1. Exploring the Data



Hpain$Hcolor: Light Blond

median mean SE.mean CI.mean.0.95 var std.dev

60.00000000 59.20000000 3.81313519 10.58696054 72.70000000 8.52642950

coef.var skewness skew.2SE kurtosis kurt.2SE normtest.W

0.14402753 0.06016732 0.03295500 -1.65679968 -0.41419992 0.99103215

normtest.p

0.98318139

-----------------------------------------------------------

Hpain$Hcolor: Dark Blond

median mean SE.mean CI.mean.0.95 var std.dev

52.00000000 51.20000000 4.15210790 11.52809965 86.20000000 9.28439551

coef.var skewness skew.2SE kurtosis kurt.2SE normtest.W

0.18133585 0.05649776 0.03094510 -2.03463655 -0.50865914 0.93979043

normtest.p

0.66445690

-----------------------------------------------------------

Hpain$Hcolor: Light Brunette

median mean SE.mean CI.mean.0.95 var std.dev

41.5000000 42.5000000 2.7233558 8.6669335 29.6666667 5.4467115

coef.var skewness skew.2SE kurtosis kurt.2SE normtest.W

0.1281579 0.3898858 0.1922163 -1.8398482 -0.3513018 0.9306073

normtest.p

0.5979735

-----------------------------------------------------------

Hpain$Hcolor: Dark Brunette

median mean SE.mean CI.mean.0.95 var std.dev

35.0000000 37.4000000 3.7229021 10.3364333 69.3000000 8.3246622

coef.var skewness skew.2SE kurtosis kurt.2SE normtest.W

0.2225845 0.6736152 0.3689542 -1.4133691 -0.3533423 0.8832138

normtest.p

0.3241291

> leveneTest(Hpain$PainScore, Hpain$Hcolor, center = median)

Levene's Test for Homogeneity of Variance (center = median)

Df F value Pr(>F)

group 3 0.3927 0.76

15

ANOVA assumptions:

* By looking at the descriptive statistics, I can see that the data groups are most likely normally distributed.
* The pain tolerance is measured at least at the interval level.
* Homogeneity of variance is satisfied by Levene’s Test (.
* Observations are taken from different people, so they are independent.

> Hmodel<-aov(PainScore~Hcolor, data = Hpain)

> summary(Hmodel)

Df Sum Sq Mean Sq F value Pr(>F)

Hcolor 3 1361 453.6 6.791 0.00411 \*\*

Residuals 15 1002 66.8

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Effect Size:

Using this formula:

SS(m) = ((1361 - (3)66.8)/ (2363+66.8)) ^.5

Effect Size: ω = .6911

Conclusion:

There was a significant effect by hair color on the amount of pain tolerance the person had, F(3,15)=6.791, p = .00411, ω = 0.6911.

Planned Comparisons

contrast1 contrast2 contrast3

Light Blond -1 -1 0

Dark Blond -1 1 0

Light Brunette 1 0 -1

Dark Brunette 1 0 1

Levels: Light Blond Dark Blond Light Brunette Dark Brunette

Call:

aov(formula = PainScore ~ Hcolor, data = Hpain)

Residuals:

Min 1Q Median 3Q Max

-11.20 -5.45 -0.50 4.30 13.60

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 47.575 1.884 25.257 1.05e-13 \*\*\*

Hcolorcontrast1 -7.625 1.884 -4.048 0.00105 \*\*

Hcolorcontrast2 -4.000 2.584 -1.548 0.14251

Hcolorcontrast3 -2.550 2.741 -0.930 0.36695

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 8.172 on 15 degrees of freedom

Multiple R-squared: 0.576, Adjusted R-squared: 0.4912

F-statistic: 6.791 on 3 and 15 DF, p-value: 0.004114

Contrast Effect Sizes:

r(contrast1) = ((-4.048^2)/(-4.048^2+15))^.5 = .723

r(contrast2) = ((-1.548^2)/(-1.548^2+15))^.5 = .371

r(contrast3) = ((-.93^2)/(-.93^2+15))^.5 = .233

Conclusion Based on Contrasts:

Planned contrasts show that subjects who had blond hair had a higher pain threshold than subjects with brunette hair, .

