Mini Project 2

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February 2019

1 Introduction

Between the years 1852 and 1978 it was the official policy of the Church of Jesus Christ of Latter-Day Saints to restrict members of African descent from being ordained to the priesthood or participating in the religion's temple ordinances. During this time period, Church leaders supplied various justifications for what came to be known as the priesthood ban, including a prominent argument that Africans carried the so called "Curse of Cain," (God's punishment of Cain and his descendants for the killing of Abel) an argument that was justified by many using passages from Genesis and additional scripture written by church founder Joseph Smith.

In this paper, we analyze data from a 1967 survey of Latter-day Saints living in Salt Lake City (the city in which the Church is headquartered) regarding their views on doctrinal, social, and political issues. We specifically wish to explore what factors were related to some members' belief that black people are inferior due to the aforementioned Curse of Cain.

2 Data

The data consist of over 900 survey responses from members of the Church of Jesus Christ of Latter-Day Saints living in ten wards in Salt Lake City in 1967. Our response variable is a binned version of people's responses when asked if they believe that Blacks are inferior because of the Curse of Cain. Of the respondents to the survey, 52% expressed belief that the statement was either definitely or probably true.

The covariates are summarized in Tables 1 and 2. The scriptural knowledge scores were created by calculating the number of correct responses to three fact-based questions regarding content in the Book of Mormon and Bible, respectively. Several demographic variables are included (age, gender, education and convert status) as well as some worldview questions (belief in Darwin's theory of evolution, stance on Church's perceived conservatism, and respondent's level of orthodoxy within the Church).

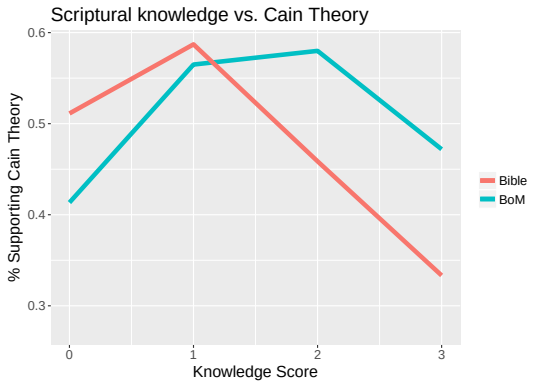

Figure 1: Relationship of scriptural knowledge and Cain theory

Variable	Mean (or proportion agrees)	SD
Believe Cain Theory	51.77%	-
Book of Mormon Score	1.26	0.96
Bible Score	1.15	0.86
Age	47	15.23
Male	48.01%	-
Convert	10.23%	-
Believe Darwin	17.54%	-
Church too conservative?	18.48%	-
Orthodoxy score {-1, 0, 1}	0.49	0.75

Table 1: Summary statistics for variables used in model

Education			
Didn't finish H.S.	H.S/Some College	College Degree	Advanced Degree
14.9%	57.1%	19.7%	8.2%

Table 2: Breakdown of educational attainment

3 Statistical Model

We modeled Church members' belief in the Cain theory as a Bernoulli random variable with the probability being a function of the covariates explained above. Before selecting which covariates to include in the model, we fit four models to the full set of covariates, each with a different link function. The link functions we considered were the logit link, the probit link, the complementary log-log link, and the log-log link.

The model with the logit link had the best log likelihood, so we used it for the rest of the models we considered. If (for the i-th individual) we denote the response variable y_i, the probability of believing in the Cain theory p_i, the vector of covariates $\mathbf{x_i}$, and the vector of coefficients $\boldsymbol{\beta}$, the model can be written as follows:

$$y_i \sim \text{Bernoulli}(p_i) \qquad \log\Big(\frac{p_i}{1-p_i}\Big) = \mathbf{x_i'}\boldsymbol{\beta} \tag{1}$$

After choosing the link function, we performed three types of variable selection using AIC: (1) backward selection, (2) backward-forward selection starting with the full model, and (3) forward selection. In each case, the minimum model included only an intercept and a coefficient for the Bible score. We decided to include the Bible Score in each of the models because we were especially interested in whether Biblical knowledge is related to belief in the Cain theory. Each of the variable selection approaches produced an identical model, incorporating the following variables: Bible Score, Age, Male, Believe Darwin, Education, and Orthodoxy.

The estimated effect for the first two education categories were almost identical, so we considered a model in which they were grouped together. The fit with this simplified model is almost identical to that of the larger model (a likelihood ratio comparison yields a p-value of 0.618) and its AIC is better, so we chose to use the simplified model. We also considered an interaction between Age and Male, but the improvement in likelihood was not statistically significant (p = 0.185), the AIC was almost unchanged, and the interaction would complicate our model's interpretation. Accordingly, we opted not to include it in our final model.

Lastly, we considered a quadratic term in Bible Score because our exploratory analysis indicated such an effect might be warranted. In the presence of the other covariates, however, the quadratic term is not significant (p = 0.296), so we did not include it in the model.

