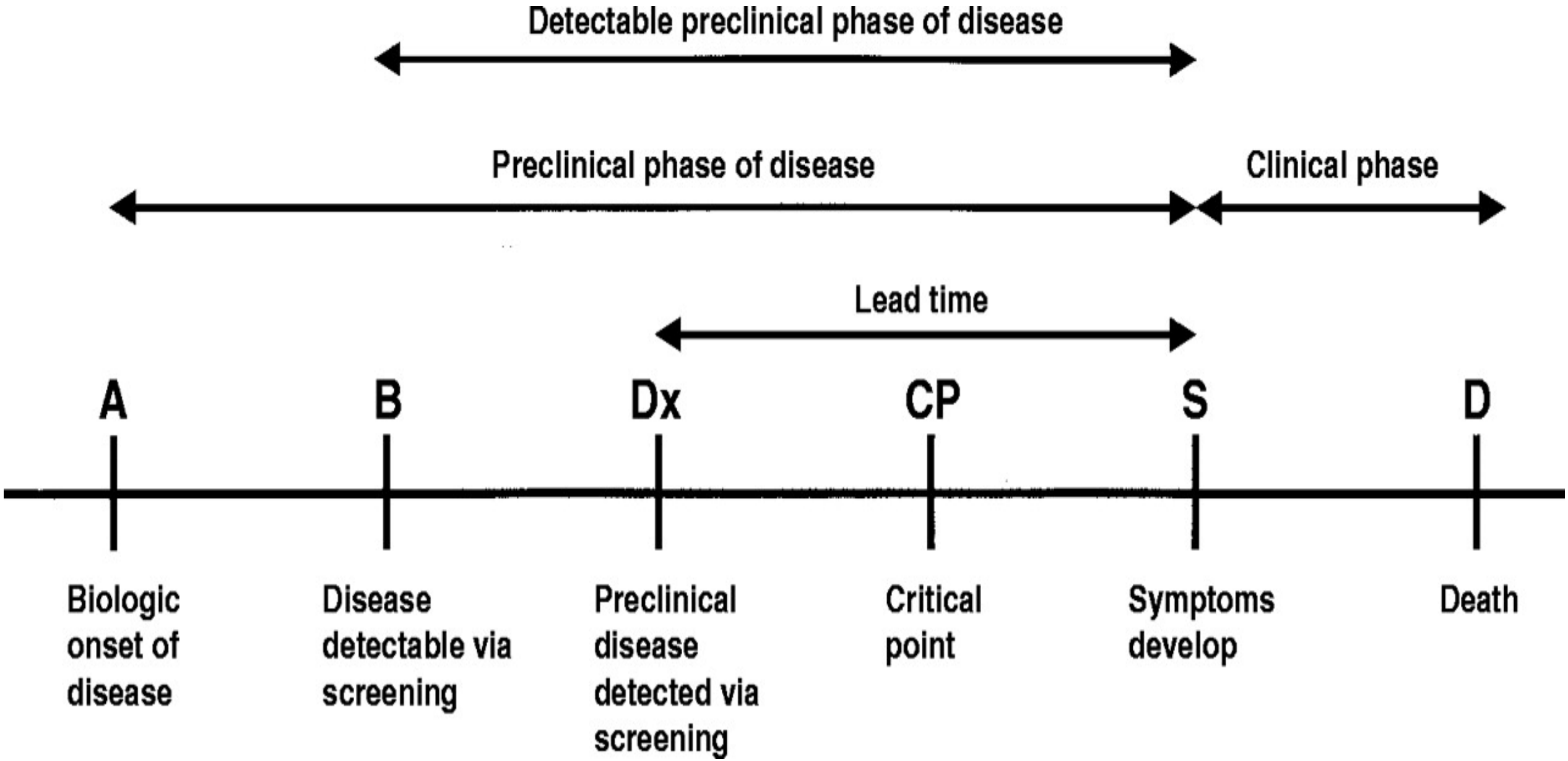
Treatment Planning: Diagnosing tests can help healthcare professionals make decisions about treatment options.
Cost-Effectiveness: While diagnosing tests may be more expensive than screening tests, they can ultimately be more cost-effective.

