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## Examining the Relationship between Pre-Collegiate Educational Experiences and Religious Affiliation

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EXAMINING THE RELATIONSHIP BETWEEN PRE-COLLEGIATE EDUCATIONAL  
EXPERIENCES AND RELIGIOUS AFFILIATION

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HONORS PROJECT

Submitted to the Honors College at Bowling Green State University  
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UNIVERSITY HONORS

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## Abstract

This paper explores the relationship between the type of school students experienced before college and how that schooling affected the students' religious affiliation. The specific types of schools examined are public and private schools with private schools being further divided into religious and non-religious private schools. I explore the differences in religious importance among several groups including students who attended Catholic schools and those who did not, students who attended religious schools for varying lengths of time (low, medium, high, and no involvement), and students who had a choice in the schools they attended and those who did not. I also explored the difference in religious service attendance between students who attended religious schools and those who did not. My hypothesis yielded mostly insignificant results, but I developed two regression models that can predict the odds of a student being religious based on the significant predictors in the model. The most important predictors of religious importance included: whether the student had a choice in attending religious services or not, gender, age 26-35, whether the student believed their previous schooling has affected their religiosity, whether the student attends religious services with family, whether the student is Catholic, whether the student is Protestant, and whether the student attends religious services or not.

*Key terms: religion, religious affiliation, public, private, religious importance*

## Examining the Relationship between Pre-Collegiate Educational Experiences and Religious Affiliation

Does the type of schools a college student attends in the years before college affect the strength of their religious beliefs? If parents want their child to be more religious, should they send their child to a religious school? People who are highly religious tend to look at religious schools more for religious reasons rather than for academic reasons (Sanders & Cohen-Zada, 2012). Determining the effect of non-religious and religious schooling on a student's religiousness is crucial for these types of decisions.

In 2015, enrollment in K-12 education at private schools was 5,751,000 that is only 10% of the total student enrollment in K-12 education in the United States (National Center for Education Statistics, 2017, p. 123). Of these students, 78.2% attend parochial schools. These numbers are quite small compared to public school enrollment and the number of public schools throughout the country, yet about 75% of the population identifies as Christians and 37% of the population is classified as highly religious (Newport, 2017). These numbers might indicate that religious schools are not the main reason for religiousness in the general population like some might believe. This leads to the questions explored in this project about the effect of religious schooling on religious affiliation.

Much research has been done regarding influences on a person's religiosity and religious affiliation. Social and biological factors are broad categories that have been examined by several researchers. The "nature versus nurture" question has been a widely studied topic that raises questions about the influence that social factors may have on behaviors or beliefs. There are countless studies and papers examining factors that can influence or even predict religiousness in

a person. The effect of school type on students' religious affiliation and the importance of religion in their lives, on the other hand, is a specific topic that has not been widely studied.

Possible factors impacting religiosity determined from past studies and research include genetics, style of parenting, education, demographics, and role models (Gunnoe & Moore, 2002). This paper focuses primarily on the education factor; more specifically, it examines how pre-college education affects a student's religiosity. For the purposes of this paper, religiosity and religiousness refer to a person's religious affiliation and the strength of that affiliation.

A simple Google search or search through religious or educational journals reveals many articles about the different social and genetic influences on religious beliefs and attitudes. In a study looking at possible predictors of being religious, the researchers found that the most significant predictor of religiosity in young adults was exposure to religious role models (Gunnoe & Moore, 2002). They further explained that attendance at religious schools could have exposed students to these role models despite religious schooling not being a significant predictor itself (Gunnoe & Moore, 2002). This article was one that did look at religious schooling as a possible predictor of religiosity and provided a look into how religious schooling may indirectly affect religiosity (Gunnoe & Moore, 2002).

Regarding genetic influences, in their study about social and genetic influences on religious affiliation in young people, Eaves, Hatemi, Prom-Womley, and Murrelle (2008) determined that social and familial factors and personal experiences contributed much more than genetic factors in the development of religious attitudes. These effects were more prominent in young people than adults (Eaves, Hatemi, Prom-Womley, & Murrelle, 2008).

Religious schooling may also serve to "reinforce religious socialization of the parents" (Uecker, 2008, p. 564), or it could break down that socialization and lead to lower religiosity.

Uecker describes several reasons different schooling methods may influence religiosity in adolescents in his study about alternative schooling strategies (2008). Similar to Gunnoe and Moore, Uecker stresses the community aspect of schools; attending a religious school may lead to a network of religious friends that could have a profound impact on how a student views and feels about religion (2008).

Additionally, these communities in religious schools may provide a closer environment with closer friendships which might allow for the parents of religious friends to reinforce the adolescent's religious upbringing experienced at home (Uecker, 2008). These reasons explain why attendance at a religious school may influence a person's religiosity be it positively or negatively, but the answer to whether the influence is actually prevalent is still not entirely clear because of conflicting research in the past.

