Bailey Williams
Problem Set 4
Due Date: July 20, 2025
Word Count: 1030
Submitted: July 23, 2025

Problem Set 4: Hypothesis Testing using Cross-tabulation and Means Comparisons

In this problem set, the techniques of cross-tabulation and means comparisons are used to test four hypotheses based on data from the 2020 American National Election Study. Prior to testing the hypotheses, the data is cleaned to remove missing values. For each hypothesis, a conclusion is drawn from the data using cross-tabulation or means comparisons with an associated graph. Finally, STATA code is included in the Appendix to support these conclusions.

Hypothesis 1:

Table 1: Tabular Test Comparing Holders of Advanced Degrees to non-Holders on how much Climate Change impacts Severe Weather in the US

POST: How much is climate change affecting severe weather/temperatures in US (percentage of total population included underneath values)	*Advanced Degree (Bachelor's degree or higher)*		*Total*
	No	*Yes*	
Not at all	435	258	693
	11.04	7.50	9.39
A little	661	464	1,125
	16.77	13.49	15.24
A moderate amount	927	614	1,541
	23.52	17.85	20.88
A lot	676	637	1,313
	17.15	18.52	17.79
A great deal	1,243	1,466	2,709
	31.53	42.63	36.70
Total	3,942	3,439	7,381
	100.00	100.00	100.00

p-value=0.00

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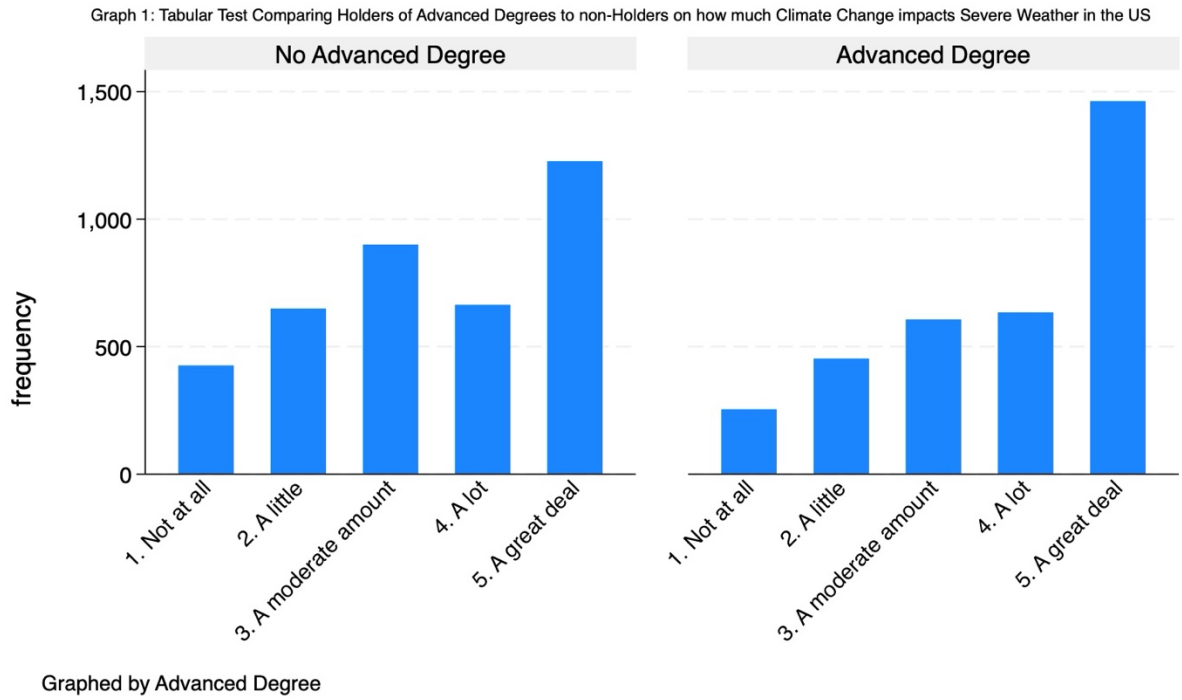
Table 1 shows results of the tabular test of hypothesis 1. The chi squared value for this tabular test is 129.12 and the p-value is 0.00, which makes this tabular test statistically significant because the p-value is less than 0.05.