Planned contrasts also show that subjects who had light blond hair did not significantly have a higher pain threshold score than subjects with dark blond hair, .

Lastly, planned contrasts show that subjects who had light brunette hair did not significantly have a higher pain threshold score than subjects with dark brunette hair,

To conclude, subjects with blond hair did seem to have a higher pain tolerance than subjects with brunette hair, however, subjects with light blond hair did not have a higher pain tolerance than subjects with dark blond hair, and subjects with light brunette hair did not have a higher pain tolerance than subjects with dark brunette hair.

2. Exploring the Data



: High

: Practice

median mean SE.mean CI.mean.0.95 var std.dev

6.0000000 5.8636364 0.4018111 0.8356120 3.5519481 1.8846613

coef.var skewness skew.2SE kurtosis kurt.2SE normtest.W

0.3214151 0.1872053 0.1906516 -0.2845140 -0.1493073 0.9701728

normtest.p

0.7150404

-----------------------------------------------------------

: Low

: Practice

median mean SE.mean CI.mean.0.95 var std.dev

6.00000000 5.68181818 0.33797438 0.70285620 2.51298701 1.58524036

coef.var skewness skew.2SE kurtosis kurt.2SE normtest.W

0.27900230 -0.45546364 -0.46384836 -0.95645447 -0.50192836 0.89195446

normtest.p

0.02058817

-----------------------------------------------------------

: Medium

: Practice

median mean SE.mean CI.mean.0.95 var std.dev

4.50000000 4.36363636 0.50771304 1.05584707 5.67099567 2.38138524

coef.var skewness skew.2SE kurtosis kurt.2SE normtest.W

0.54573412 -0.01001395 -0.01019830 -0.92027254 -0.48294080 0.97446125

normtest.p

0.81135953

-----------------------------------------------------------

: High

: Review

median mean SE.mean CI.mean.0.95 var std.dev

4.00000000 3.95454545 0.34489017 0.71723838 2.61688312 1.61767831

coef.var skewness skew.2SE kurtosis kurt.2SE normtest.W

0.40906808 -0.44564821 -0.45385224 -0.14072067 -0.07384742 0.93366620

normtest.p

0.14627837

-----------------------------------------------------------

: Low

: Review

median mean SE.mean CI.mean.0.95 var std.dev

4.00000000 4.13636364 0.35611817 0.74058827 2.79004329 1.67034227

coef.var skewness skew.2SE kurtosis kurt.2SE normtest.W

0.40381901 0.55570821 0.56593835 -0.56283465 -0.29536448 0.92132789

normtest.p

0.08099152

-----------------------------------------------------------

: Medium

: Review

median mean SE.mean CI.mean.0.95 var std.dev

3.5000000 3.9545455 0.5074223 1.0552424 5.6645022 2.3800215

coef.var skewness skew.2SE kurtosis kurt.2SE normtest.W

0.6018445 0.5975237 0.6085236 -0.4249396 -0.2229999 0.9385310

normtest.p

0.1845695

Levene's Test for Homogeneity of Variance (center = median)

Df F value Pr(>F)

group 5 1.675 0.1453

126

ANOVA assumptions:

* By looking at the descriptive statistics, I can see that the data groups are most likely normally distributed. Although, Low Class Standing and Review data group may by non-normally distributed, but non-normal data is proven to not affect an ANOVA test much at all when the data groups have the same amount of observations which they do in this case.
* The helpfulness amount is measured at least at the interval level.
* Homogeneity of variance is satisfied by Levene’s Test (.
* Observations are taken from different people, so they are independent.

> PracModel<-aov(Helpfullness ~ Standing\*ExamPrep, data = PracData)

> summary(PracModel)

Df Sum Sq Mean Sq F value Pr(>F)

Standing 2 16.5 8.25 2.170 0.118386

ExamPrep 1 54.7 54.73 14.399 0.000229 \*\*\*

Standing:ExamPrep 2 13.5 6.73 1.772 0.174244

Residuals 126 479.0 3.80

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

There was not a significant main effect by the class standing of the student, on the amount of helpfulness, *F*(2, 126) = 2.170, p = .118386.