One study determined that as a result of attending a religious school, children increased their knowledge of God, however, their religious affiliation and experience of religion was not affected; their "felt experience of God" (Smith & Crosby, 2017, p. 86) was not influenced, just their knowledge. On the other hand, Uecker determined that schools of certain denominations may have more of an effect on a student's religion than others (2009). He found that people who had attended Catholic schools in the past had levels of religiosity that were not significantly different than people who attended secular schools while those who attended Protestant schools had higher levels of religiosity (Uecker, 2009).

In a study about the impact of teachers on the religiousness of adolescents, the researchers determined that teachers contribute significantly to a student's religiosity (Cohen-Malayev, Schachter, & Rich, 2014). Because of this finding, they proposed the idea that instead of researching the effect of schooling on religiosity, we should look at the different aspects of

that education that may have an effect on a student's religious identity (Cohen-Malayev, Schachter, & Rich, 2014).

This idea is consistent with Uecker's reasons for the influence of religious schooling; the underlying influences on religiosity could be the aspects of religious schooling (e.g. teachers, peers, religious classes, etc.) that cannot be experienced at a public school or a non-religious private school. However, first examining students who attended religious schools to determine the strength of their religious affiliation can help determine if a relationship does exist. Once it is determined if evidence exists to support that, further investigation into the underlying influencers can be done.

Based on these previous studies and research, I developed four specific hypotheses to test. These hypotheses provide structure to the analysis but are not the only methods used to determine patterns in the data.

These specific hypotheses were developed because they represent some of the questions raised by past research on similar topics. Specifically, hypothesis 1 was inspired by a report that revealed religious development is not the primary educational goal in as many Catholic schools as other religious schools (Baker, Han, & Broughman, 1996). Hypothesis 2 was developed based on the thought that more exposure to religion in school in the years before college could have a more profound impact on a student than less years of exposure. I developed hypothesis 3 because I believed that the exposure to the religious education would impact the religiosity of the student and would not depend on whose decision it was for the student to attend that school based on my personal experience in parochial school for 13 years.

Question 1: Is there a difference in religiosity between students who attended Catholic schools and those who did not?

Hypothesis 1: Students who attended Catholic school before college will not consider themselves as religious compared to students who attended other religious schools.

Question 2: Does the level of involvement of the student in the religious school have an effect on their religiousness?

Hypothesis 2: Students who attended religious schools for more years will have a stronger religious affiliation than other students who did not attend religious schools for a long period of time.

Question 3: Does the freedom to choose whether to attend religious services or not lead to a difference in religiosity in students?

Hypothesis 3: Students who were given the choice to attend religious schools will not identify as being more religious than students who were not given the choice to attend religious schools.

Question 4: Does religious schooling influence how often a student attends religious services?

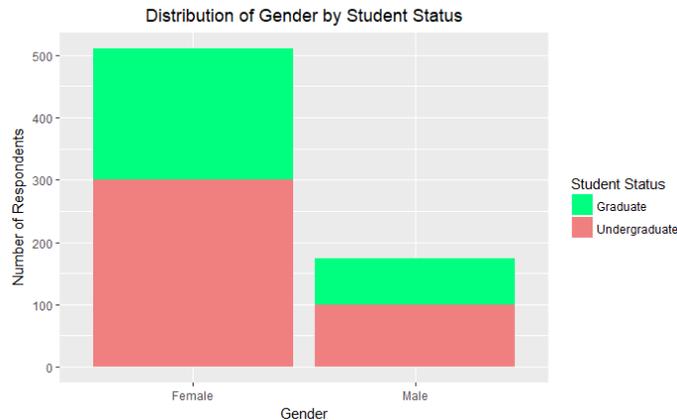
Hypothesis 4: Students who attended religious schools will attend more religious services on average than students who did not attend religious schools.

