# Analyzing Probability and Chance in HIV Testing

Controlled laboratory testing of saliva determined the sensitivity and specificity of the OraQuick Advance HIV test.

a) Sensitivity: probability the test correctly identifies someone who is HIV+ as positive = 98.4% = .984

b) **False Negative**: HIV+ person who falsely tests negative. The probability is $1 - .984 = .016$

c) Specificity: probability the test correctly identifies someone who is HIV- as negative = 99.6% = .996

d) **False Positive**: HIV- person who falsely tests positive. The probability is $1 - .996 = .004$

Globally, prevalence of HIV in prisons is between 2 and 50 times the HIV rate of the general population. In 2010, about 20,000 of the 1,570,000 inmates in state and federal prisons in the US were HIV+.

1) What is the probability that a prisoner in the US is HIV+ (20,000/1,570,000)—leave this as a decimal and round to 4 decimal places?

2) What is the probability that a prisoner is HIV-? Leave as a decimal and round to 4 decimal places.

3) Suppose we have a prison with 100,000 prisoners. Complete the number of people in each of the 6 cells in the decision matrix below using the above probabilities. Show work and round to whole numbers of people:

|  | Test + | Test - |
|---|---|---|
| Person is HIV+ | True positive people<br>multiply your response in 1) by 100,000 for the number of HIV+ people<br>then multiply that number by the probability they correctly test + in a) | False negative people |
| Person is HIV- | False positive people<br>multiply your response in 2) by 100,000 for the number of HIV- people<br>then multiply that number by the probability they falsely test + in d) | True negative people |
| Total | Total who test + | Total who test - |

4) Approximately what percentage of prisoners who test positive is actually HIV+ (i.e. true positive people/total people who test positive)? Show work and round to one decimal place.