



VISION SCREENING

AUTHOR (S)

Kovin S Naidoo: Brien Holden Vision Institute, Public Health Division, Durban, South Africa; University of KwaZulu Natal (UKZN), Durban, South Africa

Brien Holden: Brien Holden Vision Institute, University of New South Wales (UNSW), Australia

PEER REVIEWER (S)

Ron Fyfe: Past Chairman of the Public Health Committee of WCO; Currently: Asia Pacific representative on WCO Public Health Committee and member of the board of Vision 2020 New Zealand

THIS CHAPTER WILL INCLUDE A REVIEW OF:

- Screening program
- Yield

SCREENING PROGRAM

Screening is a systematic search to identify those people that are unaware as to having, or those people who are considered at high risk of developing a specific disease, defect or significant deviation from the “normal”.

OBJECTIVES OF A SCREENING PROGRAM

- Offer treatment or compensatory measures to those identified (prescriptive screening)
- To gather information about a disorder for epidemiological study (investigative screening)

FACTORS DETERMINING THE SUCCESS OF A SCREENING PROGRAM

- Establishing the need for screening
- Determining the design of the program
- Evaluating the performance of the screening procedures and program implemented

When should we screen for an ocular disorder?

- The disorder is asymptomatic
- The disorder is prevalent in the community
- The condition is treatable



SCREENING PROGRAM(CONT.)

DETERMINING THE DESIGN

Ideally a screening program should be able to identify all those with the disorder and thus all those without. This is however not always possible therefore we seek the highest accuracy in identifying those with the disorder.

Key considerations for choice of design

- Test and testing procedures
- Examiner
- Economic considerations
- Community education and follow-up care

EVALUATION OF A SCREENING PROGRAM

- Ensures accuracy, effectiveness and efficiency
- Measured in terms of reliability and validity
- Reliability: measure of repeatability
- Validity: measure of the accuracy of the results of screening tests compared to the true health status determined for each individual in the population
- Measures of validity
 - sensitivity: accuracy in identifying individuals with the disorder
 - specificity: accuracy in identifying those who do not have a disorder

YIELD

- Measure of the number of previously unrecognized cases of a particular disorder diagnosed and treated as a result of implementing screening procedures.
- Factors impacting on the yield:
 - sensitivity of screening procedures
 - prevalence of a disorder

Table 8-1: Sensitivity and specificity calculation in screening

	DISEASE POSITIVE	DISEASE NEGATIVE	TOTAL
Test-Positive	A (true positive)	B (false positive)	A+B
Test-Negative	C (false negative)	D (true negative)	C+D
Total	A+C	B+D	A+B+C+D

Sensitivity (detection rate):

Proportion of people with the disease or condition that a test correctly identifies. It is defined as “the percentage of patients with the disease who correctly test positive” (Mengel, 2002).

$$A/(A+C) [\text{i.e. sensitivity} = \text{true positives} / (\text{true positives} + \text{false negatives})]$$

Mengel (2002) states that “a test with high sensitivity will miss few cases of disease (few false negatives)”.

YIELD(CONT.)

Specificity (true-negative rate):

Proportion of persons who are disease-free that the test identifies as normal. It is defined as “the percentage of patients without the disease who will correctly test negative” (Mengel, 2002).

$$D/(B+D) \text{ [i.e. specificity = true negatives / (true negatives + false positives)]}$$

Mengel (2002) states that “a test with high specificity will rarely give an abnormal result in the absence of disease (few false positives)”.

Positive Predictive Value (PPV)

The probability of being disease-positive if the test is positive.

$$A/(A+B) \text{ [i.e. Positive predictive value = true positives / (true positives + false positives)]}$$

Negative Predictive Value (NPV)

The probability of being disease-negative if the test is negative.

$$D/(C+D) \text{ [i.e. Negative predictive value = true negatives / (true negatives + false negatives)]}$$

Yield

The number of persons screened to detect a case. This measure is dependant on the prevalence of disease in the population.

$$(A+B+C+D)/A \text{ [i.e. all individuals screened / true positives]}$$

Prevalence

The proportion of true cases in the population

$$(A+C)/(A+B+C+D) \text{ [i.e. (true positives + true negatives) / all individuals screened]}$$

e.g.: School screening for myopia

- A. Number with myopia and picked up by screening
- B. Number without myopia but screened as positive
- C. Number with myopia but not detected through screening
- D. Number without myopia and screening reveals no myopia



SELECTED READING/REFERENCES

- Mengel et al, 2002. **Fundamentals of clinical practice**. 2nd Edition. Kluwer Academic/Plenum Publishers, New York