Author’s response to reviews

Title: Factors associated with non-utilization of child immunization in Pakistan: Evidence from the Demographic and Health Survey 2006-07

Authors:

Ayesha S Bugvi (ayeshabugvi@gmail.com)
Rahl Rahat (rahlarahat@gmail.com)
Rubeena Zakar (rubeena499@hotmail.com)
Muhammad Z Zakar (mzzakir@yahoo.com)
Florian Fischer (f.fischer@uni-bielefeld.de)
Muazzam Nasrullah (muazzam.nasrullah@gmail.com)
Riffat Manawar (riffatmanawar@yahoo.com)

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Author’s response to reviews: see over
Annotated Reply to the comments of Reviewer 1

Thank you very much for providing comments on our manuscript. We have revised the manuscript in light of these comments. Modified/revised text is highlighted in red color in the manuscript. Please find below the annotated reply of comments.

Major:

Reviewer’s Comment # 1
The title wording “Determinants” should rather be “Factors associated…”

Author’s Reply:
Title of the manuscript has been revised.

Reviewer’s Comment # 2
The NIPS report in the chapter on child health (Ref.16) contains very much of the basic and stratified information reported here.

Author’s reply:
The demographic information might be the same as given by NIPS report. However, the report used only the descriptive/bivariate statistics, while our paper presents the inferential and multivariate statistics to identify the factors that are associated with incomplete immunization for children in Pakistan. Furthermore, we have focused on the “incomplete immunization” cases, while NIPS report presents the data for specific vaccines of eight vaccine preventable diseases. Additionally, we used eight more variables (mother’s age, father’s age, father’s education, father’s occupation, seek formal advice/treatment, access to information, place of delivery and use of antenatal care) in our analysis, that is not used by NIPS report.
Reviewer’s Comment # 3
It is unclear on what argument your categorization of anything less than 12 doses of vaccines is based? It seems to be a more administrative than scientific argument. At least I would expect a discussion whether there are good data indicating that having less that 12 (for example 11) doses really increases disease risks. Did you do sensitivity analyses on other cut-offs?

Author’s reply:
Thanks for your comment. According to World Health Organization (WHO), a child is considered fully vaccinated if he or she has received a BCG vaccination against tuberculosis; three doses of DPT vaccine to prevent diphtheria, pertussis, and tetanus (DPT); at least three doses of polio vaccine; and one dose of measles vaccine”. We defined complete vaccination as described by WHO. Further, prior published studies have defined complete immunization in a similar way. We have now added this information in the text along with references. Please see P.7 under Methods.

Reviewer’s Comment # 4
How where the data regarding immunization collected in the DHS? Did mothers have to show immunization cards? This is a core issue and needs to be explained in detail.

Author’s reply:
In DHS the data regarding child immunization includes questions related to specific vaccine and its dozes. Immunization coverage is based on vaccination cards or mothers’ reports.
There is one question on availability of Immunization Card/Health Card. The response categories are no card, yes seen, yes not seen and no longer has the card. The other questions were about receiving specific vaccines (BCG, Polio, DPT, Measles and HBV) and the response categories were; “No, vaccination date on card, reported by mother, vaccination marked on card and DK (Don’t Know)”. We recoded each variable in a similar way. No and DK responses were recoded as “0” and considered “Not received the vaccine” while the rest of responses “vaccination date on card, reported by mother,
vaccination marked on card” were recoded as “1” and considered “Received the vaccine”. Later we added all 12 vaccine variables and labeled “Immunization status”. The immunization status was re-coded into “0” if the child has received all 12 dozes of the above mentioned vaccinations and categorized as ‘complete immunization’, and “1” if the child has missed one or more vaccinations, and categorized as ‘incomplete immunization’. Information is now added in the manuscript on page 7 in the method section.

**Reviewer’s Comment # 5**

Model selection: authors are talking of “all significantly associated variables” that were entered into the multivariate model: which significance level was used? Why were known factors (based on the literature) not entered a priori? Were the variables adjusted, or rather the association between the independent and the dependent variable. Earlier, the authors mention 14 independent variables, among them mother’s age and education. Under statistical analysis you mention that some of these were used for adjustment. However, in a usual multiple logistic model, the associations between specific independent and the dependent variable are adjusted for all other independent variables included in the model. This seems not to be clear, or at least ill-stated.

**Author’s reply:**

Correction has been made in the manuscript. All the variables that were significant at 0.05 level or less were included in multivariable regression. Please see P. 9 under Statistical Analysis section. In the multivariate logistic model, three variables (mother age, mother education, wealth quintile) were adjusted and fixed. We entered the other significantly associated independent variables (father’s occupation, region, place of delivery etc.) one by one in the model. Please see P. 9 under Statistical Analysis section

**Reviewer’s comment # 6**

How was multicollinearity assessed, and what was eliminated?
Author’s reply:
Multicollinearity was assessed through Pearson correlation. Information is now added in the text. Please see page 9.