## **Method**

### **Respondents**

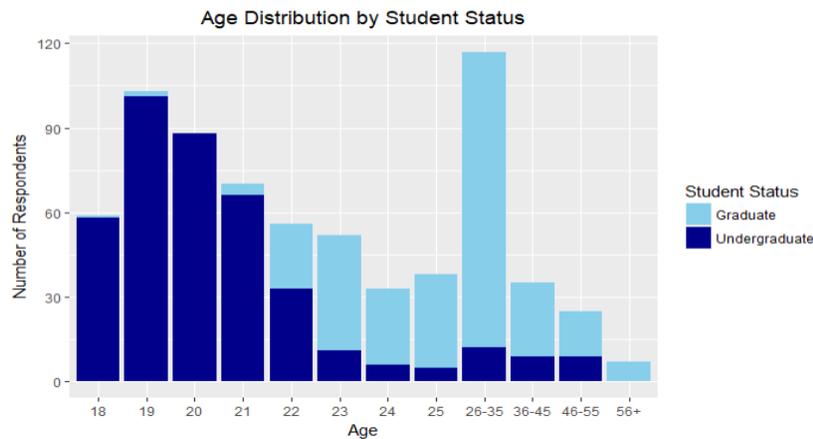
All Bowling Green State University (BGSU) undergraduate and graduate students were the target population of this research project. 703 BGSU undergraduate and graduate students responded to the survey developed for the project. The sample consisted of 511 females and 174 males. Other genders were considered in the survey, but the number of respondents who answered with “Other” or “Prefer not to answer” was insignificant; these records were removed

from the data for analysis. Of the females, 41.3% were graduate students and 58.7% were undergraduate students; of the males, 43.1% were graduate students and 56.9% were undergraduate students (see Graph 1).



*Graph 1. Gender by Student Status*

The ages of the respondents ranged from 18 years old to 56 years old or older as shown in Figure 2. About 500 of the respondents were between 18 and 25 years old. Having both undergraduate and graduate students answer the survey caused this wide range of ages. The most common age range was 26-35, which is attributed to the graduate students in the survey; it could also be attributed to the 10-year range it encompasses.



*Graph 2. Age by Student Status*

## Survey

I developed a survey to collect information about students' pre-collegiate experiences in education, their religious affiliations, and the strength of those affiliations. In the beginning of the survey, students were asked a range of demographic questions including student status (undergraduate or graduate), gender, race, and age to separate the respondents into groups for analysis. Following the demographics were questions probing the students about their pre-college education.

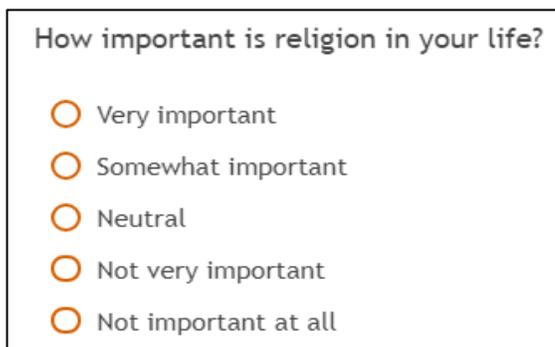
As previously described, the focus of this project is assessing the different effects public and private/religious schools have on religiosity, so students were asked to identify if they went to public or private school. If the student did attend private school, they were asked during which years of their education they attended the private school, and then they were asked whether the school was associated with any religion. This distinction between non-parochial private and parochial private schools was made because non-religious private schools may influence students

differently than religious private schools. An important goal of this study was to determine if attending religious schools before college positively or negatively influences a student's religiousness.

Additionally, students who attended private schools were asked questions about the number of years they spent in the private school. Those who attended religious schools were asked about the religious affiliation of the school.

Once classifying questions about education were answered, the students were asked with what religion they identify and how important that religion is to them. All students were asked these questions regardless of their answer to the question about their attendance at a public or private school. They were also asked how often they attend religious services (At least once a week, once or twice a month, a few times a year, or never) and with whom they attend these services (Alone, friends, family).

These questions were developed to measure the importance of religion in their lives; attending religious services more often could indicate a higher level of religious importance in one's life just as attending those services alone might indicate a higher importance of religion because there is no social pressure to attend. These questions were developed in addition to the simple question asking the students to rate how important religion is in their lives (see Figure 1) on a 5-point scale from "Not important" to "Very Important." The scale is coded with "Not important" at 5 and "Very important" at 1, so a high average indicates low religious importance.



How important is religion in your life?

- Very important
- Somewhat important
- Neutral
- Not very important
- Not important at all

*Figure 1. Sample Survey Question*

Respondents were also asked about the level of involvement the student had in the decision to attend their schools. This question was included to provide possible insight into whether students who chose the schools they attended had a different level of religiosity than those who did not. A question asking students how their attendance at religious services compares now to before college was asked to gauge how their behavior has changed.

All BGSU students were potential respondents of the survey. Both undergraduate and graduate students were included in the population to provide analysis of possible patterns among the different students. The main methods of distributing the survey were through the BGSU Campus Update and through emails to students in each college. Administrative assistants in the colleges sent out emails to students or posted on the college's canvas page with the survey link.

### **Data Cleansing**

Once the data from the survey was collected, it needed to be cleaned and modified for analysis. If certain important demographic characteristics were missing from respondents, such as student status or gender, or if the question asking if the student ever attended a private school was not answered, the record was removed from the data set. As mentioned previously, those

who responded with “Other” or “Prefer not to answer” to the gender question were removed from the data because the number of records with these responses was negligible.

