Author's response to reviews

Title: Feminisation of the medical workforce in low-income settings; findings from surveys in three African capital cities

Authors:

Giuliano Russo (grusso@ihmt.unl.pt)
Luzia Gonçalves (LuziaG@ihmt.unl.pt)
Isabel Craveiro (IsabelC@ihmt.unl.pt)
Gilles Dussault (gillesdussault@ihmt.unl.pt)

Version: 3 Date: 19 June 2015

Reviewer 1: Karen Miller
Reviewer's report:
Minor revisions are required:

1. There are number of spelling and grammatical errors.
THE WHOLE PAPER HAS NOW BEEN PROOF-READ.

2. In the Introduction a number of countries are listed with a general comment about the gender distribution of the workforce. There should be a table with the disaggregation of the workforce by gender and country with the references to sources.
WE HAVE NOW CREATED SUCH A TABLE ON THE PROPORTION OF PHYSICIAN WORKFORCE IN THE COUNTRIES MENTIONED. HOWEVER, RATHER THAN ADDING ANOTHER TABLE EARLY IN THE PAPER'S INTRODUCTION, WE SUGGEST THAT PUTTING IT IN ANNEX IS A BETTER OPTION, AND THAT WE COMMENT ON IT IN THE INTRODUCTION (TABLE S1 IN STATISTICAL ANNEX; PAG.2, PAR.1).

3. The last paragraph of the Introduction should provide more of an explanation of the reason for the selection of these particular countries and the criteria which enables a comparable data analysis.
THIS HAS BEEN ADDED BEFORE PRESENTING THE THREE LOCATIONS (INTRODUCTION, PAG.2, FIRST FULL PARAGRAPH).

4. Tables numbered incorrectly.
TABLE NUMBERS HAVE BEEN CORRECTED; 3 TABLES HAVE BEEN ADDED TO THE STATISTICAL ANNEX.

5. Page 8, the last paragraph starting with 'Our findings' are important arguments
which could be substantiated with extant research.
ARGUMENTS HAVE NOW BEEN SUBSTANTIATED BY REFERENCES (DISCUSSION, LAST PARAGRAPH. PAG.8).

Reviewer 2: William B Weeks
Reviewer's report:
1. This is an interesting paper that examines gender-based disparities in physician income and hours worked in three small, middle-income countries in Africa. Overall the paper is pretty well written and has a nice flow and organization. The study uses survey data. Originally, I was a bit disappointed in the relatively small N’s, but it turns out that there are very few physicians in the country, so that the proportion of the overall physicians surveyed is between about 10% (in Mozambique) and 50% (in Guinea Bissau). As they limit their analysis to capital city dwellers, the % goes up a bit.

MEDICAL DOCTORS AND SPECIALISTS IN LMICS TEND TO CONCENTRATE IN LARGE CITIES AND OUR URBAN SAMPLE REPRESENTS OVERALL 52% OF ALL PHYSICIANS IN THE THREE LOCATIONS (SEE 2.1 DATA COLLECTION, LAST PARAGRAPH).

2. Nonetheless, I remain a bit concerned that the missing data might not be representative – one could imagine, for instance, a higher proportion of men who refused to answer so their results might be a bit off.

WE CONDUCTED AN ANALYSIS OF THE DISTRIBUTION OF NON-RESPONDENTS AND THOSE WHOM WE WERE UNABLE TO LOCATE, AND WE DID NOT IDENTIFY ANY SYSTEMATIC DIFFERENCE WITH OUR RESPONDENTS. THIS HAS NOW BEEN MENTIONED IN THE LAST PARAGRAPH OF THE DATA COLLECTION SECTION.

3. The graphics look original. The biggest statistical concern I have is that physicians’ incomes and work hours tend to follow an inverted U shaped pattern over their working lifetime. So if one uses a continuous variable in a regression (as they do with “years as a medical doctor”) that will not be accurate.

IN OUR SAMPLE, THE INVERTED U-SHAPED PATTERN FOR HOURS WORKED AND INCOME IS NOT SO CLEAR (SEE FIGURES BELOW). IN ANOTHER PAPER, WE ATTRIBUTE SUCH AN EFFECT TO: (A) CROSS-COUNTRY DIFFERENCE, BUT, MORE IMPORTANTLY, TO; (B) ENGAGEMENT WITH PRIVATE SECTOR ACTIVITIES; AND; (C) THE NEED FOR YOUNG PHYSICIANS TO WORK EXTRA HOURS TO ACCESS LUCRATIVE POSITIONS (MCPAKE, RUSSO AND TSENG, 2014).