There was a significant main effect by the exam preparation the student took, on the amount of helpfulness, *F*(1, 126) = 14.399, p = 0.000229.



There was not a significant interaction between the class standing of the student and the exam preparation of the student, on the amount of helpfulness, *F*(2, 126) = 1.772, p = .174



Overall Conclusion:

There was not a significant interaction between the class standing of the student and the exam preparation of the student, on the amount of helpfulness, *F*(2, 126) = 1.772, p = .174. This indicates that students who used studied using a practice exam and students who attended a review session were not affected differently based off of their class standing. Specifically, the amount of helpfulness was greater for low standing students who studied using a practice exam (M=5.682, SD=1.585) over low standing students who studied using a review session (M=4.136, SD=1.6703), medium standing students had slightly more helpfulness from the practice test (M=4.364, SD=2.381) than the review session (M=3.955, SD=2.38), and high class standing students said they got significantly more helpfulness out of the practice exam (M=5.864, SD=1.885) rather than the review session (M=3.955, SD=1.618). There is no significant amount of difference between class standings when it comes to the amount of helpfulness they found. There was significantly more helpfulness gotten out of the practice exam when compared to the review session.

3.

Single.Blade Twin.Blade diff

median 7.0000000 10.5000000 -3.0000000

mean 8.1250000 11.0000000 -2.8750000

SE.mean 1.3684911 1.2817399 1.6737202

CI.mean.0.95 3.2359672 3.0308332 3.9577194

var 14.9821429 13.1428571 22.4107143

std.dev 3.8706773 3.6253079 4.7339956

coef.var 0.4763911 0.3295734 -1.6466072

skewness 0.3182738 0.3148158 -0.1529845

skew.2SE 0.2115897 0.2092908 -0.1017047

kurtosis -1.5647303 -1.3529655 -1.1863225

kurt.2SE -0.5283108 -0.4568112 -0.4005463

normtest.W 0.9319999 0.9710086 0.9832670

normtest.p 0.5344541 0.9058034 0.9772329

Single.Blade (Average Mean, Standard Error) = (8.125, 1.37)

Twin.Blade (Average Mean, Standard Error) = (11, 1.28)

Twin-blade razors seem to get more shaves out of the blades than a single-blade razor by their means. Also, the sampling distribution of the differences between the shaves is most likely normally distributed because the p-value of the scores is >.05 at p = .977.

Paired t-test

data: RazData$Single.Blade and RazData$Twin.Blade

t = -1.7177, df = 7, p-value = 0.06477

alternative hypothesis: true difference in means is less than 0

95 percent confidence interval:

-Inf 0.2959945

sample estimates:

mean of the differences

-2.875

On average, there is some evidence that the managers got more shaves out of a twin-blade razor (M = 11, SE = 1.28) than a single-blade razor (M = 8.125, SE = 1.37), t(7) = -1.7177, p<.1 at p=.06477, it also had a moderately big effect size at r = .544. This test proves that there is some evidence behind the major blade manufacturer’s claim that twin-blade razors offer more shaves than single-blade razors. This is further proved by the twin-blade razors having a higher mean number of shaves than single-blade razors.

Paired t-test

data: RazData$Single.Blade and RazData$Twin.Blade

t = -1.7177, df = 7, p-value = 0.1295

alternative hypothesis: true difference in means is not equal to 0

95 percent confidence interval:

-6.832719 1.082719

sample estimates:

mean of the differences

-2.875

I am 95% confident that the mean number of shaves with single-blade razors is 6.833 shaves less to 1.083 shaves more than twin blade razors mean number of shaves.

(Although this isn’t significant, so this most likely isn’t that accurate.)

4.

a. Error Bar Graph



The two means seem relatively close together, although, reindeer dash average dash times seem to be a little higher in 2017.