Certain variables in the data needed to be created or re-coded to allow for analysis of the hypotheses. A binary variable was created to indicate whether someone was religious or not; this variable was based on the question students were asked about how important religion was to them. The scale for this question ranged from “Not Important” (5) to “Very Important” (1) with 3 being “Neutral.” The binary variable classified the student as religious if their religious importance rating was 1 or 2 and classified all other students as non-religious.

Another variable created was the level of involvement of the student in religious schooling. This variable was based on the question that asked students during which grades in school they attended private school. Because of the format of this question, the responses were not in a format that was conducive to statistical tests or models. The level of involvement was broken into four levels, none (0), low (1), medium (2), and high (3), based on the number of years they checked for their involvement.

## **Results**

Before testing the specific hypotheses, I analyzed the demographic characteristics of the respondents in relation to religious importance, frequency of religious service attendance, and other information captured by the survey. No official hypothesis testing was done for these characteristics, but the results provided insight into the makeup of the data and the difference between the groups.

Overall, 20.8% of respondents attended private school which is twice the national private school enrollment (National Center for Education Statistics, 2017, p. 123). Of the private school

attendees, 80.9% attended private schools that were also religious schools which is comparable to the national average of 78.2% (National Center for Education Statistics, 2017, p. 123).

I calculated the average religious importance among different demographic groups to get a better understanding of how the groups differ in the data. I determined that undergraduate students had an average religious importance of 3.47 which was higher than the average for graduate students at 3.31, indicating lower religiosity because of the reverse coding of the variable. Females had an average religious importance of 3.54 while males had an average of 3.01. Additionally, I looked at the averages among the different races as shown in Table 1.

*Table 1. Religious Importance Mean Scores and Standard Deviations by Race*

		Religious Importance Score
	<i>N</i>	Mean, SD
American Indian or Alaskan Native	2	3.00, 2.83
Asian	18	3.28, 1.45
Black or African American	35	4.26, 1.22
White	604	3.38, 1.53
Other	17	2.88, 1.54
Prefer Not to Answer	7	3.43, 1.51

Since the difference between students who attended public or private schools, and then non-parochial private or parochial private, was an important distinction for this project, I

calculated the average religious importance scores for those groups as well. I found that those who attended private schools had a slightly lower religious importance (3.47) than those who did not (3.39). Furthermore, those who attended religious private schools had a lower religious importance (3.46) than those who attended non-religious private schools (3.39). Because of the reverse coding of the variable, the higher scores indicate lower religious importance.

### **Hypothesis 1**

In order to test whether students who attended a Catholic school before college do not consider themselves to be as religious as students who attended other religious school, a two-sample t-test was run. The test compared the average religious importance rating between students who did not attend a Catholic school (0) and students who did attend a Catholic school (1). The hypotheses for this test were  $H_0: \mu_0 - \mu_1 \geq 0$ ,  $H_a: \mu_0 - \mu_1 < 0$ . A one-sided test was conducted because my hypothesis was looking specifically at whether one group had a higher score than the other not simply at whether a difference was present between the groups' scores. If the difference in scores is less than 0, students who attended a Catholic school had high religious importance scores indicating lower religious importance. The p-value from this test was equal to 0.1325 which lead to the failure to reject the null hypothesis; there is not enough evidence to suggest that students who attended Catholic school have lower religious importance than students who attended other religious schools.

Additionally, frequency of religious attendance was compared between the groups as well. This variable was analyzed for this hypothesis because how often someone attends religious services could indicate how religious they are. This test also did not yield significant results. In testing the hypotheses  $H_0: \mu_0 - \mu_1 \geq 0$ ,  $H_a: \mu_0 - \mu_1 < 0$  for frequency of religious attendance between the groups, the p-value was 0.4312 which does not lead to rejection of the

null hypothesis. A one-sided test was conducted again; a difference in means that is less than 0 would indicate that frequency of religious attendance among student who attended Catholic schools was lower than those who did not. Based on the p-value, there is not significant evidence to indicate that the frequency of religious attendance is lower among students who attended Catholic schools compared to those who did not attend Catholic schools. My hypothesis about how religious Catholic school students consider themselves was not supported by the results of this analysis.

### **Hypothesis 2**

I conducted an analysis of variance (ANOVA) to compare the mean religious importance scores among the different levels of involvement in religious schools. I recoded the variable that listed during which years the respondent attended religious schools to contain four categories; the categories classified the respondent as having high (3), medium (2), low (1), and no (0) involvement in religious schools based on the number of years in school they checked. These classifications served as the groups for the ANOVA. The hypotheses for these tests were  $H_0: \mu_0 = \mu_1 = \mu_2 = \mu_3$ ,  $H_a: \text{at least one of the means is different}$ .