4. Better is to use dummy variables with years practiced in 5 year increments (using the categories they show in Figure 1) – I’d imagine that would improve the R square (which they should show in Table 3) and have the years as a medical
FROM STATISTICAL POINT OF VIEW, WE DOUBT THAT THE USE OF EXTRA DUMMY VARIABLES WOULD IMPROVE OUR MODEL, TAKING INTO ACCOUNT THE SAMPLE SIZE OF OUR STUDY. ON THE CONTRARY, BY THE PARSIMONY PRINCIPLE, MODELS WITH FEW PARAMETERS ARE PREFERABLE TO MODELS WITH A LARGER NUMBER OF PARAMETERS. WE AGREE HOWEVER THAT THE COEFFICIENT ASSOCIATED TO A CONTINUOUS VARIABLE AS ‘YEARS OF PRACTICE’ IS NOT EASILY INTERPRETED. THEREFORE, WE HAVE NOW USED AN ARTEFACT VERY POPULAR IN EPIDEMIOLOGY AND WE HAVE CONVERTED THIS VARIABLE INTO 5-YEAR INCREMENTS TO FACILITATE ITS INTERPRETATION. SUCH AN ARTEFACT DOES NOT NECESSARILY IMPROVE OUR MODEL, BUT IT SIMPLIFIES THE INTERPRETATION OF RESULTS ON THE IMPACT OF AGE INCREASES ON WORKING HOURS AND PUBLIC SECTOR SALARY, REPLACING 1 YEAR UNIT BY 5-YEAR INCREASES. AS WE FITTED GENERALISED LINEAR MODELS AND ZERO INFLATED MODELS, THE TRADITIONAL CONCEPTS – SUCH AS R-SQUARE – ARE NO LONGER APPLICABLE IN OUR CASE.

5. I’m assuming that the number of hours worked in the public and private sector is in the last week, as the intercept is 54.5 – that should be clarified in the table’s title and in the accompanying text.

IT IS WEEKLY WORKING HOURS. THIS HAS NOW BEEN CLARIFIED IN TEXT AND TABLES THROUGHOUT THE MANUSCRIPT.

6. Regarding their conclusions, I’m not clear on how they come to the conclusion that female doctors will become a majority within 5-10 years? How does their research (a single year cross sectional study) support that? Solely on the age distribution of physicians? The methods for making that conclusion (which assumes a trend, which may not be the case) should be made clear. It is the basis for most of the work.

WE AGREE THAT WE CANNOT MAKE SUCH A CLAIM BASED SOLELY ON THE CURRENT PHYSICIANS’ AGE DISTRIBUTION ACROSS THE 3 LOCATIONS. WE HAVE NOW TONED DOWN OUR CONCLUSIONS TO REFLECT MORE CLOSELY THE LIMITATIONS OF OUR FINDINGS (SEE DISCUSSIONS, PAR.1, 2 AND 3).

7. It seems like a key policy conclusion would be that, if you have more women, and they work fewer hours, then the workforce either needs to be expanded or needs to become more efficient (assuming the need to maintain the same overall productivity). This should be mentioned.

THIS ARGUMENT WAS BURIED INTO THE LAST-BUT-ONE PARAGRAPH OF OUR DISCUSSION. WE HAVE NOW GIVEN IT DUE PROMINENCE (DISCUSSION, PAR.6).

Major compulsory revisions:
1. Change the regression to include dummy variables for years worked and include R square in the table.

AS WE MENTIONED ABOVE, THE TRADITIONAL CONCEPTS OF TRADITIONAL REGRESSION MODELS FAIL IN A GLM APPROACH. ON THE OTHER HAND, BY THE PARSIMONY PRINCIPLE, MODELS WITH FEW PARAMETERS ARE PREFERABLE TO MODELS WITH A LARGER NUMBER OF PARAMETERS. WE HAVE HOWEVER, USED AN ARTEFACT VERY POPULAR IN EPIDEMIOLOGY AND WE HAVE CONVERTED THIS VARIABLE TO 5-YEAR INCREMENTS TO FACILITATE ITS INTERPRETATION – THE VARIABLE “Q_6” IN TABLES S4 AND S5 IN THE STATISTICAL ANNEX; METHODS, LAST PARAGRAPH.

2. Articulate the methods used to make the assertion that women will be the predominant gender of physicians in 5-10 years.

OUR PAPER DID NOT MAKE A PREDICTION OF SUCH TRENDS, BUT WE AGREE OUR ORIGINAL WRITING COULD LEAD TO SUCH AN ERRONEOUS INTERPRETATION. WE HAVE NOW CLARIFIED THIS IN OUR LIMITATIONS AND TONED DOWN OUR CONCLUSIONS (DISCUSSION, PAR.1, 2 AND 3, PAG.6-7).

