

EPIDEMIOLOGY AND PREVENTION

What is Preventive Medicine?

- Preventive medicine specialist works with large population groups as well as with individual patients to promote health and understand the risks of disease, injury, disability and death.

The Sanitary Revolution and the Ascendancy of Public Health

- The sanitary revolution produced the greatest transformation in the pattern of disease that the world had known since nomadic hunter-gatherers settled in permanent villages, and ultimately developed modern urban industrial communities

Public Health and Sanitation

- Achievements of the 20th century:
- Improvements in hygiene practices
- Improvements in food handling (refrigeration)
- Improvement in water and sewage treatment
- Vaccination practices

Definition of Prevention

- “Actions aimed at eradicating, eliminating, or minimizing the impact of disease and disability. The concept of prevention is best defined in the context of levels, traditionally called primary, secondary, and tertiary prevention”
- A Dictionary of Epidemiology, Fourth Edition
- Edited by John M. Last

Levels of prevention

Primordial prevention	Underlying condition leading to causation	Total population/ selected groups
Primary prevention	Specific causal factor	Total population/ selected groups/ individual
Secondary prevention	Early stage of disease	Patients
Tertiary prevention	Late stage of disease (treatment, rehabilitaton)	Patients

Primordial prevention

- Primordial prevention consists of actions and measures that inhibit the emergence of risk factors in the form of environmental, economic, social, and behavioral conditions and cultural patterns of living etc.

Primordial prevention (cont.)

- It is the prevention of the emergence or development of risk factors in countries or population groups in which they have not yet appeared
- For example, many adult health problems (e.g., obesity, hypertension) have their early origins in childhood, because this is the time when lifestyles are formed (for example, smoking, eating patterns, physical exercise).

Primordial prevention (cont.)

- In primordial prevention, efforts are directed towards discouraging children from adopting harmful lifestyles
- The main intervention in primordial prevention is through individual and mass education

Primary prevention

- Primary prevention can be defined as the action taken prior to the onset of disease, which removes the possibility that the disease will ever occur.
- It signifies intervention in the prepathogenesis phase of a disease or health problem.
- Primary prevention may be accomplished by measures of “Health promotion” and “specific protection”

Primary prevention

Achieved by

Health promotion

- Health education
- Environmental modifications
- Nutritional interventions
- Life style and behavioral changes

Specific protection

- Immunization and seroprophylaxis
- chemoprophylaxis
- Use of specific nutrients or supplementations
- Protection against occupational hazards
- Safety of drugs and foods
- Control of environmental hazards, e.g. air pollution

Approaches for Primary Prevention

- The WHO has recommended the following approaches for the primary prevention of chronic diseases where the risk factors are established:
 - a. Population (mass) strategy
 - b. High -risk strategy

Population (mass) strategy

- “Population strategy” is directed at the whole population irrespective of individual risk levels.
- For example, studies have shown that even a small reduction in the average blood pressure or serum cholesterol of a population would produce a large reduction in the incidence of cardiovascular disease
- The population approach is directed towards socio-economic, behavioral and lifestyle changes

High -risk strategy

- The high -risk strategy aims to bring preventive care to individuals at special risk.
- This requires detection of individuals at high risk by the optimum use of clinical methods.

PREVENTION PARADOX

"A preventive measure which brings much benefit to the population often offers little to each participating individual."

(Rose, 1985)

Secondary prevention

- It is defined as “ action which halts the progress of a disease at its incipient stage and prevents complications.”
- The specific interventions are: early diagnosis (e.g. screening tests, and case finding programs) and adequate treatment.

Secondary prevention (cont.)

- Secondary prevention attempts to arrest the disease process, restore health by seeking out unrecognized disease and treating it before irreversible pathological changes take place, and reverse communicability of infectious diseases.
- It thus protects others from in the community from acquiring the infection and thus provide at once secondary prevention for the infected ones and primary prevention for their potential contacts.