Screening Test VS Diagnostic Tests

	Screening Test	Diagnostic Tests
Purpose	To detect potential disease indicators	To establish presence/absence of disease
Target population	-Applied to groups. -Apparently healthy. -The initiative comes from the investigator or agency providing care.	-Single -Patients or Symptomatic individuals -Positive screening test -The initiative comes from a patient with a complaint
Test method	-Simple, acceptable. -Based on one criterion or - Cheap, benefits should justify the costs. -Not a basis for treatment.	maybe invasive, expensive but justifiable as necessary to establish diagnosis Based on evaluation of a number of symptoms, signs and laboratory findings More expensive

Iceberg Phenomenon Of Disease




Detectable preclinical phase of disease
Preclinical phase of disease
Clinical phase
Lead time
A
B
Dx
CP
S
D
Biologic onset of disease
Disease detectable via screening
Preclinical disease detected via screening
Critical point
Symptoms develop
Death

Types of Screening Tests

Vital Sign Tests

Blood Pressure Test: measures the force of blood against the walls of the arteries.
Body Mass Index (BMI): calculates the ratio of weight to height to determine if a person is underweight, normal weight, overweight, or obese.

Blood Tests

Complete Blood Count (CBC): measures the levels of different types of cells in the blood.
Lipid Panel: measures cholesterol and triglyceride levels in the blood.

Imaging Tests

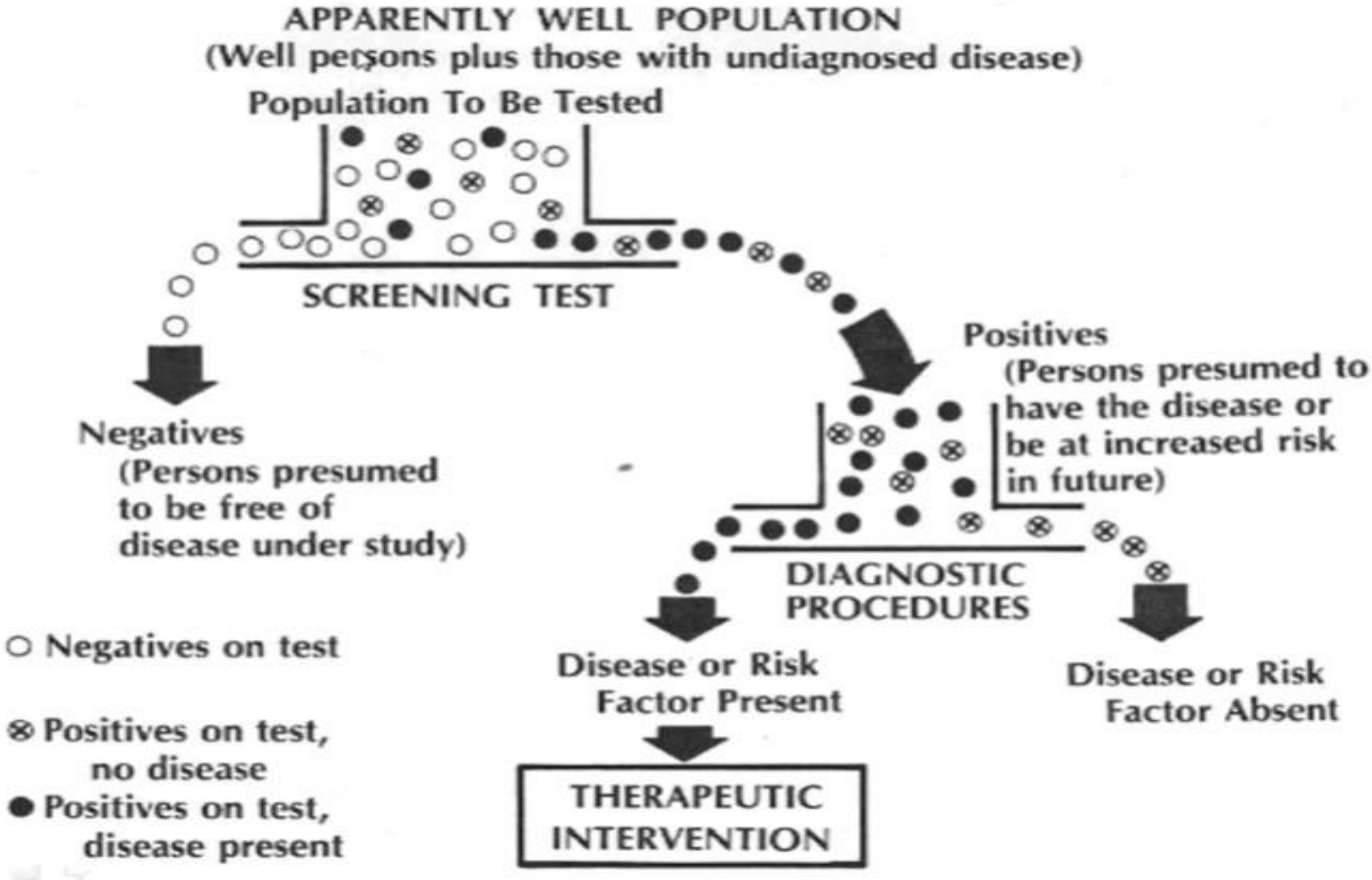
Mammogram: X-ray of the breast tissue used to detect breast cancer.
Colonoscopy: visual examination of the colon using a flexible tube with a camera attached.