Reviewer’s comment # 7
Please explain why the total number analyzed here differs from numbers given in the report (ref 16) (n = 1522)

Author’s reply:
Immunization status was measured by one question about receiving specific vaccines (BCG, Polio, DPT, Measles and HBV) and the response categories were; “No, vaccination date on card, reported by mother, vaccination marked on card and DK (Don’t Know)”. For analytical purposes, we recoded no and DK responses as “0” and considered “Not received the vaccine” while the rest of responses “vaccination date on card, reported by mother, vaccination marked on card” were recoded as “1” and considered “Received the vaccine”. We recoded each variable related to specific vaccine in a similar way. While the NIPS report used only the “no” response (not added “don’t know”) for measuring not received cases. Additionally, our analysis was weighted, this might be the case that total number of received vaccination is different than NIPS report.

Reviewer’s comment # 8
Discussion: education is singled out in the first para, why? It was used as an adjustment variable in the multivariate analysis, so obviously you considered it being a confounder and not an independent variable you were interested to study ?! The explanation for the effect of education appears simplistic.
Author’s reply:
Your concern is correct. Education was a confounding variable. We have omitted the paragraph in the discussion section.

Reviewer’s comment # 9
The authors should also discuss the period to which their data relate: What has happened since 2005/2006? Are there any more recent data relevant for this discussion? Have the DHS findings been taken up by policy?

Author’s reply:
2006-07 is the latest data available so far via DHS. The DHS findings are taken up by the policy makers to overcome the situation the non-utilization of child immunization, particularly, in less developed regions. In this regard Hib vaccine was introduced in 2008 and Measles 2 was introduced in 2012 in the national EPI schedule of Pakistan. Many other policy interventions were introduced to improve the child immunization.

Minor:
Background:

Reviewer’s comment # 10
Sentence beginning with In Pakistan, the health department: UNICEF does not fund the WHO guidelines, please review sentence.

Author’s reply:
Sentence has been reviewed and changes are made. Please see page 4 under Background section.

Reviewer’s comment # 11
The 198 cases of polio are global cases in 2011, and Pakistan’s numbers are given for 2012. Better report data for the same year. What is meant by: so far?
Please state: By end October 2013, xx cases were reported. Wording: measles have played havoc??
Author’s reply:
The sentence has been changed. The reported cases were of Pakistan. Measles deaths have certainly played havoc as the number of deaths was alarmingly high. However the word outbreak may sound appropriate. The sentences have been restructured in the manuscript, please see P.4

Reviewer’s comment # 12
The reported number of measles deaths given for Pakistan: how reliable are these figures? Again: do not use “so far”, since it is unclear when this paper will be published.

Author’s reply:
Changes have been made. Moreover we have now quoted a reliable source for polio cases and Measles deaths. Previously we have reported 450 deaths in Pakistan in 2013. The source was a news article. We could not find any reliable source so we have deleted the sentence related to measles death in 2013 from the manuscript. We have only added deaths from measles in Punjab province. The source is EPI Punjab which is considered a reliable source.

Reviewer’s comment # 13
Unclear: what is meant by “fully immunized children who have received specific vaccines”? Are there fully immunized children who have received unspecific vaccines?

Author’s reply:
Sentence has been revised.

Reviewer’s comment # 14
Many studies have tried…? Did they succeed? What are factors known to be associated with full childhood immunization? There are excellent papers giving information on this topic.
Author’s reply:
You are correct, as there are some papers which provide information on factors associated with complete immunization. However as stated earlier, the purpose of this paper is to identify factors that are associated with incomplete immunization which we think is an important issue in Pakistan.

Reviewer’s comment # 15
Childhood immunization does not protect against all childhood diseases, but against some major ones. Wording: prevents millions of disabilities? Certainly there are not only scientists, but many practitioners subscribing to the benefit of vaccinations.

Author’s reply:
Thanks for your comment. The sentence has been revised.

Reviewer’s comment # 16
The statement that lower socioeconomic groups resist immunization may be true for some developing countries, but not for some rich countries where the better off do not take up vaccination.

Author’s reply:
This is not a generalized statement. The sentence has been revised. Please see P.5 last paragraph before Methods section.

Reviewer’s comment # 17
The reasons why immunization is not taken up can be described better, for example by talking about low risk perception. If you mention very few studies in Pakistan, please give references. Is there any reason why factors associated with low immunization uptake should be different in Pakistan as compared to other countries? You are not making a strong case for this study.
Author’s reply:
Information about risk perception is mentioned on P. 5 last paragraph of "Background" Section. There is paucity of literature on determinants of non utilization of immunization aged less than 2 years. Because of structural, cultural and economic factors, the situation in Pakistan is different. For instance the perception of parents about National Immunization Days is not encouraging. Second the Cold Chain management of vaccines in Pakistan is questionable. Third affluent parents who can afford usually get their children vaccinated through private hospitals.

Methods:
Reviewer’s comment # 18
Age of last child: in the methods you state that children had to be between 12 and 23 months of age. There are no data on actual age of children included. Looking at the immunization schedule, any child aged 13 months would likely be categorized as “incompletely vaccinated” as it has not received measles 2. How did you deal with this?