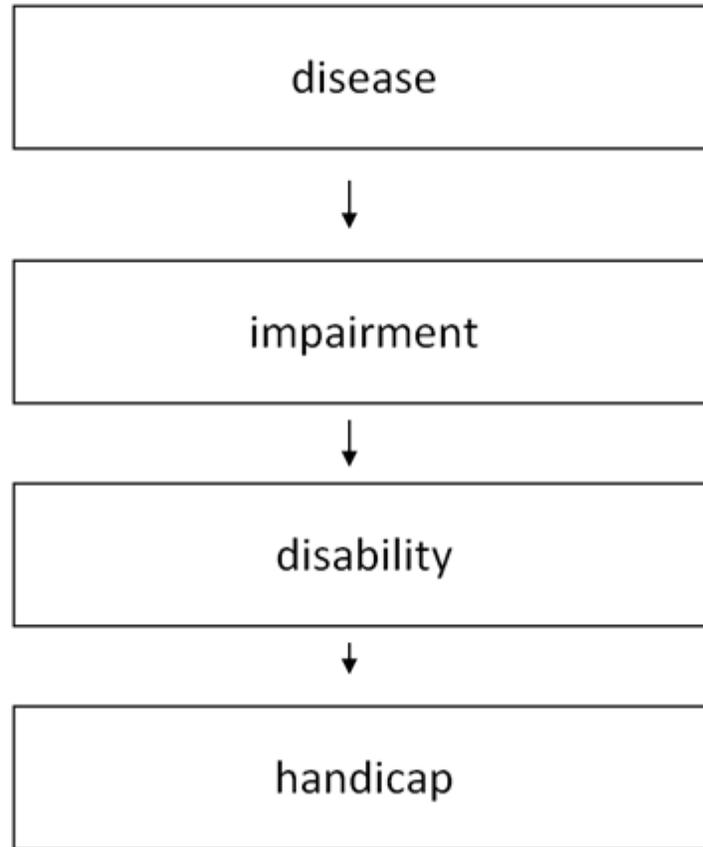
Early diagnosis and treatment

- WHO Expert Committee in 1973 defined early detection of health disorders as “ the detection of disturbances of homoeostatic and compensatory mechanism while biochemical, morphological and functional changes are still reversible.”
- The earlier the disease is diagnosed, and treated the better it is for prognosis of the case and for the prevention of the occurrence of other secondary cases.

Tertiary prevention

- It is used when the disease process has advanced beyond its early stages.
- It is defined as “all the measures available to reduce or limit impairments and disabilities, and to promote the patients’ adjustment to irremediable conditions.”
- Intervention that should be accomplished in the stage of tertiary prevention are disability limitation, and rehabilitation.

Disability limitation



Impairment

- Impairment is “any loss or abnormality of psychological, physiological or anatomical structure or function.”

Disability

- Disability is “any restriction or lack of ability to perform an activity in the manner or within the range considered normal for the human being.”

Handicap

- Handicap is termed as “a disadvantage for a given individual, resulting from an impairment or disability, that limits or prevents the fulfillment of a role in the community that is normal (depending on age, sex, and social and cultural factors) for that individual.”

Rehabilitation

- Rehabilitation is “ the combined and coordinated use of medical, social, educational, and vocational measures for training and retraining the individual to the highest possible level of functional ability.”

Control

- Concept of control:
- The term disease control describes ongoing operations aimed at reducing:
 - The incidence of disease
 - The duration of disease and consequently the risk of transmission
 - The effects of disease, including both the physical and psychosocial complications
 - The financial burden to the community.