Name t2007 t2017 pMean ADJ t2007\_ADJ\_ADJ

median NA 4.08500000 4.12000000 4.10250000 4.937500e-02 4.116875000

mean NA 4.12625000 4.17750000 4.15187500 3.885781e-16 4.126250000

SE.mean NA 0.24587989 0.25000536 0.24746020 2.474602e-01 0.015596402

CI.mean NA 0.58141355 0.59116873 0.58515039 5.851504e-01 0.036879631

var NA 0.48365536 0.50002143 0.48989241 4.898924e-01 0.001945982

std.dev NA 0.69545335 0.70712193 0.69992315 6.999231e-01 0.044113288

coef.var NA 0.16854368 0.16926916 0.16858001 1.801242e+15 0.010690891

skewness NA 0.13223018 0.12636715 0.13568675 -1.356867e-01 0.702101811

skew.2SE NA 0.08790715 0.08400938 0.09020508 -9.020508e-02 0.466760054

kurtosis NA -1.75494505 -1.78077641 -1.77162848 -1.771628e+00 -1.166792032

kurt.2SE NA -0.59253433 -0.60125595 -0.59816727 -5.981673e-01 -0.393952128

normtest.W NA 0.94423337 0.93209832 0.93954832 9.395483e-01 0.875596586

normtest.p NA 0.65315105 0.53536783 0.60664159 6.066416e-01 0.170843345

t2017\_ADJ diff

median 4.186875000 -0.070000000

mean 4.177500000 -0.051250000

SE.mean 0.015596402 0.031192805

CI.mean 0.036879631 0.073759263

var 0.001945982 0.007783929

std.dev 0.044113288 0.088226575

coef.var 0.010559734 -1.721494150

skewness -0.702101811 0.702101811

skew.2SE -0.466760054 0.466760054

kurtosis -1.166792032 -1.166792032

kurt.2SE -0.393952128 -0.393952128

normtest.W 0.875596586 0.875596586

normtest.p 0.170843345 0.170843345

2007 Time in Seconds (Average Mean, Standard Error) = (4.126, .246)

2017 Time in Seconds (Average Mean, Standard Error) = (4.178, .25)

The reindeer seem to be slightly faster in the 1000-mile dash in 2007 than they were in 2017 by their means. Also, the sampling distribution of the differences between the two dashes is most likely normally distributed because the p-value of the difference between scores is >.05 at p = .1708

>dep.t.test<-t.test(Rdata$t2007, Rdata$t2017, paired = TRUE, alternative = "less")

> dep.t.test

Paired t-test

data: Rdata$t2007 and Rdata$t2017

t = -1.643, df = 7, p-value = 0.07219

alternative hypothesis: true difference in means is less than 0

95 percent confidence interval:

-Inf 0.007847221

sample estimates:

mean of the differences

-0.05125

On average, there is some evidence that Santa Claus’s reindeer in 2007 (M = 4.126, SE = ,246) were faster than in 2017 (M = 4.178, SE = .25), t(7) = -1.643, p<.1 at p=.0722, it also had moderately big effect size at r = .528. This test proves that there is some evidence behind Santa Claus’s claim that his reindeer are becoming slower with age. Also, to further back this up, the 2007 mean 1000-mile dash was slightly lower than the 2017 mean 1000-mile dash meaning the reindeer ran slightly faster back then.

> dep.t.test<-t.test(Rdata$t2007, Rdata$t2017, paired = TRUE)

> dep.t.test

Paired t-test

data: Rdata$t2007 and Rdata$t2017

t = -1.643, df = 7, p-value = 0.1444

alternative hypothesis: true difference in means is not equal to 0

95 percent confidence interval:

-0.12500926 0.02250926

sample estimates:

mean of the differences

-0.05125

I am 95% confident that the mean time in seconds for the reindeer to run the 1000-mile dash in 2007 was .125 seconds less to .023 seconds more than the 1000-mile dash in 2017.

(Although this isn’t significant, so this most likely isn’t that accurate.)

5.

