

HW #2

1. I'm going to look at opinions towards global warming as found in the July 2017 PPIC codebook. The index will be constructed from questions questions 10, 11, and 12 which ask about how serious a threat the respondent believes global warming poses, the respondent's worry about rising sea levels, and whether or not the respondent supports California state law requiring the reduction of greenhouse gas emissions. These all have missing variables. Q10 has missing variables 8 and 9 which amount to 1.9% and 0.3% of responses. Q11 has the missing values 8 and 9 which were responsible for 1.2% and 0.1% of responses. And Q12 also has missing values of 8 and 9 which were 6.8% and 0.4%. The 6.8% is quite a bit higher than the other values but I chose to remove it because the index being constructed here is about feelings about global warming and someone who doesn't know is harder to include in an index like that. The variables were also recoded. Q10 was renamed GWThreat because it is measures how much the respondent thinks Global Warming poses a threat and this scale was measured from 1-0 where 1 corresponded with a strong belief in the threat, 0.66 corresponded with a belief that Global Warming poses some kind of threat, 0.33 corresponded with global warming posing little threat, and 0 corresponded with no threat at all. Q11 was renamed with GWSea and measures respondents beliefs about their concern about sea levels rising on a scale from 1 (very concerned), 0.66 (somewhat concerned), 0.33 (not too concerned) and 0 (not at all concerned). Q12 was renamed to GWGas and measured correspondents support for a state law that requires the state of California to reduce its greenhouse gas emissions on a scale from 1 (favored) to 0 (opposed).

2. Here are the reports of the Cronbach's alpha scores for the three variables in the index. It's a pretty high alpha score, which points to these three things being a pretty solid measure of the concept in question. The alpha would actually be slightly higher without the GWGas variable, which makes sense. That variable is more of a question about a specific policy rather than a general attitude towards global warming.

Reliability Statistics

Cronbach's Alpha	N of Items
.819	3

Item Statistics

	Mean	Std. Deviation	N
GWThreat	.7404	.35216	1551
GWSea	.6117	.36831	1551
GWGas	.7466	.43509	1551

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
GWThreat	1.3583	.497	.741	.693
GWSea	1.4870	.499	.682	.744
GWGas	1.3520	.442	.618	.825

Statistics

RawGWBelief

N	Valid	1530
	Missing	177
Mean		2.1894
Median		2.6600
Mode		3.00
Std. Deviation		.92495
Variance		.856
Skewness		-1.193
Kurtosis		.301

I also have the measures from the raw index. This has a lot of different categories and isn't the most clear or easy to use or understand so I recorded it to make it simpler.

RawGWBelief

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	118	6.9	7.7	7.7
	.33	36	2.1	2.4	10.1
	.66	34	2.0	2.2	12.3
	.99	19	1.1	1.3	13.5
	1.00	20	1.1	1.3	14.8
	1.32	41	2.4	2.7	17.5
	1.33	41	2.4	2.7	20.2
	1.66	98	5.7	6.4	26.6
	1.99	61	3.6	4.0	30.6
	2.00	58	3.4	3.8	34.3
	2.32	139	8.1	9.1	43.4
	2.33	47	2.8	3.1	46.5
	2.66	349	20.4	22.8	69.3
	3.00	470	27.5	30.7	100.0
Total		1530	89.6	100.0	
Missing	System	177	10.4		
Total		1707	100.0		

Statistics

GWBelief

N	Valid	925
	Missing	782
Mean		.7105
Median		1.0000
Mode		1.00
Std. Deviation		.36798
Variance		.135
Skewness		-.848
Kurtosis		-.678

3. I recoded the RawGWBelief into GWBelief by breaking it down into three categories, values between 0 and .99 were coded to low, values between 1 and 1.99 were coded to mid, and values between 2-3 were coded to high. This made the graphs a lot more manageable and readable. It also revealed that 57% of the responses were a high level of belief in global warming and only 14.9% responded with a low level of belief.