Graph 1 shows a graphical representation of the data presented in Table 1, where the frequency of each response by each group is on the y-axis and the different response are on the x-axis.

I accept the hypothesis that those who hold an advanced degree are more likely to believe climate change affects severe weather in the US than those without an advanced degree and reject the null hypothesis that there is no relationship between holding an advanced degree and believing that climate change affects US weather patterns. The critical threshold for rejecting a null hypothesis is a p-value of 0.05. Since the p-value for this tabular test is 0.00, the body of evidence supports rejecting the null hypothesis and accepting the hypothesis.

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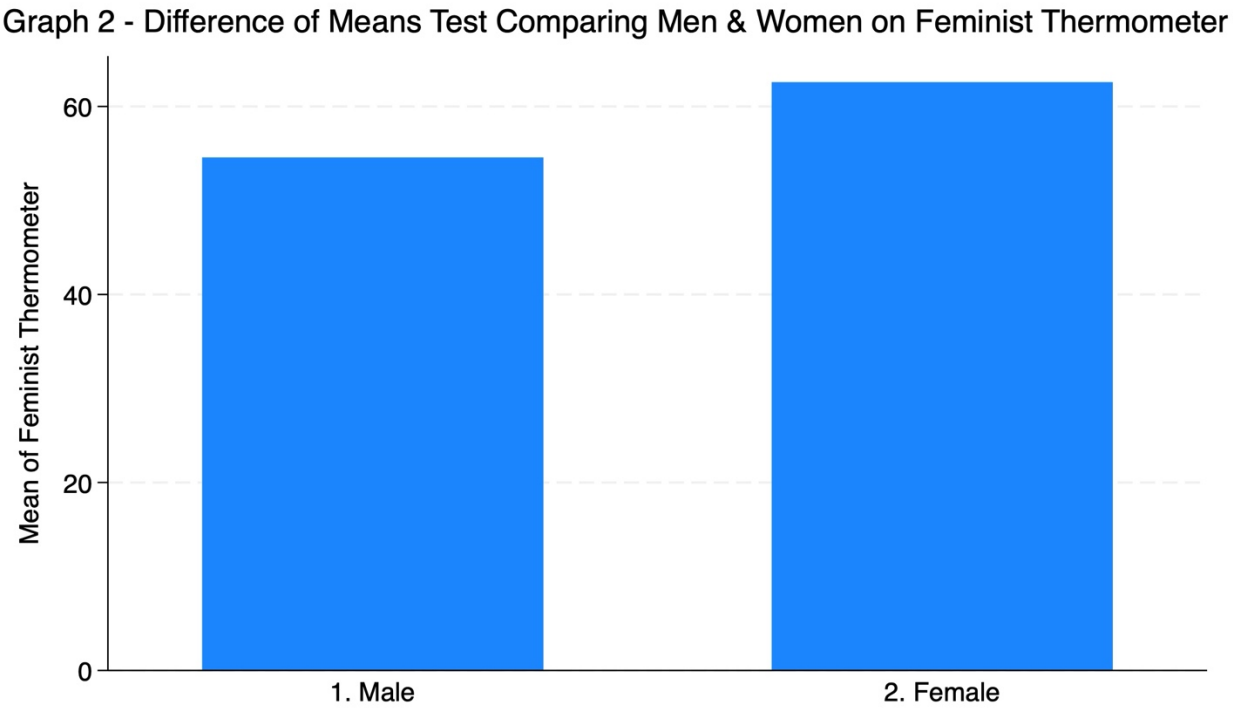
Hypothesis 2:

Table 2: Difference of Means Test Comparing Men and Women on the Feminist Thermometer Variable

