Author’s response to reviews

Title: Individual-level and Community-level Determinants of Cervical Cancer Screening among Kenyan Women: A Multilevel Analysis of a Nationwide Survey

Authors:

Fentanesh Tiruneh (fantshnibret@yahoo.com)
Kun-Yang Chuang (adinma@tmu.edu.tw)
Peter Ntenda (peterantenda@yahoo.com)
Ying-Chih Chuang (yingchih@tmu.edu.tw)

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Responses to reviewers’ comments

Reviewer 1

1. I suggest to drop the sentence about the relevance in the World, if you want to put something in the abstract please refer to a more contextualized epidemiology (Kenya, West Africa…).

There are many studies about community level factors (GPs’ attitudes, socio economic status of the area, etc.) I think the statement should be "mostly studied individual…”

We appreciate the reviewer’s comments. We dropped the sentence about the relevance in the World.

We also changed the sentence to “mostly studied individual-level”.

The background section of the abstract is revised as follows:
"Studies on the determinants of cervical cancer screening in sub-Saharan Africa have focused mostly on individual-level characteristics of cervical cancer screening. Therefore, in this study, we included both individual- and community-level indicators to examine the determinants of cervical cancer screening among Kenyan women."

2. Methods: Please report the age range.

We reported the age range in the Methods in the abstract:

Our analysis focused on 9,016 married women of reproductive age (15–49 years).

3. Results

Please report also the proportion of women who knew about cervical cancer on the total interviewed (the total is in the methods, but it is difficult for the readers to be sure that 9014 is the right denominator).

About 72.1% of women (n = 6,498) knew about cervical cancer. Of these women, only 19.4% had undergone cervical cancer screening [58.24% Papanicolaou (Pap) test and 41.76% visual inspection].

4. The OR for "older women" is not understandable for the reader: who are the reference (age bracket) and the comparison?

We changed the sentences into:

"Our multivariate analysis results indicated that the prevalence of cervical cancer screening was higher among women aged 35-49 years than women aged 15-24 years."
5. For me (a non-English speaker reader) the concept of "sexual autonomy" is not clear. Maybe is only my fault. The OR 1.15 is not a 15% increase in probability to be screened. The outcome is too common to directly use OR to estimate prevalence ratio.

Sexual autonomy was measured according to the respondents’ reports regarding whether a woman is justified to refuse sex with her husband. Previous studies used the same item to measure women’s sexual autonomy.


According to the reviewer’s comments, in this revised manuscript, we have calculated the prevalence ratio (PR) using log-binomial regression models, instead of using Odds Ratios. We revised the whole manuscript accordingly.

6. Background

Among the screening methods that have been proposed for low income countries, the authors should mention the HPV test. That is much more effective than VIA and even once in a life can reduce mortality.

We appreciate the reviewer’s comment. We added paragraphs discussing the HPV testing in the Introduction section. The paragraph is as follows:

"HPV testing is also feasible in low-resource settings. It is cost-effective and is well suited to address some of the barriers to implementing adequate screening programs in low resource settings. HPV testing has considerably better sensitivity than cytology and provides the same extent of safety with fewer rounds of screening. Even though studies suggested that sampling by a clinician (in the context of a HPV testing program) should be the recommended method, HPV testing through the self-sampling method may be an acceptable option to reach women who do not participate in the regular screening program. Therefore considering the lack of human resources, poor infrastructure, cost, and long hospital queues as the major barriers to cervical
cancer screening in most SSA countries, self-sampling for HPV DNA test is an appropriate modality that can largely increase the coverage of cervical cancer screening."

7. Page 5, second paragraph: the epidemiology has been reported at the beginning of the background, I suggest to put this part of the description of the burden of disease in Kenya just after the description of the burden in Africa and to mention only screening coverage here.

As the reviewer’s suggestion, we put the description of the burden of disease in Kenya right after the burden in Africa in the the Introduction section.

8. Page 6: some parts of the introduction are presented as conclusions.

We revised the introduction as the reviewer’s suggestion.

9. Page 6 last paragraph: I suggest to avoid to say "only studied individual"…

Please explicit the objective of the study.

We revised the last paragraph into:
"The objective of our study is to examine the determinants of cervical cancer screening among Kenyan women. We hypothesized that women who have higher levels of socioeconomic status and autonomy at both the individual and community levels, have health insurance, and feel that distance to health facilities is not a major problem are more likely to use cervical cancer screening than were their counterparts."
10. Methods

Some of the "individual" variables are actually community level variables: the distance from the health service is almost equal for an entire village; the socioeconomic level is an area based indicator if I correctly understood.