I ran the ANOVA two ways with one including students who had never attended private or religious schools and one not including those students. Both tests yielded insignificant results. The p-value of the first ANOVA was 0.375 leading to a failure to reject the null hypothesis. This indicated that there was no significant difference among the mean religious importance scores for the different groups. For the test excluding students who had never attended private or religious schools, the p-value was 0.276, indicating non-significant differences among the means as well. My hypothesis about the difference in religious importance scores between the groups

was not supported by these results. See Table 2 for mean and standard deviation values for each group.

*Table 2. Religious Importance Mean Scores and Standard Deviations by Level of Involvement*

	<i>N</i>	Religious Importance Score Mean, SD
None	541	3.39, 1.53
Low	22	3.82, 1.53
Medium	37	3.27, 1.39
High	83	3.48, 1.60

### **Hypothesis 3**

One question in the survey asked respondents whether their attendance at the types of schools they attended before college were completely determined by others such as parents or guardians. I ran a t-test to compare the difference in mean religious importance scores between students who answered “yes” (1) and “no” (0) to this question. Hypothesis being tested was  $H_0: \mu_0 = \mu_1$ ,  $H_a: \mu_0 \neq \mu_1$ . The t-test yielded a p-value of 0.3519, leading to my failure to reject the null hypothesis. There wasn’t enough evidence to conclude that the mean religious importance scores between students whose parents chose where they went to school and those whose parents did not are different.

The means of groups 0 and 1 were 2.5 and 2.61 respectively, and the difference between those means was not statistically significant. This supported my hypothesis that the students who were given the choice to attend public or private schools would not consider religion more important to themselves as other students.

In addition to the variable that captured whether parents completely determined the schools the student attended, I also analyzed religious importance scores in relation to the variable that captured whether the student is given the choice to attend religious services or if they are compelled by others. This variable also measures the level of involvement of the student in their exposure to religion, so I determined that it would be appropriate to test the students' religious importance scores among the groups of this variable as well.

The t-test comparing the mean religious importance scores between students who have a choice in whether they attend religious services and those who do not had a p-value of  $2.2 \times 10^{-16}$ . Based on this p-value, I rejected the null hypothesis indicating that there is a significant difference between the means.

The means calculated from the test show that students who answered that they do not have a choice when they attend religious services had a mean religious importance score of 4.08 while the other group had a mean score of 2.14. This evidence does not support my hypothesis because these results indicate that those who have a choice view religion as more important to them than those who do not have a choice.

#### **Hypothesis 4**

I performed a one-tailed t-test to compare the mean religious importance scores between students who attended religious schools before college and those who did not. My hypotheses for this test were  $H_0: \mu_0 \leq \mu_1$ ,  $H_a: \mu_0 > \mu_1$  because I wanted to test whether or not the mean religious

importance for students who did not attend religious schools was higher, which would indicate lower religious importance because of the reverse coding. This variable was also coded in reverse, so a higher mean indicates less frequent attendance. The test yielded a p-value of 0.7979; I failed to reject the null hypothesis, which indicates there is not enough evidence to conclude that students who attended religious schools attend more religious services than those who did not attend religious schools.

### **Logistic Regression**

Beyond the four hypothesis that I tested and the demographic patterns I discovered among the respondents, I fit a logistic regression model. I wanted to determine if the data could predict the probability of someone being religious based on their answers to certain survey questions. Fitting this model would provide more insight into the predictors of religiousness in students.

Since there was no question in the survey directly asking student if they were religious, I recoded the survey question “How important is religion in your life” to a binary variable. If the student answered “somewhat important” or “very important” to this question, it was coded as a 1, and all other responses were coded as a 0.

I determined which variables were the best predictors of the binary variable by evaluating the p-values of the different variables and adding them to the model if their p-values were significant. To determine which model with significant variables was best, I used the Akaike information criterion (AIC); my final model had the lowest AIC value of the models I tested.

The variables included in my final model to predict whether a student is religious or not are as follows:

- Whether students identified as male

- Whether students had a choice in attending religious services or not
- Whether students were in the age group of 26-35 years old or not
- Whether students believed that their pre-college education had an influence on their religiosity or not
- Whether students attended religious services with family or not
- Whether students identified as Catholic or not
- Whether students identified as Protestant or not
- Whether the student attends religious services or not

Some of these variables were not questions directly given to the students. In my analysis of the categorical predictors of my binary variable, I found certain levels of different questions that were significant. For example, I determined that the age group of 26-35 years old was significant in the model, so I created a binary variable based on whether the student fell in that age range or not. I also found that several of the religious denominations that the students identified with were Protestant religions and were significant, so I created a Protestant binary variable to include in the model instead of including several binary variables for the different denominations.