Group	*Obs*	*Mean*	*Std. err.*	*Std. dev.*	*[95% conf.*	*interval]*
Male	3,324	54.58	.45	26.13	53.69	55.46
Female	3,955	62.58	.43	26.76	61.74	63.41
Combined	7,279	58.92	.31	26.77	58.31	59.54
Difference between groups		-8.00	.62		-9.22	-6.78

t-statistic=-12.84; p-value=0.00

Table 2 shows the results of the difference of means test for hypothesis 2. The t-statistic for this test is -12.84 and the p-value is 0.00, which makes this test statistically significant because the p-value is less than 0.05.



Graph 2 is a visual representation of the data presented in Table 2, where the mean of responses for male and female respondents to the feminist thermometer is depicted.

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I accept the hypothesis that women have warmer feelings towards feminists than men and reject the null hypothesis that men and women hold the same feelings towards feminists. The critical threshold for rejecting a null hypothesis is a t-value of ±2. Since the t-value for this difference of means test is -12.84, the null hypothesis is rejected. The average difference between groups is 8.00, which means that on average women's feelings for feminists are eight percentage points higher than men's.

Hypothesis 3:

Table 3: Tabular Test Comparing Attitudes towards the Death Penalty by Church Attendance

PRE: SUMMARY: R favor/oppose death penalty (percentage of total population included underneath values)	*PRE: Ever attend church or religious services*		
	Yes	*No*	*Total*
Favor strongly	1,728 44.17	1,527 36.70	3,255 40.32
Favor not strongly	766 19.58	882 21.20	1,648 20.41
Oppose not strongly	744 19.02	920 22.11	1,664 20.61
Oppose strongly	674 17.23	832 20.00	1,506 18.65
Total	3,912 100.00	4,161 100.00	8,073 100.00

p-value=0.00

Table 3 shows the results of the tabular test for hypothesis 3. The chi squared value for this test is 48.13 and the p-value is 0.00.

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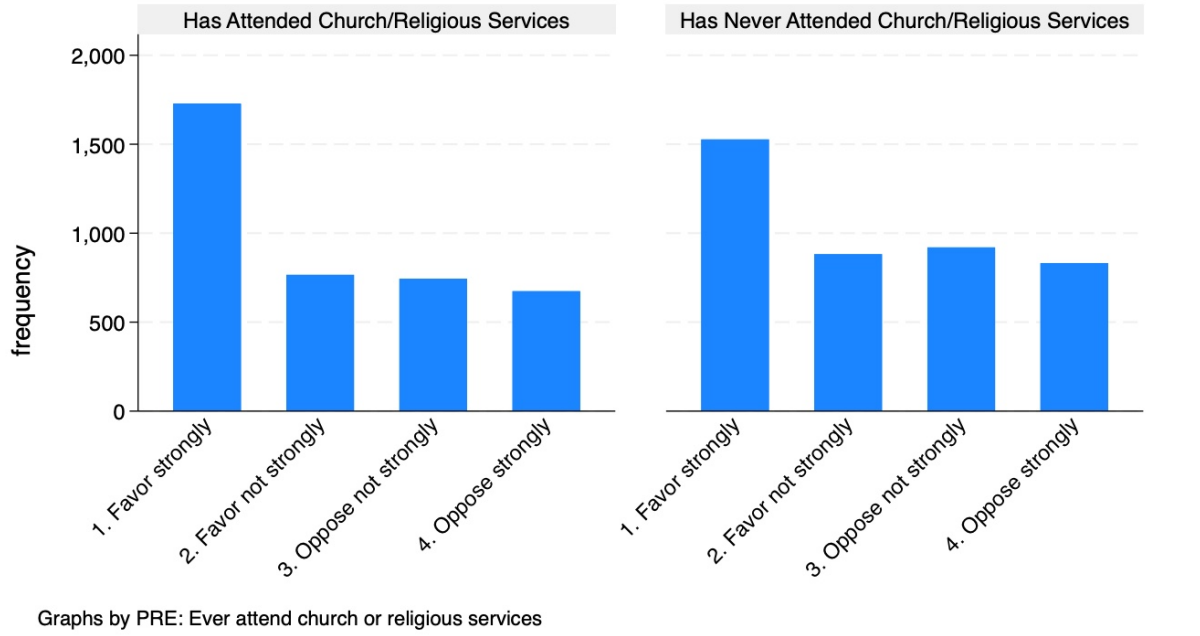
Graph 3: Tabular Test Comparing Attitudes towards the Death Penalty by Church Attendance