According to the reviewer’s suggestion, we have added the variable “community-level distance to health facility” and revised the analysis, result, and discussion sections. In our bivariate analysis, the results showed that community-level distance to health facility was significantly associated with cervical cancer screening. However, after controlling for other factors in the multivariate analysis, community-level distance to health facility was marginally associated with the primary outcome (any type cervical cancer screening).

We measured the socioeconomic level at both individual and community level. Most prior studies recognized the importance of including individual-level socioeconomic status in investigating cervical cancer screening behavior. In addition to individual-level socioeconomic status, we further measured community-level socioeconomic status. Community-level characteristics in our study are treated as “derived variables”, which is constructed by aggregating individual responses to the group level (for example, means, proportions). The derived variable is theoretically different from the individual-level variable because it represents the contextual influence of the environment (i.e. norms or resources of that environment). This method is recommended by researchers specialized in a multilevel study design for assessing group-level influences after taking into account individual-level factors (Roux 1998, 2002). Therefore, we measured the socioeconomic status both at the individual and the community level.

11. Statistical analyses: the authors used complex models using a logit link, in this case the OR is not a good approximation of the prevalence ratio. I suggest to use log binomial link or to transform the OR according to prevalence in Prevalence Ratios in order to discuss them properly.

We appreciate the reviewer’s comments. We revised our multivariate analyses using log-binomial link and presented Prevalence Ratios in our study results.
12. Results

Page 11, 2nd par. Last lines. It does not make any sense to say that are negatively (or positively) associated with other characteristics, because these characteristics does not have a clear direction in their classification.

We deleted Table 2 and the sentences the reviewer mentioned in the current version of manuscript. The purpose of the original Table 2 is to examine whether there are high correlations among community-level variable. Since we already tested the multicollinearity problems by estimating the variance inflation factor and tolerance and found no multicollinearity problems. Therefore we deleted this table.

13. Page 13, last paragraph: the interpretation of OR is not correct, with a relatively common outcome OR 1.47 is far from representing 47% more coverage.

We used PR as measure of association instead of OR according to the reviewer’s suggestion.

14. Discussion

I may agree that a national insurance would increase Pap test coverage, but this point should be sustained in a better way, including your data and other evidences from other low income countries.

We revised the paragraph about health insurance as follows:

"As anticipated, health insurance coverage was strongly associated with both primary and secondary outcomes. Our finding regarding the association between health insurance and screening use is consistent with the results of previous studies. Our study results prove that the adoption of a universal health insurance scheme ensuring equity in access to health care can largely enhance the possibility of cervical cancer screening use. Cost is one of the main barriers to obtaining a cervical cancer screening among women in resource-constrained countries. In a region where the poverty is high, emergency needs are given greater priority to out-of-pocket
payments than preventive services. Consequently, health insurance coverage may potentially reduce the financial burden for women to access preventive health care services, including cervical cancer screening."

15. I also suggest to comment about the effect of logistical barriers, that you partially observed in your study with the variable distance to health facility, but that could also be part of the community level un-explained variance. The subjective variable in this case could misclassify the real barriers since women living in very deprived Areas may have low expectations and cha judge a minor problem what a women living in a city could judge a big issue. The inclusion of an objective variable could help. The issue of logistical barriers is also mentioned in the implication for policies, but now it is not treated in the discussion.

We added more discussion about the logistic barriers with regards to health service utilization in the discussion section. The paragraph is revised as follows:

"Contradicting with our hypothesis and previous study findings, we found a marginal positive association between the proportion of women that perceived distance to a health facility as a major problem and cervical cancer screening. The possible explanation for this unexpected result is that women who live in rural and/or remote areas have low expectations of health services, and thus judge the distance to a health facility as not a major problem. Other logistical barriers such as lack of transportation and lack of finance to access screening services are influential factors that can further influence screening behavior. However, these variables are not available in our data set (KDHS). Future research should further include these potential logistical factors associated with cervical cancer screening in the study design and analysis."

16. In the text there are some typos.

We revised the whole manuscript and corrected some typos.
Reviewer 2: General comments.

1. Neither the introduction nor the discussion mentions HPV self-sampling as an alternative screening method in low-resource settings. HPV self-sampling may enhance autonomy (a woman can do the test at home), lowers barriers and should be discussed by the authors. Furthermore, an HPV DNA test is objective whereas the quality of both VIA and Pap are only moderate and variable across laboratories.

