

**Due:** At the beginning of the lecture, Tuesday, Nov. 4

1. A random sample of 100 "young" (age < 45) adult diabetes patients was contacted to complete a brief questionnaire. 28 of the subjects had a family history of diabetes, 72 did not. Of those with a family history, 24 were dependent on insulin injections, compared to 42 in the non-family history group.

(a) Test the hypothesis of statistical independence of family history and insulin dependence using the chi-squared test, the continuity-corrected chi-squared test and Fisher's exact test. Comment on the relationships between the results of the three tests. State your conclusion.

(b) Provide estimates of risk of insulin dependence for those with and without a family history of diabetes. Calculate estimates of risk difference and relative risk that reflect the increase (or decrease) in risk in those with a family history compared to those without. In each case provide relevant 95% confidence intervals.

2. Crohn's disease is an inflammatory disease which affects the small intestine, giving rise to abdominal pain and digestive difficulties. A case control study was conducted to examine whether diet was associated with the occurrence of the disease. 34 Crohn's patients and 68 controls completed food intake questionnaires, which included questions about consumption of various breakfast foods. In the Crohn's group, 23 regularly ate cornflakes, whereas only 18 in the control group did so.

(a) Test the association between regular consumption of cornflakes and Crohn's disease. Provide a 95% confidence interval for the odds ratio reflecting the increased or decreased risk of Crohn's disease amongst regular cornflake eaters. Provide a statistical interpretation of your findings. Would you conclude from this data that cornflakes appear to be a risk factor for Crohn's disease. Why or why not? If the study above had been a prospective study how might this change your conclusions.

(b) Ignoring the fact that the study was retrospective, calculate the apparent relative risk of Crohn's disease for cornflake eaters compared to non-eaters. Suppose that those who conducted the study had obtained a sample of 102 controls. What would the expected results be for the controls, if the fundamental pattern of association remained unchanged.

(c). Suppose these expected results in (b) were actually obtained in in such a study. Calculate the odds ratio and the relative risk for this sample and compare to the results obtained in (a) and (b). Explain how the differences in results reflect the appropriateness and/or inappropriateness of applying odds ratios and relative risks to case control studies.