Stat 579 Homework Set #3

1. A diagnostic test is used to detect Covid antibodies in test subjects. Consider a 2×2 table in which the row variable is the true status (row 1 = antibodies, row 2 = no antibodies) and the column variable is the test result (1 = positive, 2 = negative). Then $\Pi_{1|1}$ is the sensitivity and $\Pi_{2|2}$ is the specificity. Let ρ be the prevalence of the disease in the testing population.

The standard test for antibodies is estimated to have sensitivity $\Pi_{1|1} = .850$ and specificity $\Pi_{2|2} = .995$. Consider the test applied to a population with prevalence $\rho = .10$.

(a) Compute the joint probabilities for the 2×2 table.
(b) Compute $PVP = P(A|+)$, the predictive value positive.
(c) Provide an interpretation of the result in (b), stated in the context of the problem.

2. The following cross sectional data is based on the records of traffic accidents.

	Injury = fatal	Injury = nonfatal
Safety Equipment = none	1601	162,527
Safety Equipment = seat belt	510	412,368

(a) Compute an estimate of the relative risk.
(b) Provide an interpretation of your result, stated in the context of the problem.

3. Explain the difference between a prospective study and a retrospective study. What parameters can be estimated from a prospective study? What parameters can be estimated from a retrospective study?