Julia Nelson Homework 04 10/12/19

"I pledge my honor that I have abided by the Stevens Honor System." Julia Nelson

Problem 7.71

Sadness + spending

31 young adults given $10

→ randomly assigned Sad or Neutral group

Sad group watches sad video

Neutral watches Earth video

All offered to trade $0.50 inc for insulated bottle

Group	Purchase Prices ($)								
Neutral	0.00	2.00	0.00	1.00	0.50	0.00	0.50		
	2.00	1.00	0.00	0.00	0.00	0.00	1.00		
SAD	3.00	4.00	0.50	1.00	2.50	2.00	1.50	0.00	1.00
	1.50	1.50	2.50	4.00	3.00	3.50	1.00	3.50	

(a)

Neutral Graph - Normal Dist

SAD Graph - Normal Dist

Because both Neutral and Sad group graphs show Normal Distribution, so it is appropiate to use t-procedures for this data.

(b)

Group	Sample Size	Mean	Stand. Dev.
Neutral	14	0.571	0.730
Sad	17	2.118	1.244

Neutral:

$\bar{x} = \frac{0+2+\dots+1}{14} = \frac{8}{14} \approx 0.571$

$s^2 = \frac{\sum(x-\bar{x})^2}{n-1} = \frac{(0-0.571)^2+(2-0.571)^2+\dots}{14-1}$

$= \frac{6.928571}{13} \approx 0.533$

$s = \sqrt{0.533} \approx 0.730$

Sad:

$\bar{x} = \frac{3+4+\dots+3.50}{17} = \frac{36}{17} \approx 2.118$

$s^2 = \frac{1}{n-1} \cdot \left(\sum x^2 - \frac{\sum(x)^2}{n}\right)$

$= \left(\frac{1}{17-1}\right)\left(101 - \frac{1296}{17}\right)$

$= \frac{1}{16}(24.76470588)$

$= 1.547794118$ $s = \sqrt{1.547\dots} = 1.24410$

(c) Null Hypothesis H_0: There is NOT a Sig Difference between the Sad and Neutral group's mean price of purchasing the bottle

$H_0: \mu_{Neutral} = \mu_{Sad}$

Alternative Hypothesis H_a: There is a sig difference between the mean price of purchases of the Neutral and Sad groups

Sad > Neutr → $H_a: \mu_{Neutral} < \mu_{Sad}$

(d)

Neutral		Sad
$n_1 = 14$	$\alpha = 0.05$	$n_2 = 17$
$\bar{x}_1 = 0.571$		$\bar{x}_2 = 2.118$
$s_1 = 0.730$		$s_2 = 1.244$

Small Sample Size

t-test → under H_0: $t = \dfrac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} = \dfrac{0.571 - 2.118}{\sqrt{\frac{(0.730)^2}{14} - \frac{(1.244)^2}{17}}}$

degree freedom:

$df = \min(14-1, 17-1)$

$= 13$

$= \dfrac{-1.547}{\sqrt{0.038064285 - 0.091031584}}$

$= \dfrac{-1.547}{.359299} \approx -4.3056$

$t = -4.306$

$2P(t > -4.3056)$

$= 1 - 2P(t \leq 4.3056)$

P-value < 0.0005

$P < \alpha$

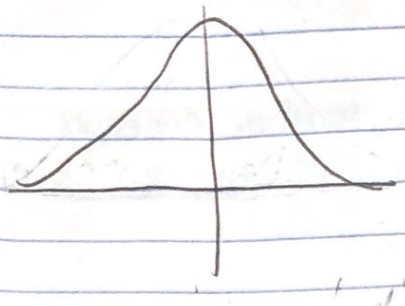
$0 < 0.05$ → Null Rejected

→ There is a Significant difference between between the Neutral and Sad means.

Sad > Neutral

(c) 95% CI for Mean Dif

$S^2_{pooled} = \frac{31.69}{29} = 1.09$



$SE = \sqrt{\frac{1.09^2}{14} + \frac{1.09^2}{17}} = 6.38$

$CI = -1.547 \pm (6.38)(-4.306)$

1.547 ± -1.63628

7.89

a) $H_0: \mu_1 = \mu_2$ μ_1 = Mean Breastfed

$H_a: \mu_1 > \mu_2$ μ_2 = Mean Baby Formula

Test statistic: $\sqrt{\frac{n_1 s_1^2 + n_2 s_2^2}{n_1 + n_2 - 2}} = \sqrt{\frac{23(1.7)^2 + (19)(1.8^2)}{23 + 19 - 2}}$

$= 1.789$

$SE = (1.7891)(\sqrt{1/23 + 1/19})$

$= 0.5546$

$t = \frac{(13.3 - 12.4)}{0.5546}$

$= 1.6228$

RHS $df = 23 + 19 - 2 = 4$

$P = 0.0562$

Not a Significant Difference

So H_0 true

b) 95% (critical value)

$\bar{x}_1 - \bar{x}_2 \pm t(SE) = 0.9 \pm (2.0211)(0.5546)$

$= (-0.2209, 2.0209)$

c) Populations are Normal Distribution

Populations variance → not much difference

7.102

$n_1 = 11 \quad n_2 = 16$

$s_1^2 = 3.5 \quad s_2^2 = 9.1$

$\alpha = 0.05$

$H_0 : \sigma_1 = \sigma_2$ the 2 pop. stand Dev are equal

$H_a : \sigma_1 \neq \sigma_2$ the 2 pop stand. Devs are not equal

a)

$$F = \frac{s_2^2}{s_1^2} = \frac{9.1}{3.5} = 2.6$$

F test stat = 2.6

b) crit val

$F_{(16-1,\,11-1),\,0.05}$

$= 2.85$

c)

$2.6 < 2.85$

Accept Null H_0 $\Rightarrow$ the 2 pop Stand. Dev: are equal

8.71 a) $n_1 = 60$ = # women

$X_1 = 48$

$\hat{p}_1 = 48/60 = 0.80$

$$SE(\hat{p}_1) = \sqrt{\frac{0.80(1-0.80)}{60}}$$

$$= 0.05164$$

$n_2 = 132$ = # men

$X_2 = 291$

$\hat{p}_2 = 52/132$

$= 0.393939$

$$SE(\hat{p}_2) = \sqrt{\frac{0.393939(1-0.393939)}{132}}$$

$$= 0.042529$$

b) 90%

let $p_1 = 0.80$ $p_2 = 0.393939$

$z = 1.645$ $n_1 = 48$

$n_2 = 132$

$$(0.80 - 0.393939) \pm (1.645)\sqrt{\frac{.8(1-.8)}{60} + \frac{0.393939(1-0.393939)}{132}}$$

$$= 0.41061 \pm 0.11004775711$$

$$= (0.2961, 0.51615)$$

c) $H_0: p_1 = p_2$ $H_\alpha = p_1 \neq p_2$ (girls ≠ boys)

$$\hat{p} = \frac{48+52}{60+132} = 0.520833$$

$$Z = \frac{0.8 - 0.393939) - 0}{\sqrt{(.520833)(1-.520833)\left(\frac{1}{60}+\frac{1}{132}\right)}} = 5.22$$

$Z = 5.22 > 1.645$

Reject H_0, is a difference