Author's response to reviews

Title: Religiosity and teen birth rate in the United States

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Author's response to reviews: see over

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Dr. Regina Kulier
Editor in Chief
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Dear Dr. Kulier,

Thank you for sharing with us these very thoughtful reviews. We have revised the article accordingly. To summarize the major changes: we obtained from the Pew Forum disaggregated data for the three pairs of states plus Maryland-District of Columbia that had previously been aggregated, and redid all the statistics with the nonaggregated data. In addition, rather than averaging the z-scores for the 8 religiosity items, we averaged the raw percents. These changes affected the original numbers only to a trivial extent.We included more references, addressed the ecological fallacy more directly, and presented correlations of teen birth with individual religiosity items. We also briefly investigated the effect of alternate scoring methods and alternate data sources, and included a section on robustness. We believe that the revised article incorporates the very worthwhile suggestions of the reviewers; the substantive points are identical to those of the original version.

Here are our detailed responses to the points made in the longer review.

Writing and style:

1. 0 is now in front of decimal places.

2. and 3. We changed some instances of passive voice to the active, and generally revised with respect to language.

4. We eliminated the word *fundamentalist* in favor of the word *conservative*.

Abstract:

1. After thought, we decided that the term partial correlation was standard enough that we did not need to explain this in the abstract. However, we included in the body of the paper some more explanation of the nature of the partial correlation.

2. We reworded some of the sentences in the abstract into active voice.

3. We reworded the conclusion in the abstract.

Background:

1. We summarized and cited the poll in J Adol Hlth.

2. We summarized and cited the Manlove et al. article.

3. We enjoyed reading the Cahn and Carbone article, and quoted from it.

Methods:

0. We didn't find data on unmarried teen births, and didn't find a data set on average age of marriage at the various states. Possibly this would be a task for another article.

1. We feel that the questions asked by the Pew Forum are a much more refined measure of religious conservatism than those based on percent membership in evangelical denominations, because they assess the beliefs of individuals. There may be considerable unmeasured variation within members of any denomination, which makes percent membership in denominations less meaningful. We chose not to defend the choice of the Pew questions in the article, in order not to dilute the research findings.

2. After reading about Gelman's "secret weapon" technique and giving this matter careful thought, we decided that this technique would not be appropriate. However, we did aggregate the data less by not converting to z-scores and by presenting correlations with teen birth for each of the 8 Pew questions separately. We even did a couple of analyses aimed at discovering whether "it is the presence of evangelical values that is associated with more teen pregnancy or the absence of evangelical values that is associated with less teen pregnancy." Whether one uses presence or absence-scored variables, the correlations reveal redundant information.

3. We contacted the Pew Forum and requested, and received, disaggregated data. This eliminates one of the nagging concerns about this analysis that we had had. The effect on the correlation of religiosity with teen birth was to raise it by 0.01.

4. We disagree with this reviewer that converting proportions to z-scores makes a parametric assumption of normality; converting to z-scores when averaging various items simply gives equal weight to each item by equalizing their standard deviations, rather than giving more weight to the items with higher standard deviations. That having been said, we did look at plots of these variables and normal probability plots, and they appear approximately normally distributed. However, we agree with the reviewer that the conversion to z-scores reduces the intuitive interpretability of the numbers. So we redid all our analyses using an average of the raw percent agreements rather than the z-scores. We established the equivalence of the two techniques by correlating the raw score average and the z-score average and finding that the two correlated with $r=0.999$.

5. We eliminated Utah and Mississippi one at a time.

6. We believe that the measure of income that we used is good enough, simply because it correlates so highly with both teen birth and religiosity. A contrast with other measures of income could be the subject of future research.

7. We examined residual plots, and can't honestly say there is no pattern apparent; the data seem to be a little more scattered with increasing values of teen birth. But in our opinion this does not invalidate the linear model, especially in view of the high correlations found and the linear appearance of the major scatterplot.

8. We used partial correlations instead of a linear regression because partial correlations provide a simple, succinct, one-number measure of effect size.

9. The data we used are publically available, but the Pew Forum report is copyrighted, so we would hesitate to republish their data without permission. If there is much interest in our data set, we can look into this further.

Results:

1. We did put the 4 main correlations reported in this article into a succinct table.

2. We converted the confidence interval reporting style to that which the reviewer finds most readable.

3. The obtaining of the disaggregated data from Pew eliminates this problem.

Discussion:

1. We changed this statement slightly to refer to the individual religiosity items.

2. We eliminated the quotes around the words *signal* and *noise*.

3. and 4. We included references about ecological data and the ecological fallacy, and discussed the necessity to avoid interpreting our results at the individual level.

5. We changed the final sentence of the discussion before conclusions so as to refer to conservative religious communities rather than institutions, to accord more with what our data were about.

6. We wondered about Utah and the Mormons as well, but we feel sure the reviewer would agree that any comments we would make about any particular state or religion would go beyond our data and our qualifications.

Conclusion:

Conclusion is now in the active voice.

Now for a response to the less lengthy (but also very thoughtful and insightful) review.

Regarding “It would have been interesting for the authors to examine several of these dimensions separately,” we agree, and we have now presented individual correlations of teen birth with each of the eight dimensions of religiosity assessed by the Pew forum.

Regarding the two systems of abortion reporting, we entered into our dataset the Guttmacher results as well as the CDC results. The two systems agree fairly well, and the partial correlations computed from the Guttmacher results agree highly with those using the CDC results.

Regarding the factor analysis of the religion questions, we appreciate this suggestion. This really should be done using individual responses rather than those aggregated at the state level -- a sample size of 35 thousand is better than a sample size of 49! This is a task for a separate piece of research, with a different data set, we feel sure the reviewer would agree.

We enjoyed reading the additional articles mentioned, and have now cited and quoted one of them in the article.

Finally, we are very grateful for the complimentary words.

And we are very grateful to both reviewers for the obvious care and effort that they have given to the reviewing task.

Sincerely,

Joseph Strayhorn, M.D.

Jillian Strayhorn