GWBelief

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	low	138	8.1	14.9	14.9
	med	261	15.3	28.2	43.0
	hi	527	30.9	57.0	100.0
	Total	925	54.2	100.0	
Missing	System	782	45.8		
Total		1707	100.0		

4. The three variables I wanted to look at in relation to the GWBelief index were Q17 (would Californians be

willing to pay more for electricity from a sustainable source), Q36 (whether the respondent supported or opposed the decision President Trump made to withdraw from the Paris climate agreement), and Q39 (measuring political ideology). My hypothesis for the first one is that Californians who would be willing to pay extra for electricity would be more likely to have a strong belief in Global Warming. The rationale here is that someone who is willing to go a little further and pay more out of their own pocket is more likely to have strong beliefs in the cause they are supporting. As for the second, if someone supports the decision to withdraw from the Paris Climate decision, then they are less likely to have a strong belief in global warming. In general, many environmentalists have had serious issues with the Trump administration's approach to climate change and the question about the Paris Climate agreement even phrases it in such a way that says that the Paris Climate agreement is the “international agreement that tries to address climate change” which could bias a respondent who doesn’t know much about this particular issue but does know their stance on climate change to pick one side over the other. And finally, as to political ideology, if someone identifies more liberal, then they are more likely to have a strong belief in global warming. Climate change has been a deeply polarized issue and belief in Global Warming and climate change has been more generally embraced by the left than the right.

GWBelief * Electricity

Crosstab

		Electricity		Total	
		oppose	support		
GWBelief	low	Count	116	18	134
		% within Electricity	28.2%	3.7%	15.0%
	med	Count	136	112	248
		% within Electricity	33.1%	23.1%	27.7%
	hi	Count	159	354	513
		% within Electricity	38.7%	73.1%	57.3%
Total		Count	411	484	895
		% within Electricity	100.0%	100.0%	100.0%

This generally appears to support the hypothesis I had made about what the percentage breakdown would be. Generally, those who in support of paying higher electricity costs for electricity from a renewable source are more likely to have a high level of belief in global warming. The opposing side, however, has a pretty even spread within the three categories with the highest percent being those who have a high level of belief in Global Warming. Part of this might be because of confounding factors not seen here in the graph. Perhaps these people are not economically able to pay extra for their electricity bills even if they would like to see it come more from sustainable sources or there could be the free rider effect where people might desire to have a specific outcome but be unwilling to actually contribute to the outcome.

GWBelief * Paris Crosstabulation

		Paris		Total	
		oppose	support		
GWBelief	low	Count	6	6	12
		% within GWBelief	50.0%	50.0%	100.0%
	med	Count	42	22	64
		% within GWBelief	65.6%	34.4%	100.0%
	hi	Count	121	137	258
		% within GWBelief	46.9%	53.1%	100.0%
Total		Count	169	165	334
		% within GWBelief	50.6%	49.4%	100.0%

Here the general breakdown is pretty evenly split. The biggest disparity is in the medium belief in global warming category in which more people who fit into the medium category of opposed the decision (65.6%) as compared to 34.4% of the medium belief in global warming who supported it. The one that surprised me the most was the group of the people with a strong belief in global warming who tended (albeit in a rather close set of percentages. 46.9% opposed the decision to withdraw and 53.1% supported it) to support the decision to withdraw from the Paris Climate Agreement. The question even includes the explanatory phrase that the Paris Climate Agreement is the “international agreement that tries to address climate change”.