We appreciate the reviewer’s suggestions. We have added more discussion about HPV test and HPV self-sampling method in the introduction and discussion sections.

2. What was the rate of missing data per question/item and how did the authors deal with missing data in the multilevel analyses?

Our outcome and predictor variables have relatively few missing values (the maximum missing value is 4 per item/question), which is less than 0.1%. Therefore, we have excluded the cases with missing values from the analyses.

3. Other comments.

Introduction.

p.6.1 .28. "Cervical cancer is easily preventable through HPV vaccination; however, financial burden prevents low-income countries from initiating a comprehensive HPV vaccination program [6]". The reference is outdated (year 2011) and the situation has changed. Nowadays, HPV vaccination is not more expensive than HPV screening. Gavi countries have access to vaccination at a very low price (about $5 per dose).

We appreciate the reviewer’s suggestions. We have revised the paragraph and cited the most recent references.
4. Methods

Where does the abbreviation KDHS stand for?

We have clarified the abbreviation in the Methods section. KDHS stand for “Kenya Demographic and Health Surveys (KDHS)”.

5. Results section.

Keep nomenclature uniform throughout the manuscript. For instance, p11.l.17 state "woman had low decision-making power at home". p.11.l.26. state "women who had high decision-making autonomy". I guess the second statement is the antonym of the first statement, but this is not obvious from the description.

We have consistently corrected the statement to “high decision-making autonomy at home” in the whole manuscript.

6. p.11.l.49. "By contrast, the variable of having undergone the Pap test….."

There is no contrast with the earlier description.

We have corrected the statement.

7. p.12.l.10. "31% of the total variance in the cervical cancer screening behavior was accounted for by community differences". This sentence is slightly misleading because it is not clear whether these differences are really caused by differences between communities or differences among women within communities. I prefer a more neutral formulation, e.g "31% of the total variance in the cervical cancer screening behavior was at the community level".
We have corrected the statement as follows: About thirty percent of the total variance in the cervical cancer screening behavior was at the community level (ICC = 0.31, p < 0.001).

8. p.12.1.43. "older women were 47\% (AOR = 1.47; 95\% CI = 1.16-1.85) more likely to undergo cervical cancer screening". The odds ratio is incorrectly interpreted as a relative risk, please adjust.

We have revised the analyses and used prevalence ratio instead of odds ratio. The whole results section was revised.

9. Table 2.- It is confusing that the same means are presented as in Table 1, but they are slightly different (because weighting is now per community rather than per individual). What is the purpose of this table? These are not community-level characteristics but averages of individual-level characteristics. I assume that the correlations will be much stronger at the individual level than at the community-level. These individual level correlations need to be shown in addition to the correlations presented in Table 2.

We have deleted table 2 to avoid the confusion. The purpose of the original Table 2 is to examine whether there are high correlations among community-level variable. Since we already tested the multicollinearity problems by estimating the variance inflation factor and tolerance and found no multicollinearity problems. Therefore we deleted this table.

10. Table 3.

- Heading N = 6498. How many are in the control group?

- The bivariate associations with community-level characteristics do not add to the associations with individual-level characteristics presented before. The community-level characteristics are mere averages.
In order to describe the results of the bivariate analyses clearly, this time we presented the percentage of both “Yes” and “No” categories (No/Yes) for the outcome. Please refer to the Table 2 in the revised manuscript.

We measured community-level characteristics as “derived variables”. A derived variable is a type of group-level variable that is constructed by aggregating individual responses to the group level (for example, means, proportions). The derived variable is theoretically different from the individual-level variable because it represents the contextual influence of the environment (i.e. norms or resources of that environment). This method is recommended by researchers specialized in a multilevel study design for assessing group-level influences after taking into account individual-level factors (Roux 1998, 2002). In our study, the community-level characteristics were measured by aggregating individual responses of the variable to the group level.

For the bivariate analysis, we categorized the percentage of each community-level characteristic into tertiles (Low, Middle, High) and examined the relationship between community-level characteristics and cervical cancer screening behavior.

11. Table 4 and 5.

- Model 3 does not make sense to me because a community-level characteristic can only be interpreted after inclusion of individual-level characteristics. This is done in Model 4 which aims to disentangle community- and individual-level effects. The between- and within community variation in Model 1 can be described in the text but does not deserve a separate empty column in Tables 4 and 5. Therefore present only Model 2 and 4.

As reviewer’s suggestion, we have presented only the original Model 2 (individual-level characteristics only) and Model 4 (both individual-level and community-level characteristics) in multivariate tables.