4 Results and Discussion

The estimated model coefficients are shown in Table 3 along with their standard errors and p-values. All variables included in the model are statistically significant at the 0.1 level, and all but Darwin are significant at the 0.05 level. The signs on the coefficients suggest that the following are indications of an increased probability of belief in the Cain theory (holding the other variables constant):

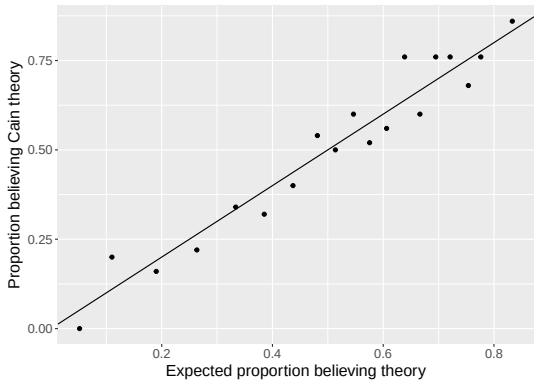

Figure 2: Expected responses from model vs. actual responses

- Low Biblical knowledge
- Older age
- Male gender
- Disbelief in Darwin's theory of evolution
- No college degree
- High orthodoxy

Because we are primarily interested in the partial effect of Bible Score, we interpret the magnitude of its coefficient: a one-point increase in Bible Score (which ranges from zero to three) is associated with a multiplicative decrease of 0.577 in the odds of believing the Cain theory. For example, if the odds that someone believes in the Cain theory are 1:1 (corresponding to a probability of 0.5), then we estimate a one-unit increase Bible Score (holding the other variables constant) would decrease the odds to 0.577:1, or a probability of 0.366.

	$\hat{\beta}$	Standard Error	P-value	
Intercept	-0.6673	0.2807	0.0174	*
Bible Score	-0.5493	0.0972	0.0000	***
Age	0.0186	0.0049	0.0001	***
Male	0.3279	0.1512	0.0301	*
Darwin	-0.3872	0.2296	0.0916	.
Bachelors	-0.3940	0.1882	0.0363	*
Advanced Degree	-0.9741	0.3023	0.0013	**
Orthodoxy	1.1053	0.1298	0.0000	***

Table 3: Coefficient estimates for our final logistic regression model

In addition to the Bible score, we were also interested in the partial effect of Book of Mormon score on the belief in the Cain theory. Removing orthodoxy from the model, Book of Mormon knowledge appears to be positively related to belief in the Cain theory. However, because Book of Mormon score is quite collinear with orthodoxy ($\rho = 0.530$), the partial effect of Book of Mormon knowledge is negligible and statistically insignificant when we control for orthodoxy.

Figure 2 was created by sorting the respondents by their predicted probabilities of believing the Cain theory, and then organizing them into groups of 50. We compared the average prediction in the group to the average response in the group. This figure demonstrates that the probabilities we are predicting are highly accurate of the true responses across the prediction spectrum.

We can get an idea about the confidence of our model by comparing confidence interval size for certain individuals. For example, if we take a hypothetical person who is male, average age, high school educated, orthodox, does not ascribe to Darwin's theory, and scored 0 on the biblical knowledge, a 95% confidence interval (created by backtransforming the logit confidence interval) of believing the Cain theory is (77.96%,

88.26%). If the same person instead had a Bible score knowledge of 3, the confidence interval would be (39.96%, 59.69%), the wider interval a result of the impact of the logit link function on the expected probability.

The finding that Bible Score is negatively related to belief in the Cain theory is particularly interesting because proponents of the theory justified it in part using Old Testament writings. Unsurprisingly, high orthodoxy is positively related to belief in the Cain theory, but our results suggest that individuals who study the Bible themselves are much less likely to believe the theory—a finding which calls the theory's supposed Biblical foundations into question. In a similar fashion, those that attain higher education (especially advanced degrees) are much less likely to believe in the theory.

With the opening of the Priesthood to worthy males of all ethnic backgrounds following President Spencer W. Kimball's revelation on the priesthood in 1978, surely little or no belief in the Cain theory remains among Church members. Even so, the model results are interesting because they indicate that even 50 years ago, a decade before the revelation on the priesthood, those that studied more intently were less likely to believe in the theory.

5 Conclusion

In this paper, we explored which factors were related to some Latter-day Saints' belief (or disbelief) in the Curse of Cain theory. Using the 1967 survey data, we fit a logistic regression model and found significant relationships between the age, gender, education, religious orthodoxy, and biblical knowledge of respondents and their propensity to believe that black people are inferior due to the Curse of Cain. Figure 2 suggests that our model provides a satisfactory fit to the data for those with a low, medium, and high propensity to believe in the Curse of Cain.

Notable from our results was the finding that biblical knowledge is negatively correlated with belief in the Curse of Cain, a surprising result given that many of the most vocal supporters of the Curse of Cain cited deep scriptural knowledge as grounds for their theories.

In the future, we may be interested in exploring factors related to other racial beliefs asked about in this same survey, such as whether members opposed or supported the priesthood ban. For example, it could be interesting to create a profile of those members who rejected the Curse of Cain but were still in favor of barring black members from holding the priesthood. The dataset provided by the 1967 survey is rich and could yield answers to any number of interesting questions given appropriate exploration.