**PAF 3401: Quantitative Methods for Policy & Practice**

**Neil G. Bennett Spring 2022**

**HW #5 – Due 11:59pm, Friday, April 1, 2022**

**50 POINTS TOTAL**

**AS THIS IS A WORD FILE, PLEASE INSERT ENOUGH SPACE AFTER EACH QUESTION TO PROVIDE ROOM FOR YOUR ANSWERS ON *THIS* DOCUMENT. (YOU *DON’T* HAVE TO TYPE YOUR ANSWERS.) SCAN, IF YOU HAVE TO, AND UPLOAD ONE PDF FILE OF THIS TO OUR BLACKBOARD GRADE CENTER.**

**THE DOCUMENT ITSELF SHOULD HAVE YOUR NAME AT THE TOP.**

**PLEASE SHOW ALL WORK TO RECEIVE FULL CREDIT FOR EACH PROBLEM.**

**(1)** It’s important to understand social/demographic changes that are taking place and to better understand the direction in which the country is heading and perhaps how to prepare for that. For example, if we see that women are delaying childbearing more and more, then we know that that might have an impact on the number of schools we should build, or at least the timing of building those schools.

Let’s say we survey 169 randomly selected mothers and we find that the age at which they gave birth to their first child is normally distributed, with a mean of 26.0 years and a standard deviation of 3.25 years.

**(8 points total)**

**(a)** What is the standard error of the mean (to 2 decimal places)?  **(2 points)**

**(b)** What is the probability that the true mean age at first birth for women (i.e., for the entire population from which this sample was drawn) falls between 26.16 and 26.46 years of age (to 4 decimal places)? **(6 points)**

**(2)** In the previous assignment, we examined a random sample of 300 adults and who were asked to assess their health, from “Poor” to “Excellent.” The proportion of people who were in “Poor” health was .100 and the standard error of that proportion was .0173. **(9 points total)**

**(a)** What is the probability (to 4 decimal places) that the true population proportion of people in poor health is above .13? **(3 points)**

**(b)** Between .11 and .12 (to 4 decimal places)? **(6 points)**

**(3)** As you know, in January Eric Adams succeeded Bill de Blasio as Mayor of New York City. Leading up to this past November’s election, suppose that two polls of randomly selected registered voters had been conducted, one month apart. In the first, 98 out of the 140 interviewed favored Eric Adams; in the second, 80 out of 100 favored Adams. **(17 points total)**

**(a)** What are the two sample proportions (to 2 decimal places)? **(2 points)**

**(b)** What is the difference between the two sample proportions (to 2 decimal places)? **(1 point)**

**(c)** What is the standard error of the difference in proportions (to 4 decimal places)? **(3 points)**

**(d)** What is the critical z value for a confidence level of 99% (to 3 decimal places) for the difference in proportions? **(1 point)**

**(e)** If we wish to find out whether the proportion of NYC registered vosters who support Eric Adams’ candidacy changed over this time period, then what is the null hypothesis (either in words or represented mathematically)? **(2 points)**

**(f)** What is the 95% confidence interval for the difference in population proportions (to 4 decimal places)?

**(5 points)**

**(g)** Based solely on the confidence interval you calculated in part (f), with 99 percent probability, does this confidence interval imply that the change in these registered voters’ preferences is significant, that is, that among the entire population of registered voters there really was a change over the time period as opposed to no change at all? How do you know this? **(3 points)**

**(4)** Suppose that a random sample of 75 Republicans had a mean income of $60,000 with a standard deviation of $5,100, whereas among a random sample of 41 Democrats the mean income was $50,000 with a standard deviation of $4,100. **(16 points total)**

**(a)** What is the difference of the sample means**? (1 point)**

**(b)** What is the standard error of the difference of sample means (to the nearest dollar)?  **(3 points)**

**(c)** How many degrees of freedom (df) are there? **(1 point)**

**(d)** What is the critical t at the 95% confidence level (to 3 decimal places)? **(1 point)**

**(e)** The question of interest is whether the two population mean incomes are different. State the null hypothesis in words. **(2 points)**

**(f)** Please give a 95% confidence interval for the difference in mean incomes of the two groups (to the nearest dollar). **(5 points)**

**(g)** Based solely on your calculations, according to this confidence interval, can we say the two groups’ mean incomes differ significantly (i.e., that the mean incomes of the corresponding two groups in the population, rather than the sample)? How do you know? **(3 points)**