Problems for Recitation 10 (4/17/98)

Problem 1. Verify that the set-theoretic probability equations above "relativize" to conditional probabilities, e.g., equation (1) relativizes to

$$\Pr(A - B \mid C) = \Pr(A \mid C) - \Pr(A \cap B \mid C).$$

Problem 2. In the OJ Simpson trial it was claimed by the defense that the fact that Simpson battered his wife should be excluded from the evidence as the fraction of wife batterers that murder their wives is 1/2000 (Dershowitz Lemma). In this problem we will condition this probability on the event that Nicole is dead and see that we obtain a somewhat different result.

We have the following statistical information (all for 1994):

- number of women = 125M
- number of women murdered in 1994 = 6000
- number of women murdered by spouse in 1994 = 1500
- number of women with spouse in 1994 = 50M
- number of women battered by spouse in 1994 = 3M

Being murdered by spouse counts as being battered by spouse. Also, we assume that the event of being murdered by somebody else is not influenced by whether or not the woman was being battered by her spouse.

Define the events

S = Woman is murdered by spouse
M = Woman is murdered
B = Woman is battered by spouse

Use the given information to evaluate the following

(a) The Dershowitz Lemma can be reformulated as

$$\Pr(S \mid B) = 1/2000.$$

Prove it.

(b) Calculate $\Pr(S \mid M)$, i.e., the probability that a murdered woman was done in by her spouse.

(c) Calculate $\Pr(S \mid B \cap M)$, i.e., the probability that a battered, murdered woman is done in by her spouse.

(d) What can you conclude about Dershowitz' argument that the battery of a spouse should not be admitted as evidence because of his lemma ?