STAT511 HW#9

Reading: Review Chapter 10 of Ott & Longnecker
See Canvas Calendar for Due Date.

28 points total, 2 points per problem part unless otherwise noted.

1. This is question 10.21 from Ott & Longnecker 7th Edition. The toxicity of two sludge fertilizer treatments are compared. One hundred tomato plants were randomly assigned to pots containing sludge processed by either the "new" or "old" treatment. The tomatoes harvested from the plants were evaluated to determine if the nickel was at a toxic level. Let π_{New} be the true population proportion of all plants treated with the "New" treatment that will be toxic and let π_{Old} be the true population proportion of all plants treated with the "Old" treatment that will be toxic. For the tests considered in parts B,C and E below we will test H_0: $\pi_{New} - \pi_{Old} = 0$.

	Toxic	Non-Toxic	Total
New	5	45	50
Old	9	41	50
Total	14	86	100

   A. Calculate the estimated proportion of toxic plants for EACH treatment.
   B. Use the two-sample Z test (prop.test function in R) to compare the proportion of Toxic plants for the two treatments. Use correct = TRUE (default). Give your (chi-square) test statistic and p-value.
   C. Use the chi-square test for contingency tables (chisq.test function in R) to compare the proportion of Toxic plants for the two treatments. Use correct = TRUE (default). Give your test statistic and p-value. Note: You should find that these results exactly match the results above.
   D. Calculate the expected cell counts from the chi-square test.
   E. Use Fisher's exact test (fisher.test function in R) to compare the proportion of Toxic plants for the two treatments. Give the resulting p-value.
   F. Considering the expected cell counts from part D above, is the chi-square test or fisher's exact test preferred for this data. Justify your choice.
   G. The "New" treatment would be preferred if it can be shown to reduce toxicity. Hence a one-side alternative could be justified here. A benefit of the two-sample Z test is that it lends itself more easily to a one-sided alternative. Use prop.test to test H0: $\pi_{New} - \pi_{Old} \geq 0$ versus HA: $\pi_{New} - \pi_{Old} < 0$. Give the resulting one-sided p-value.

2. This is question 10.69 from Ott and Longnecker 7th Edition. A study was conducted to compare two anesthetic drugs for use in minor surgery using n = 45 men who were similar in age and physical condition. The two drugs were applied on the right and left ankles of each patient, and after a fixed period of time, the doctor recorded whether or not the ankle remained anesthetized.

	Drug B Yes	Drug B No	Total
Drug A Yes	12	10	22
Drug A No	9	14	23
Total	21	24	45

   A. Calculate the estimated proportion that remain anesthetized (Yes) for EACH Drug. Note the data formatting.
   B. Considering the design, run an appropriate test comparing the effectiveness of the two drugs. State the name of the test, test statistic and p-value. (**4 pts**)

3. A case-control study in Berlin, reported by Kohlmeier, Arminger, Bartolomeycik, Bellach, Rehm and Thamm (1992) and by Hand et al. (1994) asked 239 lung cancer patients and 429 healthy controls (matched to the cases by age and sex) whether or not they had kept a pet bird during adulthood. The data is summarized below:

	Healthy Controls	Cancer Patients	Total
No Bird	328	141	469
Bird	101	98	199
Total	429	239	668

   A. Estimate the odds ratio (of "Cancer" versus "Control") for the "Bird" versus "No Bird" groups. Does the Bird or No Bird group have higher odds of lung cancer?
   B. Give a 95% confidence interval for the odds ratio. Based on this interval, can you conclude that there is a relationship between bird ownership and lung cancer? NOTE: Use method="wald". (**4 pts**)
   C. Run the chi-square test for this data. Give the p-value and conclusion.