GWBelief * ideology

Crosstab

		ideology			Total	
		conservative	center	liberal		
GWBelief	low	Count	105	18	12	135
		% within ideology	33.5%	7.2%	3.6%	15.1%
	med	Count	105	80	64	249
		% within ideology	33.5%	32.1%	19.2%	27.8%
	hi	Count	103	151	258	512
		% within ideology	32.9%	60.6%	77.2%	57.1%
Total		Count	313	249	334	896
		% within ideology	100.0%	100.0%	100.0%	100.0%

Ideology broke down in a way that was interesting as well. Conservatives actually were pretty much evenly split along all three levels of climate change belief with around a third of them in each category. The centrists and the liberals have a much clearer breakdown with only slim percentages having

low levels of belief in climate change, a mid level percentage having a medium level of belief in climate change, and then the majority by a significant amount of both categories having a high belief in climate change. My hypothesis that a higher percentage of liberals would support climate change appears to be true based on this cross tabulation. However, the conservative breakdown is the element of this that is the most interesting to me. I wouldn't have guessed at such an even divide which makes me curious about what kind of differences may exist on a broader regional or national scale.

5. I did Chi Square tests for each independent variable which came back with the following graphs.

Electricity

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	143.115 ^a	2	.000
Likelihood Ratio	152.414	2	.000
Linear-by-Linear Association	141.976	1	.000
N of Valid Cases	895		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 61.54.

Here the p value is .000 which indicates that it is very unlikely that these results occurred by chance.

Paris

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	7.195 ^a	2	.027
Likelihood Ratio	7.301	2	.026
Linear-by-Linear Association	4.030	1	.045
N of Valid Cases	334		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 5.93.

The p value for the relationship between a respondent's beliefs about the Paris climate treaty and their relative strength of belief in global warming has a higher p value of .027. This still is less than the generally accepted threshold of 0.05 but the difference between this and the others is the strength of it. The chart in data lab 11 lists this chi square result as significant, rather than very significant. However, it

is still very unlikely that this relationship occurred by chance and much more likely that it reflects the population that was sampled.

Ideology

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	180.971 ^a	4	.000
Likelihood Ratio	182.208	4	.000
Linear-by-Linear Association	162.139	1	.000
N of Valid Cases	896		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 37.52.

The Chi square for Ideology and its relationship with strength of belief in global warming gave a p value of .000. This is a very strong indicator that these results are not due to chance and instead are representative of the population sampled.

I then did ANOVA analysis on these relationships using the Raw version of the GWBelief index because a scale from 0-3 is a little easier to understand than a scale that runs from 0-1. This does mean that the scaling might be different but in numbers closer to three indicate higher levels of support, numbers between 1 and two indicate middle levels of belief in global warming and numbers less than 1 indicate low levels of belief in global warming.

Electricity

Descriptives

RawGWBelief

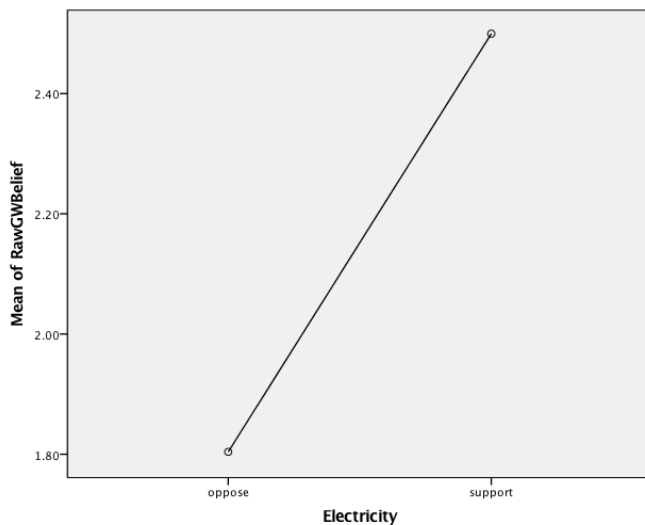
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
oppose	662	1.8039	1.06874	.04155	1.7223	1.8855	.00	3.00
support	820	2.4997	.64984	.02269	2.4552	2.5442	.00	3.00
Total	1482	2.1891	.92891	.02413	2.1417	2.2364	.00	3.00

ANOVA

RawGWBelief

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	177.312	1	177.312	238.425	.000
Within Groups	1100.647	1480	.744		
Total	1277.959	1481			

Means Plots



The mean for those who oppose spending more on electricity from renewable resources is quite a bit lower than the mean for those who support paying more for their electricity. For those in support, the 95% confidence interval is between 2.456 and 2.544 which does not touch or overlap with the boundaries for those who oppose it whos 95% Confidence Interval for the mean is between 1.722 and 1.886. This difference indicates that those who support paying more for their sustainable electricity have a higher score on the Global Warming belief index than those who do not.

