340.721 Epidemiologic Inference in Public Health I

ACTIVITY:
Validity & Reliability

Activities provide experience in applying epidemiologic methods, interpreting findings, and drawing inferences.

This Activity follows from the corresponding set of PRE-Activity Questions that should be completed prior to the start of the Activity. The PRE-Activity Questions prepare you for a productive and collaborative experience during the Activities.

Expectations for the Activities

1. *Individually, read the Activity and attempt to answer all the questions.*

2. *"Meet" with your group and discuss challenging concepts, questions and compare answers*

3. *Formulate group consensus of answers if possible (sometimes there is no right or wrong answer!)*

4. *Post questions to the Discussion Forum if there is disagreement in your group or if there is need for a clarification to answer the question.*

5. *If your group is presenting at the LiveTalk, review your answers with a TA by posting to the Discussion Forum in your Group's Category/Topic by 12PM EST of the Tuesday preceding the LiveTalk*

Question 1
Compare and contrast validity and reliability.

Question 2
Suppose the sensitivity of the nurse's test to detect (preclinical) heart disease in school children is 80%. Suppose that the specificity of the test is also 80%. How would you explain the sensitivity and specificity of the nurse' test to the parents of the children?

Question 3
Suppose that the positive predictive value of the nurse's test is 48% and the negative predictive value is 95%. How would you explain the positive predictive value of the nurse' test to the parents of the children? The negative predictive value?

<u>Question 4</u>
In the PRE-Activity Questions, the positive predictive value (PPV) of the <u>physician's test</u> was greater than the PPV of the <u>nurse's test</u>. Why are the two positive predictive values different?

[HINT: Consider the following example:

Table 1. Prevalence of Human Immunodeficiency Virus (HIV) in Different Populations and the Validity and Predictive Value of Two Tests (Test 1 and Test 2) to Screen for HIV in these Populations

Population	Sensitivity	Specificity	Prevalence	PPV	NPV
Test 1: Sensitivity=99% & Specificity=99%					
Red Cross, First Time Donors	99%	99%	0.015%	2%	100%
Injection Drug Users in NYC	99%	99%	4.3%	82%	100%
MSM in Baltimore	99%	99%	8.5%	90%	100%
Adults in Botswana	99%	99%	37.0%	98%	99%
Test 2: Sensitivity=90% & Specificity=90%					
Red Cross, First Time Donors	90%	90%	0.015%	0.1%	100%
Injection Drug Users in NYC	90%	90%	4.3%	29%	100%
MSM in Baltimore	90%	90%	8.5%	46%	99%
Adults in Botswana	90%	90%	37.0%	84%	94%

Abbreviations: MSM, men who have sex with men

Given the information in the table, how do the positive and negative predictive values change when the prevalence of the disease increases?
In a population with a given disease prevalence, what happens to the positive predictive value if a test with higher sensitivity and specificity is used?
What about the effect on negative predictive value?]

Question 5

a.) In Table 1, the PPV and NPV for Test 2 in Adults in Botswana were 84% and 94%, respectively. Use a 2x2 table to demonstrate how these predictive values were derived.
[*Hint:* To get started, assume a large study population (e.g., n=100,000)].

b.) A colleague wants to use Test 2 in her clinical practice of 500 patients and asks you to calculate the PPV and the NPV of Test 2 in this population. Are you able to calculate these predictive values for her? If so, what are they? If not, why not?

Question 6
How would the positive predictive value (PPV) of the school nurse's test compare to the PPV of the physician's test if children were first tested with the physician's test and then tested with the nurse's test?

Question 7
The nurse's test was administered to all children and then the physician's test was administered only to those children who tested positive on the nurse's test. What are the benefits of screening in this manner? Are there potentially negative consequences of screening in this manner? [HINT: Refer to the Table you were asked to complete in the PRE-Activity Questions.]

Question 8

The following figure summarizes the sensitivity and specificity for diabetes for different cutpoints of blood glucose levels (mg/100 mL).

Sensitivity and Specificity at Diabetes Screening Levels
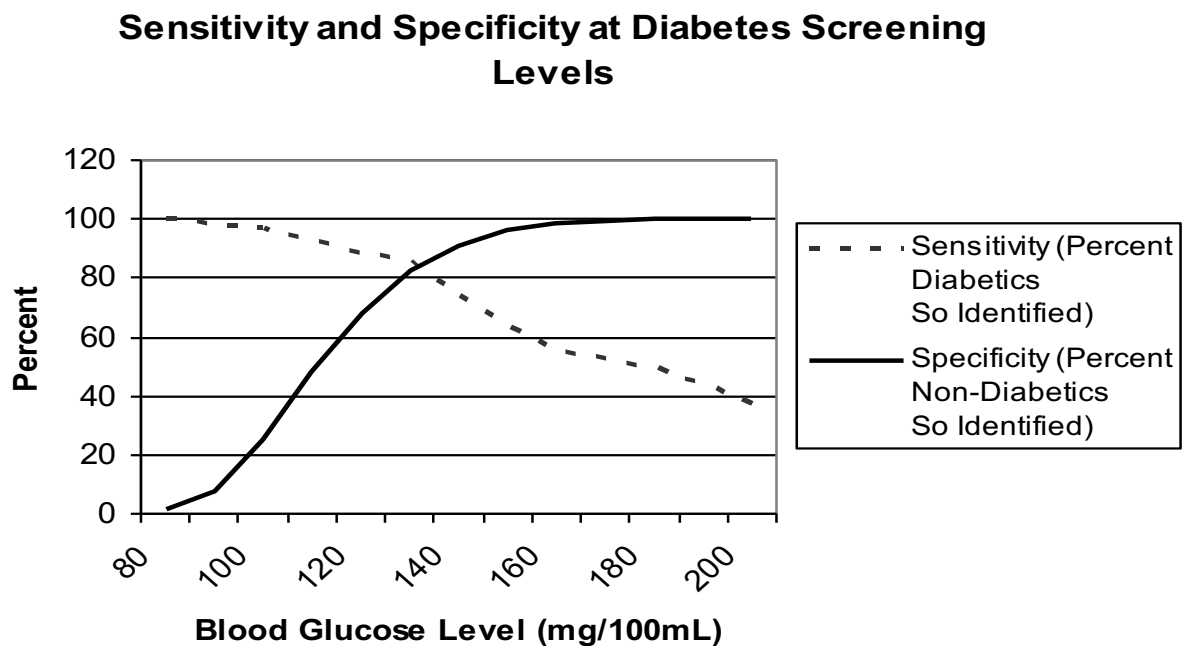
Does any pattern emerge regarding changes in sensitivity and specificity with the increasing blood glucose levels? If you were screening a population, what blood glucose level would you choose to consider positive? Why? What factors are important to consider when determining a cut-off level for a diagnostic test or screening program?

Question 9
Compare percent agreement to the Kappa statistic. How are they similar? How do they differ?

Question 10
Which would you prefer: a test that is reliable but not valid, or a test that is valid but not reliable? Why?