Understanding Science and Scientific Methods:

An Overview for Lawyers

SUMMARY – 7 November 2005

Class on 31 October 2005 Covered 3.a.iv. and 3.b. on the Syllabus

A. HIV Example

	True State of World: Has HIV	True State of World: Not Have HIV
Test is Postive:Disease / Doctor's Decision	1325	7648
Test is Negative: No Disease	23	3,816,372

Base Rate = (A+C)/(A+B+C+D) =.0003524

False Negative -- $\alpha = P(-test \mid HIV) = \frac{P(\text{- test} \cap \text{HIV})}{P(HIV)} = \frac{C}{A+C}$ =23/1348=.017

False Positive -- $\beta = P(+test \mid \sim HIV) = \frac{P(\text{+ test} \cap \sim\text{HIV})}{P(\sim HIV)} = \frac{B}{B+D} =$

7648/(3,816,372+7648)=.002

$P(HIV \mid + \text{ test}) = \frac{P(\text{HIV} \cap \text{ + test})}{P(\text{+ test})} = \frac{A}{A+B}$ = 1325/(1325+7648)=.1477

$P(\sim HIV \mid + \text{ test}) = \frac{P(\sim\text{HIV} \cap \text{ + test})}{P(\text{+ test})} = \frac{B}{A+B}$ = 1 - .1477 = .8523

$P(\sim HIV \mid - \text{ test}) = \frac{P(\sim\text{HIV} \cap \text{ - test})}{P(\text{- test})} = \frac{D}{C+D}$ = **3,816,372/(23+3,816,372)=.999994**

$P(HIV \mid - \text{ test}) = \frac{P(\text{HIV} \cap \text{ - test})}{P(\text{- test})} = \frac{C}{C+D}$ = 1 - .999994 = .000006

B. The Placebo Effect: "Mass Psychogenic Illness Attributed to Toxic Exposure at a High School." ***NEJM,*** 13 January 2000.

1. No Environmental cause of the reported illnesses was identified.

2. **How do you handle the Community? How do you convince them that there is no cover up? How do you prove a negative?**