Graph 3 shows a visual representation of the results of the tabular test of hypothesis 3, where the frequency of each possible attitude towards the death penalty is separated by whether the respondent had ever attended church or another religious service.

I accept the hypothesis that those who have ever attended church or other religious services are more likely to favor using the death penalty than those who have not and reject the null hypothesis that there is no relationship between ever attending church or religious services and favoring the death penalty. The critical threshold for rejecting a null hypothesis is a p-value of 0.05. Since the p-value for this tabular test is 0.00, the body of evidence supports rejecting the null hypothesis and accepting the hypothesis.

Hypothesis 4:

Table 4: Difference of Means Test Comparing Middle & Upper Class to Lower & Working Class on the Labor Unions Thermometer Variable

Group	*Obs*	*Mean*	*Std. err.*	*Std. dev.*	*[95% conf.*	*interval]*
Middle or Upper Class	4,257	57.09937	.3674208	23.97263	56.37903	57.8197
Lower or Working Class	3,000	60.16533	.4360564	23.88379	59.31033	61.02033
Combined	7,257	58.36682	.281517	23.98187	57.81496	58.91867

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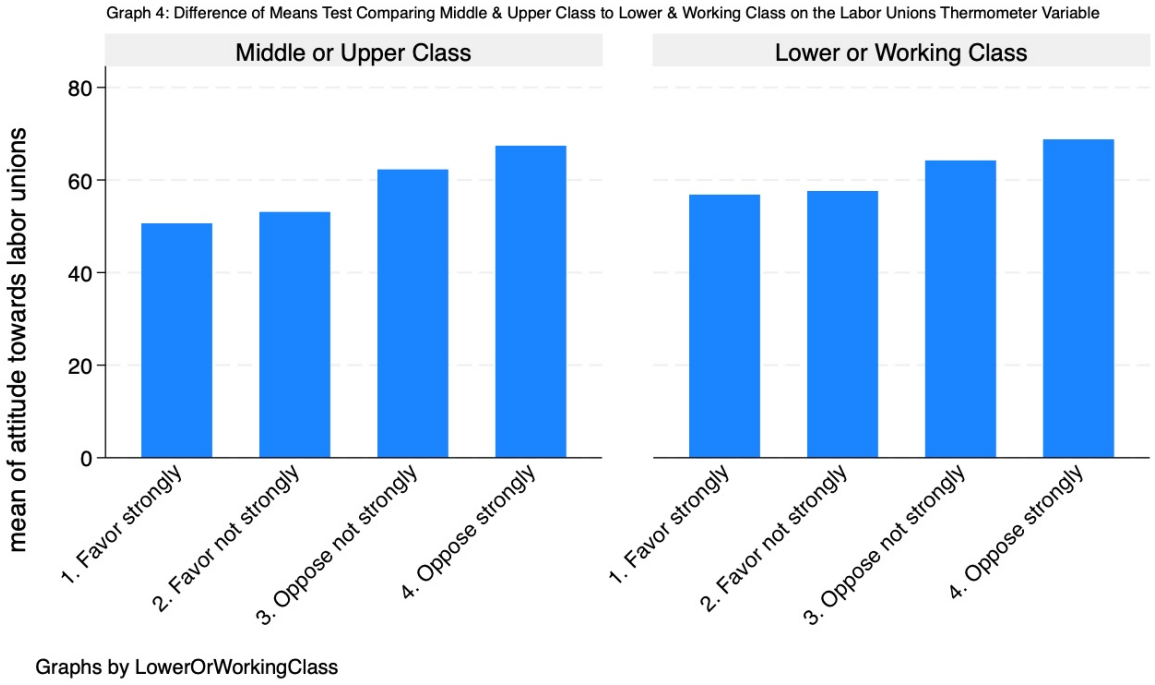
diff	-3.065968	.5705802	-4.184471	-1.947464