Call:

lm(formula = Precipitation ~ Altitude + Latitude + CoastDist,

data = RainStat)

Residuals:

Min 1Q Median 3Q Max

-28.722 -5.603 -0.531 3.510 33.317

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) -1.024e+02 2.921e+01 -3.505 0.001676 \*\*

Altitude 4.091e-03 1.218e-03 3.358 0.002431 \*\*

Latitude 3.451e+00 7.949e-01 4.342 0.000191 \*\*\*

CoastDist -1.429e-01 3.634e-02 -3.931 0.000559 \*\*\*

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 11.1 on 26 degrees of freedom

Multiple R-squared: 0.6003, Adjusted R-squared: 0.5542

F-statistic: 13.02 on 3 and 26 DF, p-value: 2.205e-05

Based off the model, precipitation(i) = -100.24 + .004091altitude(i) + 3.451latitude(i) - .1429coastdist(i).

The model predicts the average rainfall relatively well. The model is significant along with all of its predictor variables being significant too at p-values <.05.

b. The predictor variables explain about 60.03% of the variation in average annual rainfall for the various California cities.

c. Independence of Errors:

durbinWatsonTest(RainStat2)

lag Autocorrelation D-W Statistic p-value

1 -0.1329711 2.260009 0.448

Alternative hypothesis: rho != 0

The Durbin-Watson test statistic is 2.26, and the p-value for the test statistic is .448. The test statistic is close to 2 but it isn’t significantly different anyways because the p-value is greater than .05, so the errors of the model do appear to be independent.

d. Based off my previous model, I expect City B to receive .1429 less rainfall than City A.

6.

Cell Contents

|-------------------------|

| Count |

| Expected Values |

| Chi-square contribution |

| Row Percent |

| Column Percent |

| Total Percent |

| Std Residual |

|-------------------------|

Total Observations in Table: 1943

|

| Freshmen | Sophomore | Junior | Senior | Row Total |

-------------|-----------|-----------|-----------|-----------|-----------|

[1,] | 490 | 390 | 360 | 460 | 1700 |

| 483.839 | 379.722 | 362.223 | 474.215 | |

| 0.078 | 0.278 | 0.014 | 0.426 | |

| 28.824% | 22.941% | 21.176% | 27.059% | 87.494% |

| 88.608% | 89.862% | 86.957% | 84.871% | |

| 25.219% | 20.072% | 18.528% | 23.675% | |

| 0.280 | 0.527 | -0.117 | -0.653 | |

-------------|-----------|-----------|-----------|-----------|-----------|

[2,] | 50 | 37 | 40 | 55 | 182 |

| 51.799 | 40.653 | 38.779 | 50.769 | |

| 0.062 | 0.328 | 0.038 | 0.353 | |

| 27.473% | 20.330% | 21.978% | 30.220% | 9.367% |

| 9.042% | 8.525% | 9.662% | 10.148% | |

| 2.573% | 1.904% | 2.059% | 2.831% | |

| -0.250 | -0.573 | 0.196 | 0.594 | |

-------------|-----------|-----------|-----------|-----------|-----------|

[3,] | 13 | 7 | 14 | 27 | 61 |

| 17.361 | 13.625 | 12.997 | 17.016 | |

| 1.096 | 3.222 | 0.077 | 5.858 | |

| 21.311% | 11.475% | 22.951% | 44.262% | 3.139% |

| 2.351% | 1.613% | 3.382% | 4.982% | |

| 0.669% | 0.360% | 0.721% | 1.390% | |

| -1.047 | -1.795 | 0.278 | 2.420 | |

-------------|-----------|-----------|-----------|-----------|-----------|

Column Total | 553 | 434 | 414 | 542 | 1943 |

| 28.461% | 22.337% | 21.307% | 27.895% | |

-------------|-----------|-----------|-----------|-----------|-----------|

Statistics for All Table Factors

Pearson's Chi-squared test

------------------------------------------------------------

Chi^2 = 11.83072 d.f. = 6 p = 0.06585352

Minimum expected frequency: 12.99743

(1, or 1.1 = “Nice”), (2, or 1.2 = “Neutral”), (3, or 1.3 = “Naughty”)

a. There is most likely a significant relationship between the between class year and Santa Claus’s determination of “Nice”, “Neutral”, and “Naughty” *χ*2(6) = 11.82072, p-value is <.1 at .

b. About 17 Seniors (17.02)

c.



