R Commands - Hypothesis Tests

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Due Monday, April 17th, 2023

2022 MCAS ELA (English Language Arts)

Disability Status:

```
Disabilities_Data <- data.frame(score = Disabilities_2022_MCAS_ELA_Scores_List, group = "Students With Disabilities")
No_Disabilities_Data <- data.frame(score = No_Disabilities_2022_MCAS_ELA_Scores_List, group = "Students With No Disabilities")
Disability_Status_Data <- rbind(Disabilities_Data, No_Disabilities_Data)
t.test(score ~ group, data = Disability_Status_Data)
```

```
     Welch Two Sample t-test

data:  score by group
t = -40.118, df = 698.89, p-value < 2.2e-16
alternative hypothesis: true difference in means between group Students With Disabilities and group Students With No Disabilities is not equal to 0
95 percent confidence interval:
 -24.04921 -21.80509
sample estimates:
   mean in group Students With Disabilities mean in group Students With No Disabilities
                                   477.1971                                    500.1243
```

Family Income:

```
Low_Income_Data <- data.frame(score = Low_Income_2022_MCAS_ELA_Scores_List, group = "Low Income Households")
Non_Low_Income_Data <- data.frame(score = Non_Low_Income_2022_MCAS_ELA_Scores_List, group = "Non-Low Income Households")
Family_Income_Data <- rbind(Low_Income_Data, Non_Low_Income_Data)
t.test(score ~ group, data = Family_Income_Data)
```

```
    Welch Two Sample t-test

data:  score by group
t = -23.75, df = 695.87, p-value < 2.2e-16
alternative hypothesis: true difference in means between group Low Income Households and group Non-Low Income Households is not equal to 0
95 percent confidence interval:
 -11.98934 -10.15840
sample estimates:
    mean in group Low Income Households mean in group Non-Low Income Households
                               488.8499                                499.9237
```

Gender:

```
Male_Data <- data.frame(score = Male_2022_MCAS_ELA_Scores_List, group = "Male Students")
Female_Data <- data.frame(score = Female_2022_MCAS_ELA_Scores_List, group = "Female Students")
Gender_Data <- rbind(Male_Data, Female_Data)
t.test(score ~ group, data = Gender_Data)
```

```
       Welch Two Sample t-test

data:  score by group
t = 10.588, df = 704.25, p-value < 2.2e-16
alternative hypothesis: true difference in means between group Female Students and group Male Students is not equal to 0
95 percent confidence interval:
 5.146394 7.489431
sample estimates:
mean in group Female Students   mean in group Male Students
                     498.7768                     492.4589
```

Race/Ethnicity:

```
Race <- c(AI_AN_Students, AA_B_Students, Asian_Students, Hispanic_Latino_Students, NH_PI_Students,
          White_Students, Other_Students)
Score <- c(AI_AN_2022_MCAS_ELA_Scores_List, AA_B_2022_MCAS_ELA_Scores_List, Asian_2022_MCAS_ELA_Scores_List,
           Hispanic_Latino_2022_MCAS_ELA_Scores_List, NH_PI_2022_MCAS_ELA_Scores_List, White_2022_MCAS_ELA_Scores_List,
           Other_2022_MCAS_ELA_Scores_List)
Race_Ethnicity_Data <- data.frame(Race, Score)
Race_Ethnicity_Data$Race <- as.factor(Race_Ethnicity_Data$Race)
One_Way_ANOVA_Test <- aov(Score ~ Race, data = Race_Ethnicity_Data)
summary(One_Way_ANOVA_Test)
```

```
                Df Sum Sq Mean Sq F value Pr(>F)
Race             6  42040    7007   110.4 <2e-16 ***
Residuals     1371  86995      63
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

```
pairwise.t.test(Race_Ethnicity_Data$Score, Race_Ethnicity_Data$Race, p.adjustment.method = "bonferroni")
```

```
        Pairwise comparisons using t tests with pooled SD

data:  Race_Ethnicity_Data$Score and Race_Ethnicity_Data$Race

                 Afr. Amer./Black Amer. Ind./Alaska Asian   Hawaii/Pac. Isl. Hisp./Lat. Other
Amer. Ind./Alaska 1.000           -                -       -                -          -
Asian             < 2e-16         6.5e-16          -       -                -          -
Hawaii/Pac. Isl.  0.010           0.009            1.000   -                -          -
Hisp./Lat.        1.000           1.000            < 2e-16 0.013            -          -
Other             < 2e-16         1.6e-06          < 2e-16 1.000            < 2e-16    -
White             < 2e-16         1.3e-06          < 2e-16 1.000            < 2e-16    1.000

