Author’s response to reviews

Title: Trends in completion of immunization in the context of health reforms: The Tanzania case study

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RESPONSE TO COMMENTS FROM ASSOCIATE EDITOR:

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Research article
Trends in completion of immunization in the context of health reforms: The Tanzania case study
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Formatting changes requested:

1. Approval for data use:

   Access to the data was possible after submission of formal request to Measure DHS on http://www.measuredhs.com/myaccount/. The application was submitted through an account for a project titled Equity and Immunization, it was granted and data was downloaded for processing and analysis.

2. Competing interests:

   'The authors declare that they have no competing interests'. (Has been inserted)

3. Authors' contributions:

   The author reviewed literature, analyzed the data and wrote the manuscript. (It has been added into the manuscript)

   Acknowledgment: Acknowledges DHS Measure for the permission to use the DHS data sets (it has been added into the manuscript).

4. Comments from the Associate Editor:

   Introduction:

   - explain what MDG4 is. Explanation is included in the following sentence in paragraph one. MDG4 is on reduction of child mortality by two thirds between 1990 and 2015, despite it there is reversal in the decline of under five mortality most marked in countries that also experienced decline in child immunization.

   - In the last paragraph, please tell us which reforms you are referring to. Efforts to raise immunization coverage could learn from prior strategies such as Universal Child Immunization which raised immunization coverage to more than 80% by 1989[5]. The success in immunization services was due to the verticality of the Expanded Programme on Immunization (EPI). Whereas the EPI services recorded success the rest of the health services performed poorly due to inefficiency, poor resource investments, shortage of human resources and therefore in need of reforms to reverse the poor health
system performance[6]. Since late 1990s Health Sector Reforms were initiated and
guided by the public sector reforms to achieve decentralization by devolution, re-
organization of the Ministry, cost sharing at health facilities, as well as integration of
vertical programmes like EPI to the rest of the health system.

Thus the high immunization coverage was sustained until the early 1990s when reforms
in the health sector began as a result of national reforms in the public and other social
sectors including decentralization [7]. Health sector reforms integrated procurement and
distribution of supplies to the Medical Stores Department at national level. Transport,
management, distribution of vaccines, procurement and distribution of cold chain
supplies including kerosene, supervision were integrated at the district level. Such reform
strategies would affect the access to immunization services through health system as well
as household attributes[8]; hence this study analyzed household and community
attributes and its relationship completion of immunization before and after the health
sector reforms. The current efforts to raise immunization coverage have to consider the
role of community and households factors in the current global and national strategies to
achieve desired high immunization coverage.

Methods

- Definition of up to date: The sentence has changed to read as follows with a reference:

Some of the implementation included reorganization of health service
management under LGR; strengthening drug supply system; and integration of
numerous Vertical programs. Reforms and integration involving EPI activities
started to be implemented in the second half of 1990s at national level while
decentralization by devolution and integration of EPI as well as cost sharing
began in 2000 [12].

- Using PCA to create the wealth index is somewhat troubling. These assets are certain to be
correlated. Factor analysis with rotation would therefore be more appropriate. I do not
understand how the loadings were used to assign weights (were the PCA loadings = weights?)
and were any variables dropped? More information on how this index, which was newly
developed for this study, should be presented. You may want to attach this as an
Appendix. An alternative, somewhat more straightforward approach, would be to equally
weight the assets in a simple summed index. The following paragraph was added to illustrate
how the wealth index was created:

The DHS questionnaire collected information on household ownership of a
number of consumer items ranging from a television to a bicycle or car, as well as
dwelling characteristics such as source of drinking water, type of sanitation
facilities, and type of materials used in dwelling construction. Using principal component analysis each asset was assigned a weight (factor score) which were later standardized (DHS). Each household was then assigned a score for each asset, and the scores were summed for each household. Individuals were ranked according to the total score of the household in which they resided. The first factor with the highest loading value was adopted as the wealth index and quintiles of wealth were derived from it [15-17]. The sample was then divided into quintiles from one (lowest) to five (highest). The wealth indexes and wealth quintiles derived from the DHS datasets were used in this analysis.

- Which regression model does EPITAB fit? Is it logistic regression?. Clarification is provided in the following added sentences:

> For each independent variable a binary logistic regression model was fitted using EPITAB a STATA 8.0 software. The analysis yielded Crude Odds Ratio (OR) and adjusted OR (adjusted for other independent variables) with 95% Confidence Intervals (CI) for each independent variable controlling for other independent variables.

- Were the children sampled probabilistically? If so, you may be able to use survey weights and design effects to create national estimates.. The following text has been added:

> DHS used multi-stage stratified design to obtain the study samples from all seven zones, urban and rural areas of Tanzania mainland and Zanzibar. Correction factors and weights have been calculated for each of the seven zones, urban, rural and Zanzibar. Thus the data and statistics had been adjusted given the sampling design effect and hence the immunization coverage obtained in this analysis shall be representative of the national average.

Results

- Important point: Table 5 should control on not just household size, but all the other covariates in Table 4. I think the two analyses need to be combined. Wealth may be a confounder with urban residence. There may be no equity problem at all, but a problem with distribution to rural areas, which you suggest in your discussion.

> The two tables (4 & 5) have been combined and multi-variate analysis was re-done controlling for all of the other independent variables.

Discussion

- Can you provide some plausibility to the decline in immunizations among those with the least wealth, and vice versa?. It has been added as in the following paragraph.
Reforms strategies included decentralization which was to de-link the planning process and resource allocation from the centre. Additionally there was some degree of decentralization of service and staff management including integration at facility and district level. Such changes could reduce the emphasis provided to EPI services, leading to service organization mode that needed more resources from a consumer to utilize it. On the other hand the increased demand on consumer was easily borne by those who were well-off while those not well-off had to forego it leading to less likely of completing immunization.