

Assignment # 8

May 2021

1)

<i>Texting While Driving</i>	MALE	FEMALE
YES	30	34
NO	10	6

Male (Yes) = 30/40 or 3:1 odds

Female (Yes) = 34/40 or 5.667:1 odds

Male to Female (Yes) = 30/64 or .883:1 odds

Female to Male (Yes) = 34/64 or 1.132:1 odds

2)

a)

There are 80 students of 626 total students who attended a religious school. The probability of attending a religious school as .146 to 1.

b)

Probabilities:

White attending private school = .121

Non-white student attending private school = 0.415

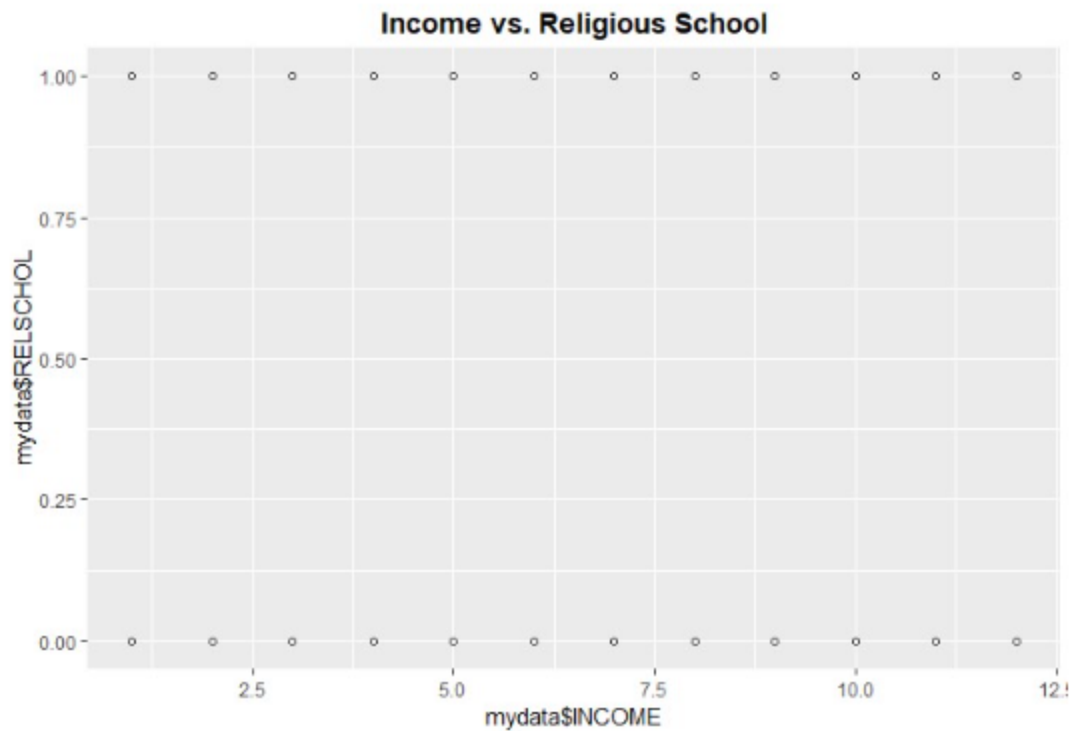
Odds:

White attending private school = .138 to 1

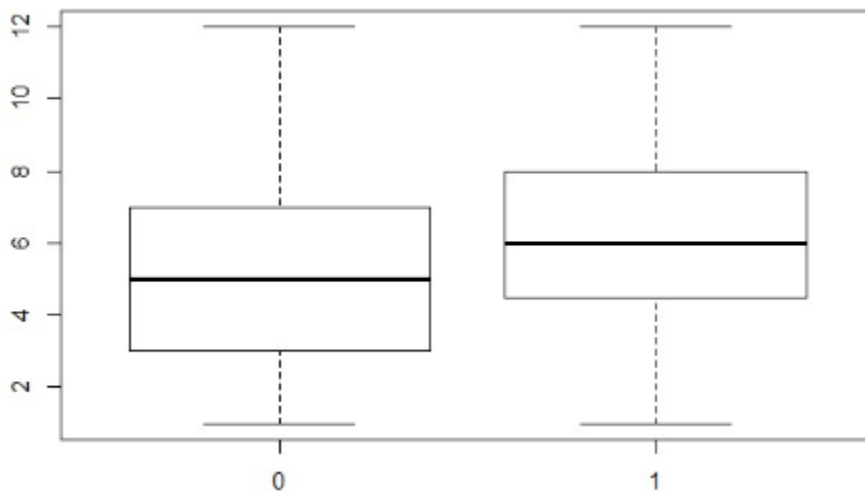
Non-white student attending private school = 0.043 to 1

Odds Ratio (95% CI) = .34

c)



The scatterplot showing religious schools and income did not have enough relevant data to show anything on the plot. It also doesn't show any differences between religious and non-religious schools.