Author’s reply:
The immunization schedule mentioned in the manuscript is the latest schedule given by Federal EPI Cell of Pakistan. Measles 2 was added in this schedule in 2012. Previously a booster doze of MMR was given privately at 15 months and it was not a part of national EPI schedule. So that’s why the data on measles 2 vaccine was not available in DHS 2006-07. Till 2006 the course of basic vaccinations for children was completed by the age of 9 months. This is the reason for fixing the age group of children. There are other studies who have adopted the same age group.

Reviewer’s comment # 19
Results:
Author’s reply:
There were no comments by the reviewer under this heading.

Reviewer’s comment # 20
Sentence on birth order is unclear: which group had a higher proportion of incomplete immunization?

Author’s reply:
Information has been added. The group with the higher birth order (>7) has the higher proportion of incomplete immunization. Please see P. 9

Reviewer’s comment # 21
Grammar and spelling in this section needs urgent attention (e.g. three fourth?)

Author’s reply:
The section has been revised for grammatical errors.

Reviewer’s comment # 22
Table 2 contains either missing or incorrect sums, as individual cells do not add up to the total n in many instances.

Author’s reply:
Absolute number of participants does not perfectly correspond to percentages because the percentages are weighted.

Reviewer’s comment # 23
Table 2: it seems awkward to use “incomplete immunization” as overall column label and have the no (i.e. the fully immunized) in the first sub column. Consider switching.

Author’s reply:
Table 2 has been revised for clarity.
Reviewer’s comment # 24
Table 3 also contains errors, missing commas etc.

Author’s reply:
95% CI were formatted as per journal style, which does not allow commas. Further p-values throughout the manuscript are now limited to only 3 decimal places.

Discussion:
Reviewer’s comment # 25
The discussion picks up most of the relevant findings, but could be more closely linked to the literature on the topic. It might make sense to discuss or highlight coverage for individual vaccines; e.g. for Polio, which was at or above 90% across Pakistan according to the DHS.

Author’s reply:
Thanks for your comment. It would be nice to include relevant information of individual vaccines but this is beyond the scope of this paper. We have recommended it for future study in this area.

Reviewer’s comment # 26
Limitation: what is meant by the sentence… Had no information on the particular doze of the vaccination? My impression was that you could very well differentiate the doses, since your basic categorization used number of doses (max.12)? Only here you mention the nature of the data, i.e. self report. I really wonder whether self report is appropriate for assessing complete 12 dose vaccination. Are there data to support the validity?

Author’s reply:
Thanks for your comment. We have revised the paragraph for clarity. As mentioned in response to comment #4 the information on child immunization in the survey is based on either immunization card or self-reports of women.
Annotated Reply to the comments of Reviewer 2

Thank you very much for providing comments on our manuscript. We have revised the manuscript in light of these comments. Modified/revised text is highlighted in red color in the manuscript. Please find below the annotated reply of comments.

Reviewer’s comment # 1
Title: Please, report the “time” (years in which data were collected).

Author’s reply:
The year in which data was collected i.e. 2006-07 has been added in the title. Please see P. 1

Reviewer’s comment # 2
Abstract. Please, better clarify that results come from a “secondary analysis” conducted on data from Pakistan Demographic and Health Survey.

Author’s reply:
Abstract: The change has been made under the heading Methods. Please see P. 2

Reviewer’s comment # 3
Background. Last paragraph, second and third statements. Please, define the context from whom the reported considerations come: is it comparable to that analyzed in your paper?

Author’s reply:
References have been added to support the 2nd and 3rd statements of last paragraph. We have also revised the paragraph too. Please see P. 5 last para of Background section.
Reviewer’s comment # 4
Methods. Page 6, last paragraph. Please, report references used to choose the independent variables included in the survey.

Author’s reply:
Methods: References (9-15) have been added here. Please see P. 7, 2nd paragraph under Methods section

Reviewer’s comment # 5

Author’s reply:
Punjab is considered affluent as compared to other provinces. We, therefore, want to compare Punjab with other less affluent provinces. Please see P. 7

Reviewer’s comment # 6
Results and discussion. In the second limitation statement, you reported that “you only know the information whether the child was given a vaccination or not but had no information on the particular doze of the vaccination”. It could be real interesting if you report and discuss the incomplete immunization level for each vaccination (i.e. polio, hepatitis B, ect.).

Author’s reply:
Thanks for your comment. We have now revised the section. Explaining incomplete immunization level for each vaccination is beyond the scope of this paper.

Reviewer’s comment # 7
Discussion. Page 12, first paragraph. For the analyzed context, “Germany” appears not a good benchmark.
Author’s reply:

Thanks for your comment. Here we are comparing this particular finding with other countries. So in this regard Germany is not a benchmark, it’s a country where a study was conducted. We have however made changes in the paragraph. Please see P. 12 last paragraph before limitations.