3. Include some more policy relevant conclusions.

THESE HAVE NOW BEEN INCLUDED IN THE DISCUSSION PAR. 6 (PAG.8).

4. Include in the limitations section that there is a possibility of bias in survey results that could change results.

OURS IS A FAIRLY REPRESENTATIVE SAMPLE OF PHYSICIANS FROM THE THREE CITIES, AND THE ANALYSIS OF NON-RESPONDENTS’ CHARACTERISTICS DID NOT IDENTIFY ANY SPECIFIC PATTERN. ON THE CONTRARY, A POTENTIAL BIAS MAY BE INTRODUCED BY THE OVER-REPRESENTATION OF FEMALE DOCTORS IN URBAN SETTINGS – AS OPPOSED TO RURAL ONES; WE DID MENTION THIS IN OUR LIMITATIONS (SEE DISCUSSION, PAR.2).

Minor essential revisions that need to be corrected:
After citation 13, there is an extra period.
THIS HAS BEEN CORRECTED.

I don’t understand the sentence ending “on the evolution of the phenomenon overtime (20).” That needs to be elaborated upon....
THIS HAS BEEN CORRECTED.

The description of the study locations (Table 1) should be in the methods or results section.

THIS TABLE AND RELATED TEXT PROVIDE BACKGROUND INFORMATION ON THE THREE CITIES AND COUNTRIES, AND ARE NOT PART OF OUR
FINDINGS OR DATA COLLECTION STRATEGY.
In the second to last line of the first PPG, do they mean Females are a greater proportion? If not, the last line in the first PPG needs to be modified.
YES, “NEWLY GRADUATED FEMALE PHYSICIANS REPRESENT THE MAJORITY…”.
What does “physicians’ dual practice in the three cities” mean? They work in all three cities? Or in two of the three? I see later that this means working in public and private sector. That should be clarified in this paragraph or sentence.
THIS HAS BEEN CLARIFIED (2.1 DATA COLLECTION, PAR 1).
The paragraph staring “Median age was 37 years” needs to have ‘for women’ after that phrase...
THIS HAS BEEN CORRECTED.
In the sentence beginning “physician median net public...” the first USD has an extra 1 after it, unless that is to be 1,405. Don’t use the decimals – the number is not that precise.
IT IS USD 1,387 IN PRAIA –. THIS HAS BEEN CORRECTED.
I don’t think you want tables 3 and 4 in the text. The model should be explained in the methods section.
TABLE 4 AND 5 HAVE BEEN MOVED TO THE STATISTICAL ANNEX (TABLES S4 AND S5). THE GLM MODEL FOR TABLE 3 IS EXPLAINED IN THE METHODS SECTION. SOME REFERENCES HAVE BEEN ADDED FOR FURTHER DETAILS ABOUT GLM AND ZI MODELS.

Reviewer 3: Jonathan SICSIC
Reviewer’s report:
Dear Editor and authors,
The topic of this article is interesting and the methodology used to respond to the research question is sound. The paper is well written in general, but there remain some errors (typos, unclear sentences, references lacking) that should be addressed to improve its quality for the journal.

Minor essential revisions
-Page 2: - The authors write “In high-income countries the number of women entering medical education is superior to that of men. Newly graduated male physicians represent the majority of new entrants (...)”. Did the authors mean female rather than male? Otherwise the two sentences are contradictory.
THIS HAS BEEN CORRECTED.

-Page 3: The authors write that “the three locations were selected for the similarities of their national healthcare systems (...)” but the authors provide no further explanation about the healthcare systems organization and major remuneration schemes for doctors. One or two sentences would be necessary in
order to characterize these systems in comparison to OECD healthcare systems, for instance.

EXTRA INFORMATION HAS BEEN ADDED ON THE THREE COUNTRY’S HEALTH SYSTEMS TO COMPLEMENT TABLE 1. (INTRODUCTION, LAST AND LAST BUT ONE PAR.).

-Page 4: At the end of the Data collection subsection, the authors write “41.1% could not be located”. This figure is not clear: what do the author mean by “not be located”? Indeed, the survey questionnaire was “administered in person” (page 3), so it does not make sense.

OF THE PHYSICIANS LISTS PROVIDED BY THE RESPECTIVE MEDICAL ASSOCIATIONS, 41% WERE EITHER WORKING OUTSIDE THE CAPITAL CITIES, DEAD OR AWAY AT THE TIME OF DATA COLLECTION. THIS HAS BEEN CLARIFIED IN THE TEXT (DATA COLLECTION, LAST PARAGRAPH).

- Data analysis: “Confidence intervals for proportions (...) were obtained using Wilson and Agresti-Coull methods”: please add a reference as one may not be familiar with these tests.