The plot shows us that the amount of expected cases for being classified as “Nice” is relatively the same for all four class years with far more students as a whole being classified as “Nice” than “Neutral” or “Naughty”. The plot also shows us that the amount of expected cases for being classified as “Neutral” is relatively the same for all four class years, but far less students as whole were classified as “Neutral” as compared to “Nice”. Although, “Neutral” still clearly has slightly more students classified as it when compared to “Naughty”. Lastly, the plot shows us that the amount of expected cases for being classified as “Naughty” is relatively the same for all four class years with far less students as a whole being classified as “Naughty” when compared to “Neutral” or “Nice”.

7.

Call:

glm(formula = ATTORNEY ~ LOSS + GENDER + SEATBELT + dummyMarried +

dummyWidowed + dummyDivorced, family = binomial(), data = AutoData)

Deviance Residuals:

Min 1Q Median 3Q Max

-3.9888 -1.0175 0.1359 1.1179 1.7270

Coefficients:

Estimate Std. Error z value Pr(>|z|)

(Intercept) -0.588607 0.501834 -1.173 0.2408

LOSS 0.101979 0.012892 7.910 2.57e-15 \*\*\*

GENDER -0.635079 0.117299 -5.414 6.16e-08 \*\*\*

SEATBELT 0.569050 0.496596 1.146 0.2518

dummyMarried -0.000914 0.117311 -0.008 0.9938

dummyWidowed -0.922289 0.678812 -1.359 0.1742

dummyDivorced 0.718855 0.418555 1.717 0.0859 .

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for binomial family taken to be 1)

Null deviance: 1857.1 on 1339 degrees of freedom

Residual deviance: 1708.6 on 1333 degrees of freedom

AIC: 1722.6

Number of Fisher Scoring iterations: 6

modelChi <- attor$null.deviance - attor$deviance

chidf <- attor$df.null - attor$df.residual

chisq.prob <- 1 - pchisq(modelChi, chidf)

chisq.prob

p-value of logistic regression model = approimately 0, thus the model significantly fits the data

The model fits the data significantly, however, LOSS and GENDER are the only predictor variables that predict the outcome significantly with p-values of those two predictors being <.05.

Based off the model,

P(Attorney) = 1/(1+e^-(-.588607+.101979(LOSS)-.635079.(GENDER)+.569050(SEATBELT)-.000914(Married)-.922289(Widowed)+.718855(Divorced))

c.

No Multicollinearity:

VIF Values

LOSS GENDER SEATBELT dummyMarried dummyWidowed

1.018275 1.013528 1.009651 1.037704 1.017813

dummyDivorced

1.025425

Tolerance Values

LOSS GENDER SEATBELT dummyMarried dummyWidowed

0.9820529 0.9866526 0.9904409 0.9636664 0.9824983

dummyDivorced

0.9752055

None of the variance inflation factors are above 10. None of the tolerance values of the predictors are below .02. Also, the average VIF is not substantially greater than 1 with average VIF is 1.02. Thus, none of the predictor variables seem to be related.

d.

Using previous model,

P(Attorney) = 1/(1+e^-(-.588607+.101979(2000)-.635079(0)+.569050(1)-.000914(0)-.922289(0)+.718855(0))

P(Attorney) = Approximately a 100% chance he hired an attorney.

e.

exp(attor$coefficients)

(Intercept) LOSS GENDER SEATBELT dummyMarried

0.5551002 1.1073600 0.5298935 1.7665887 0.9990864

dummyWidowed dummyDivorced

0.3976080 2.0520825

The odds a female hires an attorney is .5298 times higher than if it was a male.

8.

