Author's response to reviews

Title: A bibliometric analysis of childhood immunisation research productivity in Africa since the onset of the Expanded Programme on Immunisation in 1974

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Author's response to reviews: see over
January 6, 2013

Author’s response to reviews

The Editorial Team:

RE: MS: 1071507553719442
A bibliometric analysis of childhood immunisation research productivity in Africa since the onset of the Expanded Programme on Immunisation in 1974

Thank you for the opportunity to revise and resubmit our manuscript. We have now provided a point-by-point response to comments from the statistical advisor and the Referee 3.

We are delighted that you would consider a response to the statistical advisor’s comments to be sufficient to cover the issues raised by Referee 3.

We are surprised that the Referee 3 is claiming that it is IMPOSSIBLE TO compute Bayesian Information Criterion (BIC) for frequentist approach. We have now provided a description and references for the BIC in the revised manuscript.

We used the Bayesian Information Criterion (BIC) to compare different count regression models. The BIC assesses the overall fit of a model and allows the comparison of both nested and non-nested models. It is based on a Bayesian comparison of models. In case of two or more count regression models, under the assumption of no prior preference for one model over the other, BIC identifies the model that is more likely to have generated the observed data.

The formula for the BIC statistic reported by Stata is:

\[ BIC = -2\ln(likelihood) + \ln(N)k \]

where \(N\) is the number of observations used in estimation or the number of independent terms in the likelihood and \(k\) is the model degrees of freedom, number of parameter estimated including the constant calculated as the rank of variance–covariance matrix of the parameters and Given the models fit on the same data, the model with the smallest value of the BIC is considered to be best.

Sincerely, for Authors
Charles Wiysonge
A. STATISTICS ADVISOR’S COMMENTS

Suppl ? Figure 1 (Test 1): Predicted proportions from intercept-only Poisson and negative binomial models compared with observed publication proportion

1a. Why to compare or emphasize ?intercept-only? model?

Reply: This graph was basically used to display and informally compare poisson and negative binomial regression intercept only models; in a previous version of this manuscript. However, as stated in the last revision of the manuscript, we have now TAKEN OUT this graph. We acknowledge that we cannot use the figure of predicted probabilities to compare models we now implemented in the last submitted version of the manuscript and in the current revision. Since the last revision, we now used the Bayesian Information Criteria (BIC) to formally compare the models; since graphs of predicted count are subjective.

1b. Please clarify ? whether the negative binomial model is also ?intercept-only? based? Otherwise it should not be a fair comparison between two kinds of models if the complexity (the # of model parameter) of two models is not the same.

Reply: As mentioned above, we have now used Bayesian Information Criteria (BIC) to formally compare the models; since graphs of predicted counts are subjective.

1c. In the reference section, the authors are recommended to cite Stata ?nbvargr? routine which is used to create the figure.

Reply: As mentioned above, we have now used Bayesian Information Criteria (BIC) to formally compare the models; since graphs of predicted count are subjective. We have provided a reference for BIC.

1d. As author?s response, ?x-axis is the mean of the count variable?. Then the observed minimal count is zero shown in the left bottom corner. ? Why author said, ?Such as zero-truncated count models, since our data have no zeros.? (p. 4, lines 3-4)

Reply: The total number of publication indexed during the study period ranged from one in Seychelles, Mauritania, Mauritius, and Equatorial Guinea to 346 in South Africa. Though the figure started from zero, the proportion (y-axis) for the observed data (straight line) is zero, i.e. no observed zero count in our data. It is negative binomial regression that predicted zero count (0.06%)

. sum total_publication , d

<table>
<thead>
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<th>total_publication</th>
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<td>Percentiles</td>
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<tr>
<td>5%</td>
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<td>10%</td>
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<td>25%</td>
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</table>
50% 17 Mean 31
Largest Std. Dev. 52.82009
75% 33 99
90% 70 104 Variance 2789.962
95% 104 154 Skewness 4.345306
99% 346 346 Kurtosis 25.06458

Suppl ? Test 2
2. Is there a similar figure to compare two models with multiple covariates corresponding to Test 2?

Reply: No, we now used Bayesian Information Criteria (BIC) to formally compare the models. Since graphs of predicted count are subjective.

Statistical analyses and Table 4
3a. Please clarify whether Deviation Information Criterion (DIC) are used to compare models for both univariable (author's so called 'unadjusted') and multivariable ('adjusted') analyses. Author's description may be confused for a reader.

Reply: Thanks for pointing this out. We have now clarified this in Table 4. We have also provided detail a description of Bayesian Information Criterion with the necessary formula and references.

3b. Similarly, please add a column for the number of model parameters involved for each of 4 models in Table 4, or specify the nature of 'multivariable analysis' in the table title.

Reply: These have now been added

Statistical analyses / Correlation (p. 4-5)
4. Correlation analyses were mentioned twice in the Statistical Analysis section. But correlations seemed not reported in the Result section.

Reply: Wholeheartedly agree, we did not report the correlation analyses. We have now deleted this in the method section.
B. REVIEWER 3: SHENG T LUO

1. The authors presented Bayesian Deviance Information Criterion (DIC) for model selection. But DIC is the model selection technique for Bayesian inference method, but this manuscript uses frequentist approach. This is a glaring mistake. I strongly suggest the authors to have a well-trained statistician to look over the manuscript before any further submission.

Reply: There is no glaring mistake in reporting or using Bayesian information criteria. The Bayesian information criterion is implemented in all major software used by frequentists such as Stata, SPSS, and SAS.

Taking a trip back to memory lane, the Bayesian information criterion, was introduced by Schwarz as far back as 1978 as a competitor to the Akaike (1973, 1974) information criterion.

Schwarz derived BIC to serve as an asymptotic approximation to a transformation of the Bayesian posterior probability of a candidate model. In large-sample settings, the fitted model favored by BIC ideally corresponds to the candidate model which is a posteriori most probable; i.e., the model which is rendered most plausible by the data at hand. The computation of BIC is based on the empirical log-likelihood and does not require the specification of priors.

The Bayesian information criterion is often called the Schwarz information criterion. Common acronyms: BIC, SIC, SBC, SC.

BIC was justified by Schwarz (1978) "for the case of independent, identically distributed observations, and linear models," under the assumption that the likelihood is from the regular exponential family.

We also suggest that the reviewer should discuss with a well-trained statistician about how Bayesian Information Criteria have been implemented in the frequentist approach, most especially the use of non-informative prior in Bayesian analyses and how the results of non-informative prior are similar to the frequentist approach.

Moreover, DIC has selected negative zero-truncated binomial regression model as the final model, instead of the original negative binomial regression model. This indicated the importance of having model selection and subjectivity of the original findings.

Reply: We would like to point that, though zero-truncated negative binomial model produced the lowest DIC, it is not really better than negative binomial model previously reported and did not change the magnitude and direction of our results materially.

See below how the difference in BIC is used to judge a better model, the difference in BIC between the two models is just 5, i.e. there is no strong evidence that the zero-truncated model is better than the negative binomial.

<table>
<thead>
<tr>
<th>Diff in BIC</th>
<th>Evidence against model</th>
</tr>
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<tbody>
<tr>
<td>0 – 2</td>
<td>Not worth more than a bare mention</td>
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</tbody>
</table>
2 – 6  Positive
6 – 10  Strong
>10     Very strong

References [1-5]


The end. Thanks