The datasets are separated at the 5-level income bracket and thus we will create two separate sets of values at the key level.

Cross-tabulation results:

Probabilities:

Low income students attending private school = .097

High income students attending private school = .032

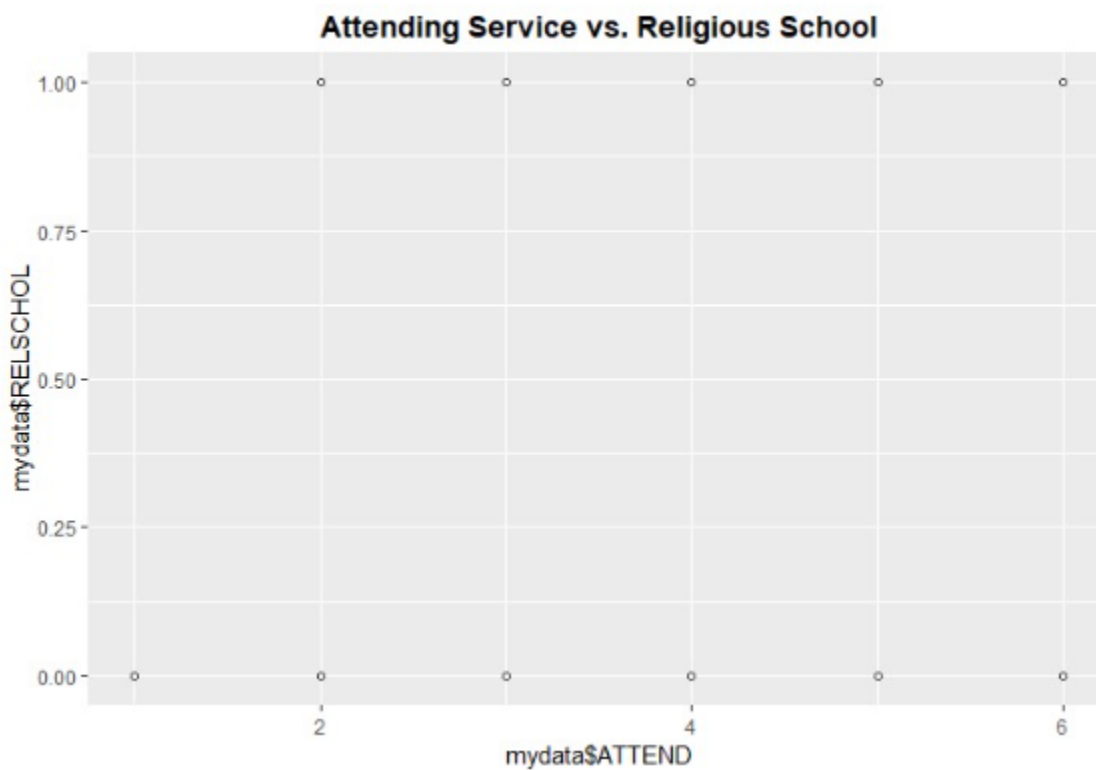
Odds:

Low income students attending private school = .107 to 1

High income students attending private school = .033 to 1

Odds Ratio (95% CI) = .41

d)



The plot again shows there are no individuals who attend a religious service less than 2 times per month that attend a private school.

Cross-tabulation results:

Probabilities:

1 service per month attending private school = 0

2 service per month attending private school = .006

3 service per month attending private school = .006

4 service per month attending private school = .014

5 service per month attending private school = .085

6 service per month attending private school = .016

Odds:

1 service per month attending private school = 0 to 1

2 service per month attending private school = .006 to 1

3 service per month attending private school = .006 to 1

4 service per month attending private school = .014 to 1

5 service per month attending private school = .093 to 1

6 service per month attending private school = .016 to 1

The results show the attending 5 services a month is the highest indicator of attending a private school. The data peaks at 5 and then begins to drop down, at least for attending 6 services which is an interesting note from the data.

