

**Math and Medicine: Homework Assignment 1**  
**Due on Sept 1**

1. As in class, suppose that the test for HEV has 90% sensitivity (only 10% of infected people test negative) and 80% specificity (20% of uninfected people test positive). The treatment kills 50% of people, but if left untreated, all infected people die hideously.
  - a. Suppose that a fraction  $p$  of people have HEV. Find the fraction of people who would die with the three following strategies
    - Treat nobody
    - Treat everybody
    - Treat only those who test positive.For what values of  $p$  does the last strategy kill the fewest people? How would you decide what to do given that  $p$  isn't actually known? Would you feel bad that some uninfected people have to die?
  - b. Suppose that  $p$  is known to be 10%. How much would mortality from treatment need to be reduced to make treating only those who test positive produce the fewest deaths?
2. In the Kopelman paper, the mystery patient had three findings: Nonreactive PPD skin test, Noncaseating granulomas, Normal angiotensin-converting enzyme level.
  - a. Find the probability of TB if the angiotensin-converting enzyme level had **not** been normal.
  - b. Find the therapeutic threshold in this case.