

BIOMETRY, CLASS EXERCISE 5

(1) Consider the following contingency table that shows incidence of myocardial infraction (MI) for women who smoke and women who had never smoked.

	MI Yes	MI No	Totals
Smokes	55	65	
Never smoked	25	125	
Totals			

Let $A = \{\text{woman smokes}\}$ and let $B = \{\text{woman had an MI episode}\}$.

- a) Determine and interpret with a sentence each of $p(A|B)$, $p(B|A)$ and $p(A|B^c)$.
- b) Are A and B independent? Give a quantitative argument.

(2) In the context of drawing a single card from a well-shuffled deck give an example of:

- a) Two disjoint events.
- b) Two independent events.

(3) In the backyard you have a cluster of baskets with beautiful petunias frequented by hummingbirds, bees and other creatures (your knowledge of insects is too shallow to identify them precisely). Let us name some events when observing the petunia patch:

- H - at least one hummingbird present
- B - at least one bee present
- O - at least one other creature present



In 250 observations of the iris patch you have observed H 100 times; B 120 times; O 75 times; $H \cap B$ 10 times; $H \cap O$ 24 times; $B \cap O$ 44 times. You have never observed three types of visitors at the iris patch at the same time.

- a) Compute $p(H|B)$, $p(H|O)$.
- b) Compute $p(B|H)$, $p(B|O)$.
- c) Are the events H and B independent? Justify your answer with quantitative argument based on the values you computed above.
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- e) Are the events B and O independent? Justify your answer with quantitative argument based on the values you computed above.

(4) Spring peeper is a small chorus frog widespread in southern Quebec. It is known that in a certain area 4% of these frogs are infected with fungus (deadly disease). A field test for this fungus shows positive with probability 0.85 if the frog is infected and shows positive with probability 0.1 even if the frog is not infected.



a) You test a spring peeper from this area in the field and the test for fungus is positive. What is the probability that the frog is infected with fungus.

b) Another spring peeper tests negative. What is the probability this frog is nevertheless infected?