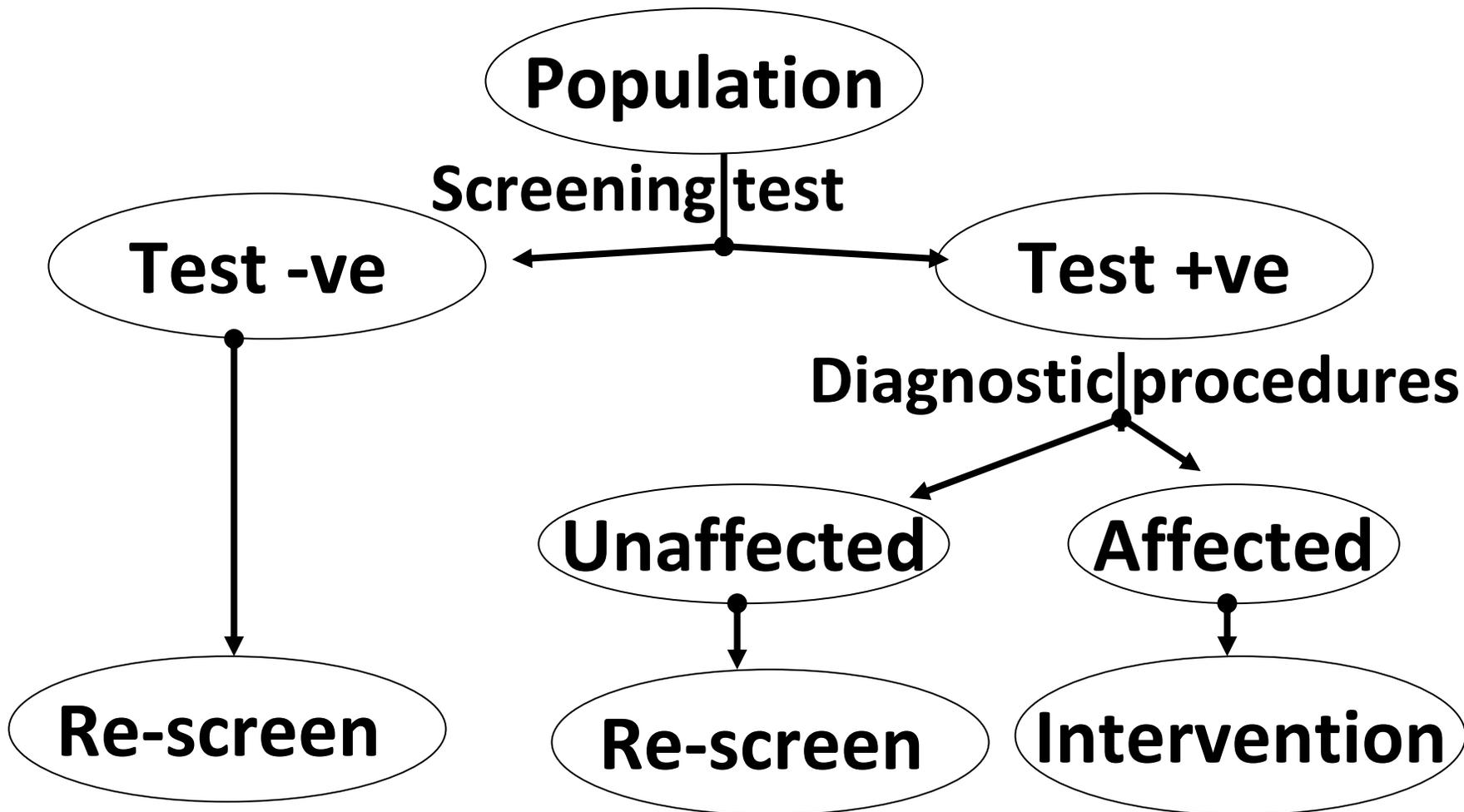
Screening

Screening is the process to detect among healthy people disorders or risk factors of which they are unaware

SCREENING: DEFINITION

“The PRESUMPTIVE identification of UNRECOGNIZED disease or defect by the application of *tests, exams or other procedures* which can be applied RAPIDLY to sort out apparently well persons who PROBABLY have a disease from those who PROBABLY do not”*

Flow diagram for a screening program



Factors appropriate for screening

- Important health problem
- High prevalence
- Natural history understood
- Long latent period
- Early detection improves prognosis

Evaluation of a screening program

- Reliability
- Feasibility
- Validity
- Performance
- Effectiveness

Reliability

- the consistency of results when the screening program is repeated on the same persons under the same conditions.

Feasibility

- Acceptability
 - Quick
 - Easy
 - Safe
- Cost effectiveness
 - Screening
 - Diagnosis
 - Follow-up
 - Intervention

Validity

- Sensitivity:
 - Probability to test positive among truly affected
- Specificity:
 - Probability to test negative among truly unaffected

Validity of Screening Test (Accuracy)

- **Sensitivity:** Is the test detecting true cases of disease? (Ideal is 100%: 100% of cases are detected)

- **Specificity:** Is the test excluding those without disease? (Ideal is 100%: 100% of non-cases are negative)

Where do we set the cut-off for a screening test?

Consider:

-The impact of high number of false positives:

anxiety, cost of further testing

-Importance of not missing a case:

seriousness of disease, likelihood of re-screening

Performance

- PV+:- Probability to be affected among test positives
- PV-:- Probability to be unaffected among test negatives
- PCC:- Probability to be correctly classified

Principles for Screening Programs

- 1. Condition should be an important health problem**
- 2. There should be a recognizable early or latent stage**
- 3. There should be an accepted treatment for persons with condition**
- 4. The screening test is valid, reliable, with acceptable yield**
- 5. The test should be acceptable to the population to be screened**
- 6. The cost of screening and case finding should be economically balanced in relation to medical care as a whole**

Types of screening

- Mass
- Multiple or multiphasic
- Targeted
- Case-finding or opportunistic