The final model to predict whether a student is religious or not is depicted in Table 3. Each of the predictors was significant at an  $\alpha = 0.05$  level, and the McFadden pseudo-R squared value is 36.58%.

*Table 3. Logistic Regression Output for Predicting Student Religiousness*

```
Call:
glm(formula = BinaryReligiousImportance ~ ChoiceAttendService +
     Gender + Age26_35 + BelieveInfluence + withFamily + Catholic +
     DoNotAttend + Protestant, family = binomial, data = DATA)
```

Deviance Residuals:

Min	1Q	Median	3Q	Max
-2.4693	-0.4828	0.4188	0.6497	3.2010

Coefficients:

	Estimate	Std. Error	z value	Pr(> z )	
(Intercept)	-1.0227	0.3767	-2.715	0.00663	**
ChoiceAttendServiceYes	2.4710	0.3182	7.765	8.15e-15	***
GenderMale	-0.5556	0.2327	-2.388	0.01696	*
Age26_351	-0.6932	0.2797	-2.479	0.01318	*
BelieveInfluenceYes	0.5096	0.2512	2.028	0.04252	*
WithFamily1	-0.6105	0.2342	-2.607	0.00913	**
Catholic1	0.6149	0.2728	2.254	0.02419	*
DoNotAttend1	-2.9285	0.3479	-8.417	< 2e-16	***
Protestant1	1.5517	0.3331	4.658	3.19e-06	***

---  
 Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

Null deviance: 891.76 on 654 degrees of freedom  
 Residual deviance: 565.52 on 646 degrees of freedom  
 (28 observations deleted due to missingness)  
 AIC: 583.52

Number of Fisher Scoring iterations: 5

The equation in Figure 2 shows the equation from the logistic model that will determine the logit from the predictor variables. The logit can then be converted into odds and probabilities.

$$\begin{aligned} \text{logit} \left[ \frac{P(X)}{1 - P(X)} \right] &= -1.02247 + -2.0882x_{\text{ChoiceAttend}} + 0.5331x_{\text{Male}} + 0.6639x_{\text{Age}} \\ &+ 0.5096x_{\text{BelieveInfluence}} + -0.6105x_{\text{WithFamily}} + 0.6149x_{\text{Catholic}} \\ &+ -2.9285x_{\text{DoNotAttend}} + 1.5517x_{\text{Protestant}} \end{aligned}$$

Figure 2. Logistic model logit equation

For each variable I calculated the odds in Table 4. The odds indicate an increase in odds of being religious when all the other variables are held constant. If a student is given the choice to

attend religious services, the student's odds of being religious are 11.8 times higher than a student who was not given the choice. Additionally, if the student said they believe their school influenced them, their odds of being religious are 1.66 times higher than a student who did not believe that. If a student answered that they were Catholic or Protestant, their odds of being religious were respectively 1.84 and 4.71 times higher than students who were not affiliation with these religions.

*Table 4. Odds of Being Religious by Predictor*

	Odds
Choice Attend Service	11.83
Male	0.57
Age 26-35	0.49
Believe Influence	1.66
Attend with Family	0.54
Catholic	1.84
Do Not Attend	0.05
Protestant	4.71

For any of my variables that have odds below 1, the odds are not in favor of that variable. For example, if a student answered that they were male, their odds of being religious were 0.43 times less than female students. For those who answered that they are 26-35 years old, their odds of being religious are 0.51 times lower. For students who attend religious services or who do not attend religious services at all had 0.46 and 0.95 times smaller odds of being religious respectively than other students.

To illustrate the relationship between each variable and the response further, Table 5 indicates the probability of being religious for two hypothetical students with set characteristics. For example, a student who has the choice to attend religious services, is not male, is not between 26 and 35 years old, does not believe their previous schooling has affected their religiousness now, does not attend religious services with family, does attend religious services, and is not Protestant would have a probability of 80.97% of being religious.

*Table 5. Probability of Being Religious for Hypothetical Students*

	Probability
Given Choice to Attend Services	
Female	
Not Age 26-35	
Does Not Believe Influence of School	80.97%
Does Not Attend with Family	
Not Catholic	
Does Attend Services	
Not Protestant	
	Probability
Not Given Choice to Attend Services	
Female	
Not Age 26-35	
Does Not Believe Influence of School	1.89%
Does Not Attend with Family	
Not Catholic	
Does Not Attend Services	
Not Protestant	

This logistic model provided valuable insight into the variables that contributed to the religiousness of a student but predicting if a student is religious or not does not provide the level of detail that an ordinal logistic regression could provide.

