

Homework 4

Question 1

Pregnancy induced hypertension (PIH) is a condition which develops during pregnancy, and affects about 8% of women. Diabetes is a known risk factor for PIH. A study was conducted among pregnant women, who were enrolled on the basis of their exposure (diabetes/no diabetes). They were followed up throughout pregnancy and assessed for the development of PIH. All women who were enrolled in the study completed this study. Consider the 2 x 2 table below and answer the questions which follow.

	Outcome: Pregnancy Induced Hypertension		Total
	Yes	No	
Exposure: Diabetes	500	9,500	10,000
No Diabetes	900	89,100	90,000
	1,400	98,600	100,000

1. What type of study was this? [1 point]

Cohort

2. What is the appropriate measure of association for this study? [1 point]

Cumulative Incidence

3. Calculate this measure of association [1 point]

$$CI_e = 500/10000 = 0.05$$

$$CI_u = 900/90000 = 0.01$$

$$CIR = CI_e/CI_u = 0.05/0.01 = 5$$

4. What is the proportion of PIH that would have been avoided if some women had not had diabetes? [2 points]

$$P_e = 10000/100000 = 0.1$$

$$PAR\% = \frac{[P_e(CIR-1)]}{[P_e(CIR-1)+1]} * 100 = \frac{[0.1(5-1)]}{[0.1(5-1)+1]} * 100 = \frac{0.4}{1.4} * 100 \approx 0.2857 * 100 \approx 28.57\%$$

Question 2

Deep vein thrombosis (DVT) is a serious condition in which blood clots form in the legs, and can travel to other parts of the body including the arteries that carry blood to the lungs, causing shortness of breath and even death. There had been medical reports suggesting that the use of oral contraceptive pills may increase the risk. A team of investigators conducted a case-control study, where cases were women admitted to the hospital for DVT and controls were women admitted to the hospital for other reasons. Investigators found that 70% of the cases used oral contraceptive pills, compared to 20% of the controls. The investigators found that the odds ratio for the association between oral contraceptive pills and DVT was around 10.

1. Was the control group a valid selection? Why or why not? [2 points]

Yes, because it is the same basic population at the same hospital. Random in the sense that they were not directed to the hospital for the study.

2. Other researchers reviewing the results of the study found that because a link between oral contraceptive use and DVT had been suspected, cases with DVT were more likely to be admitted to the hospital if they reported that they were taking oral contraceptive pills. If this were the case, what would the resulting odds ratio be an underestimate or overestimate of the true association between oral contraceptive pills and DVT? In 1-2 sentences, briefly defend your answer [3 points]
It would overestimate because they did not call in as many who were not taking oral contraceptive pills. The cases in the hospital would have a higher proportion of DVT cases due to the suspected link with the pills. There may be something overlooked by not admitting those who did not take contraceptive pills and have DVT.

Question 3

A study was conducted to examine the effect of TRUVADA, a pre-exposure prophylaxis (PrEP) drug, on the development of HIV. Researchers enrolled HIV negative men and transgender women in the study, and participants were randomly assigned to either TRUVADA or placebo. At the time the study was conducted, there was no other available PrEP drug. All participants regardless of treatment assignment were also advised about safer sex practices, including the use of condoms, and also received monthly HIV testing. Answer the following questions:

1. What the proposed study design ethical? Why or why not? [1 point]
Yes. Subjects were informed of study including only available PrEP, along with advisement of safer sex practices.
2. If investigators knew the treatment status of participants, and where therefore more likely to provide more counseling about safer sex practices to those who were on TRUVADA, what would be the most likely effect on the relative risk of the study? Would it lead to an overestimate or underestimate? Why or why not? [2 points]
Well the relative risk of not taking TRUVADA would be overestimated due to the overall lack of sexual safety education to the placebo group.
3. If participants on TRUVADA were less likely to receive HIV testing than the control group, what type of bias would result? Would this overestimate or underestimate the relative risk in the study? Why or why not? [2 points]
If TRUVADA is truly an effective PrEP drug, then it would overestimate the relative risk of the placebo group because there will likely be higher number of HIV positive cases among placebo group than if both groups had the same ratio of testing results. Bias would be information bias due to misclassification error.