Genetic testing has revolutionized the field of screening tests, allowing for more personalized and targeted approaches to healthcare.

Common Disease Screenings

- Pap smear screens for **cervical cancer**
- Fasting blood sugar screens for **diabetes**
- Blood pressure screens for **hypertension**
- Bone densitometry screens for **osteoporosis & osteopenia**
- PSA test screens for **prostate cancer**
- Mammography screens for **breast cancer.**

With few exceptions, screening tests *do not diagnose the illness*. Rather subjects who test positive typically require further evaluation with subsequent *diagnostic tests* or procedures.


APPARENTLY WELL POPULATION
(Well persons plus those with undiagnosed disease)
Population To Be Tested
SCREENING TEST
Negatives
(Persons presumed
to be free of
disease under study)
Positives
(Persons presumed to
have the disease or
be at increased risk
in future)
DIAGNOSTIC
PROCEDURES
Disease or Risk
Factor Present
Disease or Risk
Factor Absent
THERAPEUTIC
INTERVENTION
○ Negatives on test
⊗ Positives on test,
no disease
● Positives on test,
disease present

In its simplest form, the screening test has only two outcomes: positive or negative. An ideal screening test would have a positive result if and only if the subject actually has the disease and a negative result if and only if the subject did not have the disease. Actually, most screening tests exhibit what are termed false positives and false negatives to varying degrees. Logical possibilities are described in the 2 × 2 Table

	Disease present	Disease absent
Positive test	True positive	False positive
Negative test	False negative	True negative

The test must satisfy the following criteria

Acceptability: acceptable to people at whom it is aimed. Painful, discomforting or embarrassing examinations are not likely to be acceptable to the population in mass campaigns.

Repeatability (Reliability, precision , reproducibility): the test must give consistent results when repeated more than ones on the same individual under the same conditions.

Validity: is the ability of a screening test to accurately identify diseased and non-disease individuals.

Validity is measured by **sensitivity and specificity**.

Sensitivity: the ability of the test to identify correctly all those who have the disease, that is *"true-positive"*.

Example: 90% sensitivity means that 90% of the diseased people screened by the test will give a "true-positive" result and the remaining 10% a "false-positive" result

Specificity:
the ability of a test to identify correctly those who do not have the disease, that is *"true-negatives"*

Example: 90% specificity means 90% of non-diseased persons will give"true-negative" result, 10% of non-diseased people screened by the test will be wrongly classified as "diseased" when they are not.