t-statistic=-5.37; p-value=0.00

Table 4 shows the results of the difference of means test of hypothesis 4. The t-statistic for this test is -5.37 and the p-value is 0.00, which makes this test statistically significant because the p-value is less than 0.05.



Graph 4 is a visual representation of the data presented in Table 4, where the mean of responses for middle/upper class and lower/working class respondents to the labor union thermometer is depicted.

I accept the hypothesis that members of the lower and working classes have a more favorable rating of labor unions than members of the middle and upper classes and reject the null hypothesis that all class types hold the same feelings towards labor unions. The critical threshold for rejecting a null hypothesis is a t-value of ±2. Since the t-value for this difference of means test is -5.37, the null hypothesis is rejected. The average difference between groups is three points, which means that on average the lower and working class respondents have a three percentage point warmer attitude towards labor unions than middle and upper classes.

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Appendix

```
use "/Users/baileywilliams/Downloads/anes_timeseries_2020.dta"

replace V201510 = . if V201510==95, nopromote

replace V201510 = . if V201510==-9, nopromote

replace V201510 = . if V201510==-8, nopromote

replace V201510 = . if V201510==-8, nopromote

generate AdvancedDegree = 0

replace AdvancedDegree = 1 if V201510>=6

replace V202332 = . if V202332<=0

tabulate V202332 AdvancedDegree, chi2 column

replace V201600 = . if V201600==-9, nopromote

replace V202160 = . if V202160<0

replace V202160 = . if V202160>100

ttest V202160, by(V201600)

graph bar (mean) V202160, over(V201600)

graph export "/Users/baileywilliams/Desktop/Problem Set 4 Graph 2.jpg", as(jpg)
name("Graph") quality(90)

graph save "Graph" "/Users/baileywilliams/Desktop/Graph 2.gph"

graph bar (count), over(V202332, label(angle(forty_five))) by(AdvancedDegree)

graph save "Graph" "/Users/baileywilliams/Desktop/Graph 1.gph"

graph export "/Users/baileywilliams/Desktop/Problem Set 4 Graph 1.jpg", as(jpg)
name("Graph") quality(90)

replace V201452 = . if V201452<=-8, nopromote

replace V201345x = . if V201345x==-2, nopromote

graph bar (count), over(V201345x, label(angle(forty_five))) by(V201452)
```

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```
graph export "/Users/baileywilliams/Desktop/Problem Set 4 Graph 3.jpg", as(jpg)
name("Graph") quality(90)

graph save "Graph" "/Users/baileywilliams/Desktop/Graph.gph"

tabulate V201345x V201452, chi2 column

replace V202352 = . if V202352<0

replace V202162 = . if V202162<0

replace V202162 = . if V202162>100

generate LowerOrWorkingClass = 0

replace LowerOrWorkingClass = . if V202352==.

replace LowerOrWorkingClass = 1 if V202352<=2

ttest V202162, by(LowerOrWorkingClass)

graph bar (mean) V202162, over(V201345x, label(angle(forty_five)))
by(LowerOrWorkingClass)

graph export "/Users/baileywilliams/Desktop/Problem Set 4 Graph 4.jpg", as(jpg)
name("Graph") quality(90)

graph save "Graph" "/Users/baileywilliams/Desktop/Graph 4.gph"

save "/Users/baileywilliams/Desktop/POLS 418 Problem Set 4.dta"
```