The ANOVA chart gives the significance of this relationship which is .000 which means that it's unlikely that this relationship occurred due to chance and thus is statistically significant.

The means plot simply gives a visual representation of what is described in the Descriptives chart in terms of the means of both groups.

Descriptives

RawGWBelief

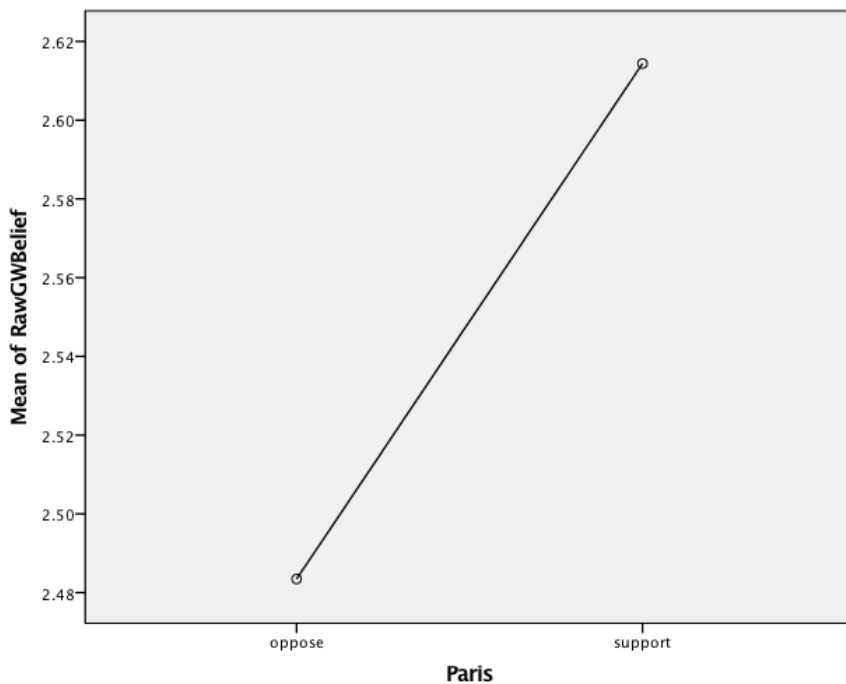
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
oppose	337	2.4835	.59056	.03216	2.4202	2.5467	.00	3.00
support	231	2.6144	.64466	.04243	2.5308	2.6980	.00	3.00
Total	568	2.5367	.61593	.02584	2.4859	2.5874	.00	3.00

ANOVA

RawGWBelief

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.349	1	2.349	6.247	.013
Within Groups	212.805	566	.376		
Total	215.153	567			

Means Plot



Here the mean GWBelief score of those who oppose the President's decision to remove the United States from the Paris Climate Agreement is actually lower than the mean score of those who supported this decision, though they are very close. The confidence intervals actually overlap a bit with oppose running from 2.420 to 2.457 and support running from 2.530 to 2.698 which indicates that while those who opposed the decision tended to have a little less belief in Global Warming they were still generally close to those who supported it and, based on this mean, with still generally high values. This result surprised me, which may be due to anecdotal evidence on my part, but I was expecting this to be the opposite way as many of the staunch environmentalists I know were

strongly against withdrawing from the Paris Climate Agreement but it appears to not necessarily be the case for everyone, based on this date.

The ANOVA box also gives the statistical significance level for the relationship between opinions on the US Withdrawing from the Paris Climate Agreement and general belief in global warming at a .013. This is still a good statistical significance score (under 0.05), though again it is higher than the significance for the other two relationships.

