Universidade de Brasília
IE - Departamento de Estatística
Análise de Dados Categorizados – 1/2024

Lista Exercícios Ic

*Estude os **tópico 1.3** do **capítulo 1** do livro–texto e as notas de aula e resolva os seguintes exercícios:*

1. Resolver os exercícios 9, 10 e 16, páginas 16 a 20, da 2ª edição do livro-texto (2007).

1.9 A sample of women suffering from excessive menstrual bleeding have been taking an analgesic designed to diminish the effects. A new analgesic is claimed to provide greater relief. After trying the new analgesic, 40 women reported greater relief with the standard analgesic, and 60 reported greater relief with the new one.

a. Test the hypothesis that the probability of greater relief with the standard analgesic is the same as the probability of greater relief with the new analgesic. Report and interpret the P-value for the two-sided alternative. (Hint: Express the hypotheses in terms of a single parameter. A test to compare matched-pairs responses in terms of which is better is called a *sign test*.)

b. Construct and interpret a 95% confidence interval for the probability of greater relief with the new analgesic.

1.10 Refer to the previous exercise. The researchers wanted a sufficiently large sample to be able to estimate the probability of preferring the new analgesic to within 0.08, with confidence 0.95. If the true probability is 0.75, how large a sample is needed to achieve this accuracy? (Hint: For how large an n does a 95% confidence interval have margin of error equal to about 0.08?)

1.16 Using calculus, it is easier to derive the maximum of the log of the likelihood function, $L = \log \ell$, than the likelihood function ℓ itself. Both functions have maximum at the same value, so it is sufficient to do either.

a. Calculate the log likelihood function $L(\pi)$ for the binomial distribution (1.1).

b. One can usually determine the point at which the maximum of a log likelihood L occurs by solving the *likelihood equation*. This is the equation resulting from differentiating L with respect to the parameter, and setting the derivative equal to zero. Find the likelihood equation for the binomial distribution, and solve it to show that the ML estimate equals $p = y/n$.

2. **DESAFIO!** - Resolver o exercício 18 do livro-texto, página15, da 2ª edição do livro-texto (2007).

> **1.18** For a given sample proportion p, show that a value π_0 for which the test statistic $z = (p - \pi_0)/\sqrt{[\pi_0(1 - \pi_0)/n]}$ takes some fixed value z_0 (such as 1.96) is a solution to the equation $(1 + z_0^2/n)\pi_0^2 + (-2p - z_0^2/n)\pi_0 + p^2 = 0$. Hence, using the formula $x = [-b \pm \sqrt{(b^2 - 4ac)}]/2a$ for solving the quadratic equation $ax^2 + bx + c = 0$, obtain the limits for the 95% confidence interval in Section 1.3.4 for the probability of success when a clinical trial has nine successes in 10 trials.

Bom Estudo!!!!