Homework 7

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Question 1

a)

The Margin of error is equals to the z value times the standard error.

$ME = 1.96 * \sqrt{\frac{0.66*(1-0.66)}{1018}} = 0.0291$

b)

p hat = 0.66

p = 0.7

n = 1018

alpha = 0.05

Ho: p = 0.7

Ha: p > 0.7

Test z value: $Z = \frac{\hat{p}-p}{\sqrt{\frac{p*(1-p)}{n}}} = \frac{0.66-0.7}{\sqrt{\frac{0.7*(1-0.7)}{1018}}} = -2.78$

P-value: P(Z > -2.78) = 1 - 0.0027 = 0.9973

Since the P-value(0.9973) is greater than alpha(0.05), so we fail to reject Ho and there is no sufficient evidence to prove the hypothesis.

Question 2

a)

The 61% is a sample statistic because it is based on the sample(1578) of every person who live in the States.

b)

$1.96 * \sqrt{\frac{0.61*(1-0.61)}{1578}} = 0.024$

The interval of 95% of the confidence interval is (58.6%, 63.4%)

c)

It is true for this data because if a data statisify n * p >= 10 and n * (1 - p) >= 100, then the distribution of the data is normal.

d)

It is false because people cannot reject the proportion is above or below 50% from the interval.

Question 3

p hat = 0.61

confidence interval = 0.02

$n = \frac{2.32^2 * 0.61 * 0.39}{0.02^2} = 3201.182 = 3202$

There should be at least 3202 of American who needs to do the survey.

Question 4

CA:

P1 hat = 0.08

n1 = 11545

OR:

P2 hat = 0.088

n2 = 4691

$\hat{p1} - \hat{p2} = 0.08 - 0.088 = -0.008$

$1.96 * \sqrt{\frac{\hat{p1} * (1 - \hat{p1})}{n1} + \frac{\hat{p2} * (1 - \hat{p2})}{n2}} = 1.96 * \sqrt{\frac{0.08 * (1 - 0.08)}{11545} + \frac{0.088 * (1 - 0.088)}{4691}} = 0.009498$

Confidence interval: (-0.0175, 0.001498).

Question 5

a)

CA:

P1 hat = 0.08

n1 = 11545

OR:

P2 hat = 0.088

n2 = 4691

p hat = (924 + 412) / (11545 + 4691) =0.082

Hypothesis:

Ho: P1 = P2

Ha: P1 not equals P2

Test:

$Z = \frac{\hat{P}1 - \hat{P}2}{\sqrt{\hat{p}*(1-\hat{p})(\frac{1}{n1}+\frac{1}{n2})}} = \frac{0.08-0.088}{\sqrt{0.082*(1-0.082)(\frac{1}{11545}+\frac{1}{4691})}} = -1.68$

Find the P-value:

2 * P(Z > 1.68) = 2 * (1 - 0.9535) = 0.093

The p-value(0.093) is greater than the alpha(0.05) we failed to reject the Ho which means that there is no sufficient evidence to support the hypothesis.

b)

Since we failed to reject the Ho and the Ha is true, so this question is a type 2 error.

Question 6

a)

P1 hat = 264 / 318 = 0.83

P2 hat = 299 / 369 = 0.81

p = 0.82

n1 = 318

n2 = 369

Ho: P1 = P2

Ha: P1 not equals to P2

Test: $Z = \frac{\hat{P}1 - \hat{P}2}{\sqrt{\hat{p}*(1-\hat{p})(\frac{1}{n1}+\frac{1}{n2})}} = \frac{0.83-0.81}{\sqrt{0.82*(1-0.82)(\frac{1}{318}+\frac{1}{369})}} = 0.68$

P-value: 2 * P(Z > 0.68) = 2 * (1 - 0.7517) = 0.4966

The P-value(0.2483) is greater then the alpha(0.05), so we failed to reject Ho which means that proportion are equal.

b)

It it a type 2 error because P1 does not equals to P2 and we failed to reject Ho.

Question 7

a)

```r
table <- matrix(c(26, 94, 120, 10, 110, 120, 36, 204, 240), ncol = 3, byrow = TRUE)
colnames(table) <- c("Yes", "No", "Total")
rownames(table) <- c("Nevaripine", "Lopinavir", "Total")
table <- as.table(table)
table
```

```
##            Yes  No Total
## Nevaripine  26  94   120
## Lopinavir   10 110   120
## Total       36 204   240
```

b)

Ho: Pn = Pl

Ha: Pn not equals to Pl

c)

Test:

$Z = \frac{\hat{P}1 - \hat{P}2}{\sqrt{\hat{p}*(1-\hat{p})(\frac{1}{n1}+\frac{1}{n2})}} = \frac{0.22-0.083}{\sqrt{0.15*(1-0.15)(\frac{1}{120}+\frac{1}{120})}} = 2.89$

P-value

P(Z > 2.89) = 1 - 0.9981 = 0.0019

Since the p-value is smaller than the alpha(0.05) so there is a strong evidence to prove that there is a huge difference between the Nevaripine and Lopinavir groups.

Question 8

Pp = 104 / 311 = 0.334

Ps = 109 / 322 = 0.339

Np = 311

Ns = 322

P = 213 / 633 = 0.336

a)

Pp - Ps = 0.334 - 0.339 = -0.005

$2.57 * \sqrt{\frac{\hat{P}p*(1-\hat{P}p)}{Np} + \frac{\hat{P}s*(1-\hat{P}s)}{Np}} = 2.57 * \sqrt{\frac{0.334*(1-0.334)}{311} + \frac{0.339*(1-0.339)}{322}} = 0.0965$

The 90% of confidence interval is (-0.1015, 0.0915)

b)

Ho: Pp = Ps

Ha: Pp < Ps

Test: $Z = \frac{\hat{P}p - \hat{P}p}{\sqrt{\hat{P}*(1-\hat{P})(\frac{1}{Np}+\frac{1}{Ns})}} = \frac{0.334-0.339}{\sqrt{0.336*(1-0.336)(\frac{1}{311}+\frac{1}{322})}} = -0.13$

P-value: P(Z < -0.13) = 0.4483

Since the p value(0.4483) is greater than alpha(0.1) so we failed to reject Ho which means that there is a strong evidence that the return rate of the pain is lower than the skydiver.