Ideology

Descriptives

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
conservative	485	1.6771	1.11117	.05044	1.5780	1.7762	.00	3.00
center	422	2.3152	.78395	.03818	2.2402	2.3903	.00	3.00
liberal	568	2.5367	.61593	.02584	2.4859	2.5874	.00	3.00
Total	1475	2.1906	.92974	.02421	2.1431	2.2380	.00	3.00

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	202.547	2	101.274	139.024	.000
Within Groups	1071.565	1471	.728		
Total	1274.112	1473			

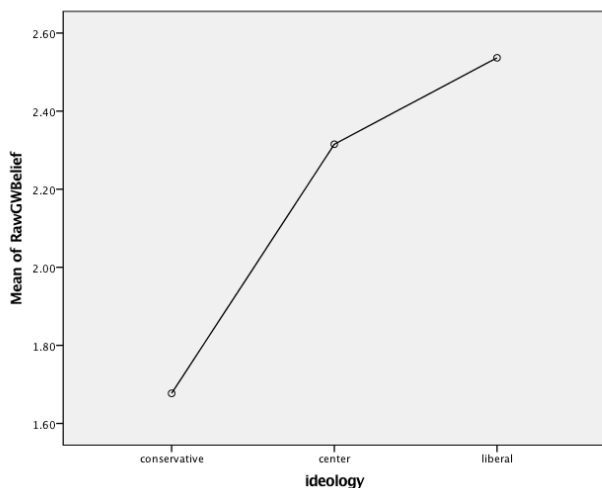
Post Hoc Tests

Multiple Comparisons

Dependent Variable: RawGWBelief
Scheffe

(I) ideology	(J) ideology	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
conservative	center	-.63812 [*]	.05683	.000	-.7774	-.4989
	liberal	-.85956 [*]	.05276	.000	-.9888	-.7303
center	conservative	.63812 [*]	.05683	.000	.4989	.7774
	liberal	-.22144 [*]	.05487	.000	-.3559	-.0870
liberal	conservative	.85956 [*]	.05276	.000	.7303	.9888
	center	.22144 [*]	.05487	.000	.0870	.3559

Means Plots



Global warming.

The descriptive chart for Ideology shows a pretty sharp divide in means where the conservative mean is 1.677, the centrist mean is 2.315, and the liberal mean is 2.537. The center and liberal means are closer to each other, as are their confidence intervals but none

of the confidence intervals overlap. All three sets of ideologies form rather distinct clusters in their beliefs about global warming, even if the liberals and centrists tend to be closer together.

The ANOVA analysis provides the significance figure for this relationship at .000 which implies that the relationship between political ideology and belief in global warming is a statistically significant one that is unlikely to be due to chance.

Also, since the Ideology variable had three categories, the ANOVA analysis also provided a comparison between the categories. There is a mean difference of close to one whole point between conservatives and liberals (.8596) and around half a point for conservatives and centrists (.6381). Centrists and liberals are closer together with a difference of (.2214). All of these differences between categories have a statistical significance of .000 implying that it's highly likely that these represent the actual population.

The means plot provides a visual breakdown of the difference and clearly shows that as one tends more liberal in their ideology, they also tend to have a higher amount of belief in

6. Out of the three variables I tested, I think political ideology presented the best explanation in variation in the DV GWBelief. The other ones, willingness to pay additional money for electricity and opinion on the US withdrawing from the Paris Climate Agreement, also presented statistically significant relationships with the dependent variable but I'm picking Ideology as the best explanation for a couple reasons. In the cross tabulation, especially in regard to the centrist and liberal categories, the data showed a clear split where some liberals and centrists didn't believe strongly in global warming, a few more believed at the mid amount, and most believed strongly in global warming. In particular, this breakdown was pretty astonishing for the liberal category which went from low = 3.6%, med = 19.2%, and high = 77.2%. Conservatives in general were more evenly split on the issue, which I found interesting and wonder if it would be the case in places outside of California.