Saturated Model

Statistics:

X^2 df P(> X^2)

Likelihood Ratio 0 0 1

Pearson 0 0 1

Model 1:

~ATTORNEY + GENDER + SEATBELT + ATTORNEY:GENDER + ATTORNEY:SEATBELT + SEATBELT:GENDER

Model 2:

~ATTORNEY \* GENDER \* SEATBELT

Deviance df Delta(Dev) Delta(df) P(> Delta(Dev)

Model 1 3.059096 1

Model 2 0.000000 0 3.059096 1 0.08029

Saturated 0.000000 0 0.000000 0 1.00000

Remove the three-interaction from model since p-value is greater than .05 at p = .08029. Next, check which two-interactions are relevant to the model.

> ATTORNEYGENDER<-update(threeWay, .~. -ATTORNEY:GENDER)

> anova(threeWay, ATTORNEYGENDER)

LR tests for hierarchical log-linear models

Model 1:

. ~ ATTORNEY + GENDER + SEATBELT + ATTORNEY:SEATBELT + GENDER:SEATBELT

Model 2:

~ATTORNEY + GENDER + SEATBELT + ATTORNEY:GENDER + ATTORNEY:SEATBELT + SEATBELT:GENDER

Deviance df Delta(Dev) Delta(df) P(> Delta(Dev)

Model 1 30.794469 2

Model 2 3.059096 1 27.735373 1 0.00000

Saturated 0.000000 0 3.059096 1 0.08029

> ATTORNEYGENDER<-update(threeWay, .~. -ATTORNEY:SEATBELT)

> anova(threeWay, ATTORNEYGENDER)

LR tests for hierarchical log-linear models

Model 1:

. ~ ATTORNEY + GENDER + SEATBELT + ATTORNEY:GENDER + GENDER:SEATBELT

Model 2:

~ATTORNEY + GENDER + SEATBELT + ATTORNEY:GENDER + ATTORNEY:SEATBELT + SEATBELT:GENDER

Deviance df Delta(Dev) Delta(df) P(> Delta(Dev)

Model 1 3.059667 2

Model 2 3.059096 1 0.0005711425 1 0.98093

Saturated 0.000000 0 3.0590958385 1 0.08029

> GENDERSEATBELT<-update(threeWay, .~. -GENDER:SEATBELT)

> anova(threeWay, GENDERSEATBELT)

LR tests for hierarchical log-linear models

Model 1:

. ~ ATTORNEY + GENDER + SEATBELT + ATTORNEY:GENDER + ATTORNEY:SEATBELT

Model 2:

~ATTORNEY + GENDER + SEATBELT + ATTORNEY:GENDER + ATTORNEY:SEATBELT + SEATBELT:GENDER

Deviance df Delta(Dev) Delta(df) P(> Delta(Dev)

Model 1 9.206856 2

Model 2 3.059096 1 6.147760 1 0.01316

Saturated 0.000000 0 3.059096 1 0.08029

Remove ATTORNEY:SEATBELT interaction since its p-value is above .05 at p = .98. Final model should include both ATTORNEY:GENDER and GENDER:SEATBELT interactions since both their p-values were less than .05.

Chi-square of both interactions:

ATTORNEY:GENDER – *χ*2(1) = 27.73, , odds ratio = .555

GENDER:SEATBELT – *χ*2(1) = 6.325, , odds ratio = .331

Final Model:

Statistics:

X^2 df P(> X^2)

Likelihood Ratio 3.059667 2 0.2165717

Pearson 3.057318 2 0.2168262

The three-way loglinear analysis produced a final model that retained the attorney × gender and gender × seatbelt interactions. The likelihood ratio of this model was *χ*2(2) = 3.059, . The attorney × gender interaction was significant, *χ*2(1) = 27.73, , odds ratio = .555. This interaction indicates that there is a relationship between whether the person had an attorney or not and whether the person was male or female. The gender × seatbelt interaction was significant, *χ*2(1) = 6.325, , odds ratio = .331. This interaction indicates that there is a relationship between whether the person was male or female and whether they had their seatbelt on or not.

Mosaic Plots of both interaction’s contingency tables