	Disease Present	Disease Absent
Test Positive	True Positive	False Positive
Test Negative	False Negative	True Negative

$$\text{Sensitivity} = \frac{\text{True Positive}}{\text{True Positive} + \text{False Negative}}$$

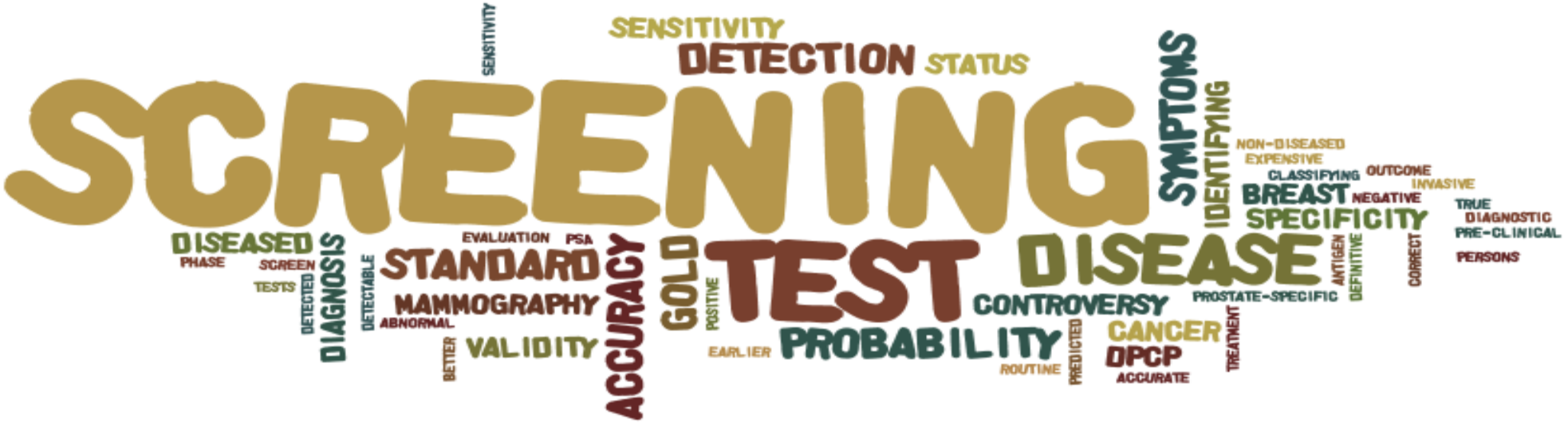
"Be sensitive to those who have disease"
"SenSitivity = Screening"

	Disease Present	Disease Absent
Test Positive	True Positive	False Positive
Test Negative	False Negative	True Negative

$$\text{Specificity} = \frac{\textbf{True Negative}}{\textbf{True Negative} + \textbf{False Positive}}$$

“Negative people get specific”
“SpeCificity = Confirmation”

THANK YOU!


SENSITIVITY
SENSITIVITY
DETECTION
STATUS
SCREENING
SYMPTOMS
IDENTIFYING
NON-DISEASED
EXPENSIVE
CLASSIFYING
OUTCOME
INVASIVE
BREAST
NEGATIVE
SPECIFICITY
TRUE
DIAGNOSTIC
PRE-CLINICAL
PERSONS
DISEASED
PHASE
SCREEN
TESTS
EVALUATION
PSA
STANDARD
DISEASE
ANTIGEN
DEFINITIVE
CORRECT
DIAGNOSIS
DETECTED
DETECTABLE
MAMMOGRAPHY
ABNORMAL
GOLD
TEST
POSITIVE
CONTROVERSY
PROSTATE-SPECIFIC
ACCURACY
BETTER
VALIDITY
EARLIER
PROBABILITY
CANCER
TREATMENT
ROUTINE
PREDICTED
DPCP
ACCURATE