The Chi-Square for this relationship also returned a strong statistical significance at .000 which was echoed in the ANOVA. The ANOVA also helped visualize the differences between the groups and the three distinct clusters they made as well as the statistically significant difference between all of the different categories. This additional set of data was also interesting to have and look at.

On a broader level, I think the political ideology question is more likely to return answers that have actual knowledge behind them. It's a little easier to know one's own political ideology (at least in very broad strokes) than to keep up on the news about a specific event (in the case of the Paris Agreement variable). Additionally, it's possible that other factors (such as economic standing) might have influenced someone's answer in the case of the question about whether people were willing to pay extra for sustainable energy and their answer might not necessarily been as influenced by their environmental reasons.

The relationship between the ideology variable and the index of Global Warming belief is pretty clear, as someone becomes more liberal, they also become more supportive of global warming as a concept. This relationship is also statistically significant, making it unlikely it was just due to chance.

SYNTAX

```
DATASET ACTIVATE DataSet1.  
WEIGHT by Weight .  
FREQUENCIES VARIABLES=q10  
/ORDER=ANALYSIS.
```

```
FREQUENCIES VARIABLES=q11  
/ORDER=ANALYSIS.
```

```
FREQUENCIES VARIABLES=q12  
/ORDER=ANALYSIS.
```

```
MISSING VALUES q10 (8, 9).
recode q10 (1=1) (2=.66) (3=.33) (4=0) into GWThreat.
value labels GWThreat 1 'very' .66 'somewhat' .33 'little' 0 'no'.
```

```
missing values q11 (8,9).
recode q11 (1=1) (2=.66) (3=.33) (4=0) into GWSea.
value labels GWSea 1 'very' .66 'somewhat' .33 'little' 0 'no'.
```

```
missing values q12 (8, 9).
recode q12 (1=1) (2=0) into GWGas.
value labels GWGas 1 'yes' 0 'no'.
```

```
reliability
/variables= GWThreat GWSea GWGas
/scale('GW3') GWThreat GwSea GWGas
/statistics=descriptive
/summary=total.
```

```
compute RawGWBelief = (GWThreat + GWSea + GWGas).
fre var RawGWBelief
/statistics = mean median mode stddev var skew kurtosis.
```

```
recode RawGWBelief (0, .99=0) (1 thru 1.99= .5) (2, 3 =1) into GWBelief.
value labels GWBelief 0 'low' .5 'med' 1 'hi'.
fre var GWBelief
/statistics = mean median mode stddev var skew kurtosis.
```

```
fre var q39.
missing values q39 (8, 9).
recode q39 (1, 2 =1) (3=.5) (4,5 = 0) into ideology.
value labels ideology 1 'liberal' .5 'center' 0 'conservative'.
fre var ideology
```

```
fre var q36.
missing values q36 (8, 9).
recode q39 (1 =1) (2=0) into Paris.
value labels Paris 1 'support' 0 'oppose'.
fre var Paris
```

```
fre var q17.
missing values q17 (8, 9).
```

```
recode q17 (1 =1) (2=0) into Electricity.  
value labels Electricity 1 'support' 0 'oppose'.  
fre var Electricity
```

```
crosstabs tables = GWBelief by ideology, Paris, Electricity  
/ cells = column count  
/statistics = btau chisq.
```

```
oneway RawGWBelief by Electricity  
/statistics=descriptives  
/ranges=scheffe  
/plot means.
```

```
oneway RawGWBelief by Paris  
/statistics=descriptives  
/ranges=scheffe  
/plot means.
```

```
oneway RawGWBelief by Ideology  
/statistics=descriptives  
/ranges=scheffe  
/plot means.
```

Comments:

Index construction is very good.

Recoding of index isn't based on raw frequency distribution and hence not optimal.

First two hypotheses seem to have IVs which are more likely dependent on the DV.

Third hypothesis and IV make good sense.

Crosstabs don't report measures of association.

Appropriate use of Chi-square.

Anova need not be run for first two Ivs since they have only two categories.

Good use of Anova for the third IV.

Grade: 85