### Ordinal Logistic Regression

Once I determined the most significant and representative model, I performed an ordinal regression on the original categorical response variable that I used to create my binary variable for the logistic regression. The ordinal regression provided more insight into the probabilities being predicted because the dependent variable now had several levels instead of the two binary levels. Instead of predicting probabilities of a student being religious or not, this ordinal model looks at the probabilities for the different levels of religiousness (Not at all important (5), Not very important, Neutral, Somewhat important, Very important (1)).

The ordinal regression model is shown in Table 6.

*Table 6. Ordinal Regression Output for Predicting Level of Religiousness*

```
Call:
polr(formula = OrdinalMeasure ~ ChoiceAttendService + Gender +
      Age26_35 + BelieveInfluence + WithFamily + Catholic + DoNotAttend +
      Protestant, data = DATA)

Coefficients:
                Value Std. Error t value
ChoiceAttendServiceYes -2.0882    0.2111  -9.890
GenderMale              0.5331    0.1750   3.046
Age26_35                0.6639    0.2082   3.189
BelieveInfluenceYes    -0.4825    0.1735  -2.780
WithFamily1            0.6569    0.1718   3.824
Catholic1              -0.5023    0.1951  -2.574
DoNotAttend1           2.2451    0.2118  10.599
Protestant1            -1.0650    0.2186  -4.872

Intercepts:
      Value Std. Error t value
1|2 -1.9299  0.2645  -7.2973
2|3 -0.6312  0.2596  -2.4318
3|4  0.3472  0.2573   1.3497
4|5  1.4271  0.2613   5.4614

Residual Deviance: 1597.256
AIC: 1621.256
(28 observations deleted due to missingness)
```

The equation in Figure 3 shows the equation from the ordinal model that will determine the logit for each of the intercept values ( $\alpha_k$ ,  $k = 1,2,3,4,5$ ) that can be converted into odds and probabilities for each level of  $k$ .

$$\begin{aligned} \text{logit} \left[ \frac{P(X \geq k)}{P(X < k)} \right] \\ = \alpha_k + -2.0882x_{\text{ChoiceAttend}} + 0.5331x_{\text{Male}} + -0.4825x_{\text{BelieveInfluence}} \\ + 0.6639x_{\text{Age}} + 0.6569x_{\text{WithFamily}} + -0.5023x_{\text{Catholic}} + 2.2451x_{\text{DoNotAttend}} \\ + -1.0650x_{\text{Protestant}} \end{aligned}$$

*Figure 3. Ordinal model logit equation*

The calculated odds for the ordinal regression are shown in Table 7. The results are consistent with the output from the logistic regression model. The variables with higher odds have a higher likelihood of having one of the higher numbers which indicates a lower religiosity. Males, students between 26 and 35 years old, students who attend religious services with their families, and students who do not attend religious services have higher odds of having a lower religiousness. The other variables indicate higher religiousness. Again, to illustrate this, the following table indicates the probability of each response (“Not important” to “Very important”) for each variable given that the other variables are not true.

*Table 7. Odds of Having a Higher Religious Importance Score by Predictor*

	Odds
Choice Attend Service	0.12
Male	1.7
Age 26-35	1.94
Believe Influence	0.61
Attend with Family	1.92
Catholic	0.6
Do Not Attend	9.44
Protestant	0.34

The ordinal and logistic regressions had consistent results. The ordinal regression provided more detail than the logistic regression, but the results did not contradict the logistic results. The interpretation for the different models was different. The logistic regression was predicting whether a student would be religious or not based on the variables while the ordinal regression was predicting which religious importance score a student would have based on the variables.

Because of the reverse coding of the religious importance code, the odds from the ordinal regression were opposite the ones from the logistic regression. Higher odds in the ordinal model indicate increased odds of scoring higher on the religious importance scale, which indicates lower religious importance; in the logistic regression, higher odds indicate increased odds of being religious. For example, the odds for the gender variable in the model were 1.704 in the ordinal model while they were 0.57 in the logistic model. Despite the seeming contradiction, the numbers indicate the same thing: increased odds of being less religious.

Table 8 shows the probability for each level of the ordinal response for a hypothetical student based on the ordinal model.

*Table 8. Probabilities at Each Level of Religious Importance for Hypothetical Student*

	Very Important	Somewhat Important	Neutral	Not Very Important	Not Important at All
Given Choice to Attend Services					
Female					
Not Age 26-35					
Does Not Believe Influence of School	53.95%	27.16%	10.84%	5.16%	2.89%
Does Not Attend with Family					
Not Catholic					
Does Attend Services					
Not Protestant					

### Discussion

Out of my four hypotheses, three yielded results that did not support the hypothesis. With the data I collected, students who identified their religious affiliation as Catholic did not consider themselves as less religious than other students like I had thought. I believed that since Catholic schools did not prioritize religion as much as other schools that Catholic students would not consider themselves as religious as others, but that belief was not supported (Baker, Han, & Broughman, 1996).