P value adjustment method: holm
```

2022 MCAS MATH (Mathematics)

Disability Status:

```
Disabilities_Data <- data.frame(score = Disabilities_2022_MCAS_MATH_Scores_List, group = "Students With Disabilities")
No_Disabilities_Data <- data.frame(score = No_Disabilities_2022_MCAS_MATH_Scores_List, group = "Students With No Disabilities")
Disability_Status_Data <- rbind(Disabilities_Data, No_Disabilities_Data)
t.test(score ~ group, data = Disability_Status_Data)
```

```
      Welch Two Sample t-test

data:  score by group
t = -32.597, df = 679.51, p-value < 2.2e-16
alternative hypothesis: true difference in means between group Students With Disabilities and group Students With No Disabilities is not equal to 0
95 percent confidence interval:
 -22.67004 -20.09413
sample estimates:
   mean in group Students With Disabilities mean in group Students With No Disabilities
                                   477.1857                                    498.5678
```

Family Income:

```
Low_Income_Data <- data.frame(score = Low_Income_2022_MCAS_MATH_Scores_List, group = "Low Income Households")
Non_Low_Income_Data <- data.frame(score = Non_Low_Income_2022_MCAS_MATH_Scores_List, group = "Non-Low Income Households")
Family_Income_Data <- rbind(Low_Income_Data, Non_Low_Income_Data)
t.test(score ~ group, data = Family_Income_Data)
```

```
Welch Two Sample t-test

data:  score by group
t = -22.246, df = 680.8, p-value < 2.2e-16
alternative hypothesis: true difference in means between group Low Income Households and group Non-Low Income Households is not equal to 0
95 percent confidence interval:
 -13.33642 -11.17317
sample estimates:
    mean in group Low Income Households mean in group Non-Low Income Households
                               486.8017                                499.0565
```

Gender:

```
Male_Data <- data.frame(score = Male_2022_MCAS_MATH_Scores_List, group = "Male Students")
Female_Data <- data.frame(score = Female_2022_MCAS_MATH_Scores_List, group = "Female Students")
Gender_Data <- rbind(Male_Data, Female_Data)
t.test(score ~ group, data = Gender_Data)
```

```
        Welch Two Sample t-test

data:  score by group
t = -1.8357, df = 703.12, p-value = 0.06683
alternative hypothesis: true difference in means between group Female Students and group Male Students is not equal to 0
95 percent confidence interval:
 -2.68343332  0.09016496
sample estimates:
mean in group Female Students   mean in group Male Students
                     493.7119                     495.0085
```

Race/Ethnicity:

```
Race <- c(AI_AN_Students, AA_B_Students, Asian_Students, Hispanic_Latino_Students, NH_PI_Students,
          White_Students, Other_Students)
Score <- c(AI_AN_2022_MCAS_MATH_Scores_List, AA_B_2022_MCAS_MATH_Scores_List, Asian_2022_MCAS_MATH_Scores_List,
           Hispanic_Latino_2022_MCAS_MATH_Scores_List, NH_PI_2022_MCAS_MATH_Scores_List, White_2022_MCAS_MATH_Scores_List,
           Other_2022_MCAS_MATH_Scores_List)
Race_Ethnicity_Data <- data.frame(Race, Score)
Race_Ethnicity_Data$Race <- as.factor(Race_Ethnicity_Data$Race)
One_Way_ANOVA_Test <- aov(Score ~ Race, data = Race_Ethnicity_Data)
summary(One_Way_ANOVA_Test)
```

```
             Df Sum Sq Mean Sq F value Pr(>F)
Race          6  77568   12928   152.1 <2e-16 ***
Residuals  1373 116710      85
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

```
pairwise.t.test(Race_Ethnicity_Data$Score, Race_Ethnicity_Data$Race, p.adjustment.method = "bonferroni")
```

```
        Pairwise comparisons using t tests with pooled SD

data:  Race_Ethnicity_Data$Score and Race_Ethnicity_Data$Race

                  Afr. Amer./Black Amer. Ind./Alaska Asian   Hawaii/Pac. Isl. Hisp./Lat. Other
Amer. Ind./Alaska 1.00000          -                 -       -                 -          -
Asian             < 2e-16          < 2e-16           -       -                 -          -
Hawaii/Pac. Isl.  0.11363          0.34490           0.03313 -                 -          -
Hisp./Lat.        0.16172          1.00000           < 2e-16 0.27670           -          -
Other             < 2e-16          0.00051           < 2e-16 1.00000           < 2e-16    -
White             < 2e-16          0.00032           < 2e-16 1.00000           < 2e-16    1.00000

P value adjustment method: holm
```