3)

Model 1 = $-1.073 - 1.091X_1$

a) Interpretation = $b_1 = .1623$ is the change in log odds ratio for a 1 unit change in x_1 = income

b) For each additional income bracket, odds of attending private religious school increases by 17.621%

c) AIC = 467.4662

d) BIC = 476.3449

4)

Model 2 = $-2.8211 + .1623X_2$

a) Interpretation = $b_1 = .1623$ is the change in log odds ratio for a 1 unit change in x_1 = income

b) For each additional income bracket, odds of attending private religious school increases by 17.621%

c) AIC = 445.322

d) BIC = 454.084

e) The lower aic and bic values show a better fit for predicting if an individual attended a religious private school rather than race. The model is also easier to interpret and makes more logical sense.

No values of X seems to exceed the .50 threshold which seems to make sense as income alone is not a good indicator for whether a student attends private religious school or not.

5)

$$\text{Model 3} = -2.9727 + .2269X_3$$

- a) Interpretation = $b_1 = .2269$ is the change in log odds ratio for a 1 unit change in $x_1 = \text{attend}$
- b) For each additional income bracket, odds of attending private religious school increases by 25.47%
- c) AIC = 478.504
- d) BIC = 487.382
- e) The results show that this model is not as good a fit as model 1 and 2 despite its easier interpretability.

No value of X seems to exceed the .50 threshold and it makes logical sense that religious attendance alone is not a good indicator for whether a student attend private religious school or not.

6)

$$\text{Model 4} = -23.5831 + .3316X_1 + .2007X_2 - 1.2893X_3$$

- a) Interpretation = $b_1 = .3316$ is the change in log odds ratio for a 1 unit change in $x_1 = \text{attend}$; $b_2 = .2007$ is the change in log odds ratio for a 1 unit change in $x_2 = \text{Income}$; $b_3 = -1.2893$ is the change in log odds ratio for a 1 unit change in $x_3 = \text{race}$
- b) For each additional day per month an individual attends religious services, odds of attending private religious school increases by 39.319%; For each additional change in income bracket the odds an individual attending private religious school decreases by 22.226%; For each additional change in income bracket the odds an individual attending private religious school decreases by 22.226%; For white individuals the chances of them attending a private religious school decreases by 72.45%
- c) AIC = 424.793
- d) BIC = 442.313
- e) This model compares the most favorably which makes sense as each variable combine to prove a better prediction on if an individual attends private school or not. The model becomes more complicated as we add more variables and will have to play out with further models.

$$\text{White} = -3.583 + (.3316 * 5) + (.2007 * 4) + (-1.2893 * 1) = -2.4116; \text{Odds} = .090 \text{ to } 1$$

$$\text{Non-white} = -3.583 + (.3316 * 5) + (.2007 * 4) + (-1.2893 * 0) = -1.1223; \text{Odds} = .325 \text{ to } 1$$

The odds ratio is .115, and because this value is much lower than 1, we can say the odds of prediction if an individual attends a private religious school based on race is low.

7)

$$\text{Model 1} = -1.073 - 1.091$$

- a) $P! = \exp(\text{Model 1}) / (1 + \exp(\text{Model 1}))$
- b) Using this formula, none of the P! levels are greater than .50 so each predicted value s 0

Model 2 = $-2.8211 + .1623$

a) $P! = \exp(\text{Model 2}) / (1 + \exp(\text{Model 2}))$

b) Using this formula, none of the P! levels are greater than .50 so each predicted value is 0

Model 3 = $-2.9727 + .2269$

a) $P! = \exp(\text{Model 3}) / (1 + \exp(\text{Model 3}))$

b) Using this formula, none of the P! levels are greater than .50 so each predicted value is 0

None of these models produce correct classifications for students who attend religious schools

8)

After reviewing the results, there does not seem to be a very strong relationship between a student's race, religious service attendance, family income, and religious school. Other outside factors seem to play a more prominent role in the correlation. Income bracket, for example, was a good measure of private school attendance which made logical sense due to the cost and regard placed on private schools. Race did not seem to have a noticeable enough correlation to attending a religious school. Increasing from a zero to one decreased the percent change of attending a private school, and look forward to building more models to gain better results.