- “The Vuong test was used to verify if a GLM is indistinguishable for the corresponding ZI model”: please also add a reference for the test.


-Page 6: “Female physicians worked shorter hours per week (50.23) than their male colleagues (53.88) (p=0.025)” : it is not clear where the results are reported. I can’t find the results in Table 2.

THESE DATA HAVE BEEN INCLUDED IN TABLE 2.

- The authors say that “the adjustment of the GLM model to the data is poor, displaying some high Pearson residuals”. Is there a threshold to judge about large residuals? Note that providing standardized Residuals (that are staked) could facilitate the interpretation.

THE PACKAGES USED IN THIS WORK PROVIDE DEVIANCE RESIDUALS FOR GLM AND PEARSON RESIDUALS FOR ZI MODELS. THE FORMULAS ARE PRESENTED ON https://r-forge.r-project.org/scm/viewvc.php/*checkout*/pkg/BinomTools/inst/ResidualsGLM.pdf?

TRADITIONALLY, IN LINEAR REGRESSION, WE ASSUME THE ADEQUACY OF THE NORMAL DISTRIBUTION AND THE THRESHOLDS -1.96 AND 1.96
ARE USED AS A POSSIBLE REFERENCE. FOR DEVIANCE RESIDUALS -4 AND 4 ARE ALSO TAKEN AS A REFERENCE BASED ON A CHI-SQUARE DISTRIBUTION. HOWEVER, IN GLM AND ZI MODELS THE ADEQUACY OF THE NORMAL DISTRIBUTION (OR OTHER) IS NOT REALISTIC AND WE NEED TO BE CAREFUL WITH THIS TYPE OF THRESHOLDS. SEVERAL PLOT ANALYSIS HELP US IN THIS PROCESS AND SOME TRENDS IN A GRAPH INDICATE PROBLEMS OF OVERESTIMATION OR UNDERESTIMATION. OF COURSE, WE DO NOT USE THESE MODELS TO MAKE PREDICTIONS, WHERE THESE PROBLEMS CAN BE MORE COMPLICATED AND WE NEED TO BE RIGOROUS WITH THE ADJUSTMENT. NEVERTHELESS, WE ONLY USED THE MODEL TO EXPLORE SOME RELATED VARIABLES WITH NUMBER OF THE HOURS WORKED, AND NOT TO PREDICT THE NUMBER OF HOURS WORKED, WE CONSIDERED IMPORTANT TO POINT OUT THIS ASPECT IN OUR MANUSCRIPT.

-Page 12: Please create Tables for the results of the ZI models, rather than the outputs of R software.

TABLES HAVE BEEN CREATED, MERGING COUNT AND ZI MODELS (TABLES S4 AND S5 IN THE STATISTICAL ANNEX).

Discretionary revisions

-Page 2: “Some authors put forward the hypothesis that while female physicians have for quite some time already given preference to a lighter work-load (...))”. The sentence is not clear, please revise.

THE PHRASE HAS BEEN CLARIFIED (PAG.2, END OF PAR.3).

-Page 5: The authors write “Overall, 52.3% of female physicians declared holding a specialty (...) and then “(...) General practice and gynaecology were the most frequent specialties”. In some countries, General practice is not a specialty, so one may ask what medical profession are practised by those who do not hold a specialty (47.7% of the female physicians)?

GENERAL PRACTICE IS A SPECIALTY IN CAPE VERDE AND MOZAMBIQUE, BUT NOT IN GUINEA BISSAU. WE SUSPECT THAT SOME OF THOSE WHO DECLARED HOLDING A GENERAL PRACTICE SPECIALTY HAD, IN FACT, NONE. LIKewise, WE ALSO SUSPECT THAT SOME OF THOSE WITHOUT A SPECIALIZATION, ERRONEOUSLY DECLARED HOLDING ONE BECAUSE ENGAGED IN SOME SPECIALISED PRACTICE. WE HAVE CLARIFIED THIS IN THE DISCUSSION’S PARAGRAPH ON LIMITATIONS (DISCUSSION PAR.2).

-Page 8: -Paragraph 3: ‘female doctors distribute unevenly across medical specialties (...), although all in all (...)”. Please delete “all in all” which is unclear.

THIS HAS BEEN DELETED.

-Paragraph 4: “(...) the specificities of its consequences”: not clear, please revise.

THIS HAS BEEN REVISED.
-Page 9: There is a typo in Table 1: please replace 133rd by 133th (line 4, column 4) to be coherent with the notation of the other columns. THE TYPO HAS BEEN CORRECTED.

-Page 10: There is a typo in Table 2: the p-value of the effect of ‘Married (%yes)’ in the Maputo subgroup is incorrect. Please revise. THE TYPO HAS BEEN CORRECTED.