Question 4

Researchers at a nearby health center recruited 2,000 participants to study the relation between diet and cholesterol. They hypothesized that persons who eat meat will have higher cholesterol compared to vegetarians. At enrollment 1,000 participants were carnivores, and the other 1,000 participants had a strict vegetarian diet. After several months the researchers measured the cholesterol levels of the 1,000

carnivores (the exposed group) and the 1,000 vegetarians (the unexposed group) and categorized each participant as having low or high cholesterol.

Researchers collected the following data:

- Among the 1,000 carnivores, 610 had high cholesterol.
- Among the 1,000 vegetarians, 226 had high cholesterol.

1. What type of study design is this?

I feel like this is just a cross-sectional study. There was no prevalence measured at the beginning and the several months don't really mean anything here. So basically this compares exposure prevalence vs. disease prevalence.

2. Complete the 2x2 table below. Be sure to label the rows and columns.

		Outcome: Higher Cholesterol		Total
		High	Normal or Low	
Exposure: Meat Carnivore	Carnivore	610	390	1000
	Vegetarian	226	774	1000
	Total	836	1164	2000

3. What is the most appropriate measure of association for the above data?

Prevalence Ratio

4. Calculate the measure of association from Question 3, rounded to 2 decimal places.

$$P_{\text{carnivore}} = 610/1000 = 0.61$$

$$P_{\text{vegetarian}} = 226/1000 = 0.226$$

$$\text{Prevalence Ratio} = 0.61/0.226 = 2.699115044 \approx 2.70$$

Carnivores have 2.7 times the prevalence of Higher Cholesterol than Vegetarians.

Knowing that smoking is associated with higher cholesterol and that smokers are less likely to be vegetarians, the researchers suspected that smoking might be influencing the association seen above. To test this hypothesis, the researchers stratified the group of 2,000 participants based on their smoking status. Participants were categorized as smokers and non-smokers. The following data were collected:

- Of the 1000 carnivores, 80% were smokers
- Of the 1000 vegetarians, 90% were non-smokers
- Three hundred of the non-smoking vegetarians had high cholesterol, while thirty of the smoking vegetarians had high cholesterol
- There were 324 cases of high cholesterol among the smoking carnivores and only 90 cases among the non-smoking carnivores
- Note: don't worry if the numbers in the stratified table do not add up to the crude table above – just focus on the information provided here.

5. Complete the two 2x2 tables below with the data stratified by smoking status. Be sure to label the rows and columns.

	Smoking +		
	High Cholesterol	Normal or Low	Total
Carnivore	324	476	800
Vegetarian	30	70	100
Total	354	546	900

	Smoking –		
	High Cholesterol	Normal or Low	Total
Carnivore	90	110	200
Vegetarian	300	600	900
Total	390	710	1100

6. Calculate the appropriate measure of association for each stratum of smoking status *rounded to the nearest tenth*.

$$P_{\text{carnivore_smoking}} = 324/800 = 0.405$$

$$P_{\text{vegetarian_smoking}} = 30/100 = 0.3$$

$$\text{Prevalence Ratio for Smokers} = 0.405/0.3 = 1.35 \approx 1.4$$

$$P_{\text{carnivore_nonsmoking}} = 90/200 = 0.45$$

$$P_{\text{vegetarian_nonsmoking}} = 300/900 \approx 0.33$$

$$\text{Prevalence Ratio for Non-Smokers} = 0.45/0.33 \approx 1.36 \approx 1.4$$

Carnivores have 1.4 times the Prevalence of Higher Cholesterol than Vegetarians. Smoking and Non-Smoking yield the same ratio.

7. Is smoking a confounder? Explain your answer in one sentence.

No, smoking does not cause any difference in this study of carnivores vs vegetarians and high cholesterol.