Taller 04

Universidad Externado de Colombia

Departamento de Matemáticas

Estadística 2

Juan Sosa, Ph. D.

June 20, 2018

Inferencia estadística acerca de la media poblacional

De Thijseen (2016), leer y sintetizar la Sección 4.1 (*Sampling Distribution of the Mean*, p. 47) y 4.2 (*Confidence intervals*, p. 49).

Simulación

Considere una población con distribución Gamma con $\alpha = 3$ y $\beta = 5$.

1. Graficar la función de densidad de la población.
2. ¿Cuál es el valor esperado μ y la varianza σ^2 de esta población?
3. Simular $M = 100$ muestras de tamaño $n = 50$. Con la información de cada muestra y una confiabilidad del 95%, calcular y graficar el intervalo de confianza correspondiente para la media poblacional.

Distribuciones muestrales

1. (Anderson 2011, Sec. 7.5, problem 24) Barron's reported that the average number of weeks an individual is unemployed is 17.5 weeks (Barron's, February 18, 2008). Assume that for the population of all unemployed individuals the population mean length of unemployment is 17.5 weeks and that the population standard deviation is 4 weeks. Suppose you would like to select a random sample of 50 unemployed individuals for a follow-up study.

   a. Show the sampling distribution of $\bar{X}$, the sample mean average for a sample of 50 unemployed individuals.

   b. What is the probability that a simple random sample of 50 unemployed individuals will provide a sample mean within 1 week of the population mean?

   c. What is the probability that a simple random sample of 50 unemployed individuals will provide a sample mean within 1/2 week of the population mean?

2. (Berenson 2012, problem 7.28) In a recent survey of full-time female workers ages 22 to 35 years, 46% said that they would rather give up some of their salary for more personal time. (Data extracted from *I'd Rather Give Up*, USA Today, March 4, 2010, p. 1B.) Suppose you select a sample of 100 full-time female workers 22 to 35 years old.

   a. What is the probability that in the sample, fewer than 50% would rather give up some of their salary for more personal time?

   b. What is the probability that in the sample, between 40and 50% would rather give up some of their salary for more personal time?

   c. What is the probability that in the sample, more than 40% would rather give up some of their salary for more personal time?

   d. If a sample of 400 is taken, how does this change your answers to (a) through (c)?

Case study: Insurance

(Keller 2014, problem 12.158) A national health care system was an issue in recent presidential election campaign and is likely to be a subject of debate for many years. The issue arose because of the large number of Americans who have no health insurance. Under the present system, free health care is available to poor people, whereas relatively well-off Americans buy their own health insurance. Those who are considered working poor and who are in the lower-middle-class economic stratum appear to be most unlikely to have adequate medical insurance. To investigate this problem, a statistician surveyed 250 families whose gross income last year was between $10,000 and $25,000. Family heads were asked whether they have medical insurance coverage (2 = Has medical insurance and 1 = Doesn't have medical insurance). The statistics practitioner wanted an estimate of the fraction of all families whose incomes are in the range of $10,000 to $25,000 who have medical insurance. Perform the necessary calculations to produce an interval estimate with 90% confidence. The data set is available in Xr12-158.

Case study: Young Professional Magazine

(Anderson et al. 2011, Chap. 8, case problem 1) Young Professional magazine was developed for a target audience of recent college graduates who are in their first 10 years in a business/professional career. In its two years of publication, the magazine has been fairly successful. Now the publisher is interested in expanding the magazine's advertising base. Potential advertisers continually ask about the demographics and interests of subscribers to Young Professional. To collect this information, the magazine commissioned a survey to develop a profile of its subscribers. The survey results will be used to help the magazine choose articles of interest and provide advertisers with a profile of subscribers. As a new employee of the magazine, you have been asked to help analyze the survey results. The data set is available in Professional.

Prepare a managerial report summarizing the results of the survey. In addition to statistical summaries, discuss how the magazine might use these results to attract advertisers. You might also comment on how the survey results could be used by the magazine's editors to identify topics that would be of interest

to readers. Your report should address the following issues, but do not limit your analysis to just these areas.

a. Develop appropriate descriptive statistics to summarize the data.

b. Develop 95% confidence intervals for the mean age and household income of subscribers.

c. Develop 95% confidence intervals for the proportion of subscribers who have broadband access at home and the proportion of subscribers who have children.

d. Would Young Professional be a good advertising outlet for online brokers? Justify your conclusion with statistical data.

e. Would this magazine be a good place to advertise for companies selling educational software and computer games for young children?

f. Comment on the types of articles you believe would be of interest to readers of Young Professional.