Furthermore, the test for my second hypothesis demonstrated that the level of involvement of students in religious schools (based on the number of years they spend in a religious school) did not have an impact on how important religion is to students. This lack of

difference in religiosity could possibly be attributed to the level of education they are achieving; the students who took this survey are college students, and Hungerman's study found that more education leads to lower religiosity (2014).

Hypothesis 3 had conflicting results because of the two variables I tested to determine if the level of involvement of the student in the decisions regarding their exposure to religion influenced their religiosity. Students who chose where they attended school and those whose schooling was decided by others had similar mean religious importance scores. When comparing students who choose to attend religious services and those who are compelled, the test showed the former having scores that indicate higher religiosity.

In my test comparing religious importance scores between student who attended religious schools and those who did not, I determined that there was not a significant difference. Overall, the conclusions from my hypothesis tests did not provide much evidence to determine whether pre-college educational experiences have an effect on students' religiousness. My logistic and ordinal logistic models did, however, provide more insight into possible characteristics of students that increase the likelihood that they are religious.

In both regression models, there were several significant variables that were good predictors of the religiousness of a student. The two variables that had the most extreme predictions of religious were whether the student had the choice the attend religious services or not and whether students attended religious services or not. When all the other variables were fixed, the odds of being religious if the student had the choice to attend religious services were 11.8 times higher than a student not given the choice to attend religious services. For students who do not attend religious services, the odds of being religious were 0.95 times smaller than those who do attend services when all other variables are fixed.

The logistic and ordinal regression models gave more information about what factors contribute to religiousness in students. Based on the results of the survey of BGSU students, the factors that increase the chance of religiousness in a student are having the choice to attend services, believing that previous schooling has had an influence, and identifying as either Catholic or Protestant. The factors that negatively affect religiousness are being a male between 26 and 35 years old, attending religious services with family, and not attending religious services at all.

### **Conclusions and Future Research**

Despite the insignificant results from my analysis, the project still provided benefits that will help with future analysis of data that I perform. I had minimal experience with the analysis of survey data before working on this project, so developing a survey and analyzing the results for this project exponentially increased my skills. I experienced challenges with the data because all the questions had categorical responses; any experience I had with analyzing data had usually dealt with continuous variables and predictors, so I had to adapt and learn the different analysis techniques for this kind of data.

There are several ways I would have changed this project given the chance regarding the analysis of my data. Certain variables collected in the survey would have allowed for better analysis of the data if they had been collected differently. For example, I decided to collect age as a categorical variable with ranges for the less common ages which prevented me from being able to calculate the average age and from using age as a continuous predictor in my regression models.

Furthermore, the question asking students during which years in school they attended religious schools did not allow for an efficient way of determining how many years the student

had spent in the religious school; the variable was categorical since the student had to check a box for each grade. In the future, providing another question in addition to this one that asked how many years the student spent in religious schools could provide further insight into the data.

Despite the challenges I faced during this project, the results of my analysis and the research I did in various academic journals were interesting and sparked ideas about possible future research. In one specific study, Perl and Gray examined the effect of religious education outside of school on students' religious identification (Perl & Gray, 2007). Religious education outside of religious schooling was not accounted for in this project; the students who attended public schools may have had religious education (CCD) in addition to their regular school hours which could have led to some of the insignificant results. This is a possible avenue for expansion on this topic in the future.

I learned so much from researching articles and papers for references, collecting my data, and running the analysis to test my hypotheses. My data was real, personal data that I collected myself. I had to develop the survey and ensure the information I would get from it would be useful. Once I finished collecting the data, I had to spend time cleaning the data and making sure it was in the correct format for analysis in R. Using R to analyze my data helped me enhance my skills in the software; I had experience with it from several classes in the past but had never used it with my own data (R Core Team, 2017).

In addition to my improved R skills, I also developed a deeper understanding of logistic regression. Performing the stepwise regression and fitting a good model for my binary prediction helped me further understand this method of regression, but I also learned about a method of logistic regression I had never experienced in classes: ordinal logistic regression. Learning how

to use this method and how to interpret it in the context of my data made this project a fruitful experience.

This project enhanced the skills I already had by providing me with real-world applications of the statistical analysis techniques that I have been exposed to in my classes. It also provided me with new skills in problem-solving and critical-thinking that developed from my handling of the challenges I faced in developing my survey, cleaning my data, and analyzing my data. This project was very valuable and helped supplement the knowledge that I gained during classes.

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