Author's response to reviews

Title: Physician and nurse supply in Serbia using time-series data: A Case Study

Authors:

Milena Santric Milicevic (msantric@med.bg.ac.rs)
Vladimir Vasic (vladimir@ekof.bg.ac.rs)
Jelena Marinkovic (jmarinkovic@med.bg.ac.rs)

Version: 2 Date: 1 December 2012

Author's response to reviews: see over
Cover letter

Dear Editor in Chief, Dr Mario Dal Poz,

We are sending the revised Manuscript ID 3963514817345639 now entitled “Physician and nurse supply in Serbia using time-series data: A Case Study” by authors Milena Santric-Milicevic, Vladimir Vasic and Jelena Marinkovic for publication in Human Resources for Health. The details of revision undertaken are described in the annexes 1, 2 and 3 of the cover letter.

The manuscript has been revised in light of the reviewers’ requirements and suggestions (reviewers comments No: 1093318117738069, 1397949177968363, 8057572177657460). The study describes variables that were significantly related to physicians and nurses’ employment in the public healthcare sector of Serbia from 1961 to 2008, and it displayed forecasted physicians and nurses’ requirements for the public healthcare sector of Serbia by 2015. This study may be used as an approach for understanding the health workforce policy making in other settings and to discuss the accountability of HRH governance. Thus, we hope our study methods and results will be found suitable and interesting for publication in your distinguish Journal.

No paper resembling the enclosed article has been or will be published except in your Journal. Both authors declare no conflict of interest. The manuscript has been seen and approved by both authors.

Sincerely,

Milena Santric-Milicevic, Associate Professor
Institute of Social Medicine & Centre School of Public Health and Health Management
Faculty of Medicine University of Belgrade, Dr Subotica 15, 11000 Belgrade, Serbia
Phone: +381-11-2685-451; Fax: +381-11-3059-233
Email: msantric@med.bg.ac.rs

Vladimir Vasic, Associate Professor,
Department of Statistics and Mathematics,
Faculty of Economics, University of Belgrade, Serbia
Email: vladimir@ekof.bg.ac.rs

Jelena Marinkovic, Professor
Institute of Statistics and Informatics
Faculty of Medicine University of Belgrade, Serbia
Dr Subotica 15, 11000 Belgrade, Serbia
Email:jmarinkovic@med.bg.ac.rs
Dear Sir,

Thank you very much for your time, thorough analysis, useful comments and constructive suggestions. On behalf of all authors, I would kindly ask you to consider the co-authorship on this manuscript if it becomes good enough to be published in the HRH Journal, and if that option is in line with the HRH Journal policy.

Sincerely,

Milena Santric-Milicevic

Major revisions:
1. The paper needs to be written in standard English: we have used the official editing services to have paper written in standard English.

2. I suggest rewriting the abstract: We fully accepted the suggestion.

3. (I have starred (*) the term unemployment because I am not sure whether that is actually what the article is about) That implies that physicians will not have jobs. Yes the article is about unemployment. Later in the document we read about shortages due to out-migration. That later part also discusses some factors that are excluded from the model but must be include—outmigration and private sector employment. Outmigration and private sector employment are included in the discussion.

4. The remaining parts need to be made more precise in describing what was modeled—we have clarified the dependent variable(s) in remaining parts of the manuscript, and do not use the term “correct” to describe the results. Instead of “correct” we used term “stable”. The conclusions fall short—they ask for change in the modeling, when, in fact, it is production and training policies that need changing – thank you we have changed it in Manuscript Conclusions section (page) into: „The significant mismatch between forecasted requirements of physicians and available posts should be used as pointer to decision-making on intake planning for the medical schools in Serbia.“

5. The opening justification for the article needs to recognize the political and institutional content in specific and direct ways, not as generalized references to “social, economy, policy, technology, environment and epidemiology context (sic)”. Thank you we have changed it in Manuscript Background section (page 1, paragraph 1) into: „ Strategic HRH planning for attaining the health goals and objectives encompass identification of interplay among many factors within and beyond health care system. Those factors include: policies, legislation, rules and procedures that guide health workforce production, education, deployment, performance, payment and management, as well as health strategies, programmes and action plans designed to be delivered by a range of providers in settings with different socio-demographic characteristics, level of economic development, environmental threats and epidemiology profiles. Along with that, HRH planning should include projections about cross-cutting problems regarding the HRH production, employment and management, such as attractiveness of health professions, private sector role and migration of health professionals“

6. I am confused by the description of the various plans for HRH in Serbia. The text implies that there were adjustments to training policy but that is followed by “Hence, the national
strategy for HRH development has not been created. Instead, the staffing in healthcare institutes continues according to the by-law, which has been slightly updated after its adoption in 2006.” If the “By-law” (which needs to be identified in detail) does set policy, then it needs to be described. (Discretionary): Thank you; we have changed that in the Manuscript Background section (page 1, paragraph 5, page 2and paragraph 3).

7. The statistics about unemployment (supply) of physicians and nurses needs to be presented more directly: what is the total number of physicians residing in Serbia and eligible for work, and what is the number “unemployed”, the number in “private” practice, the number employed in other fields. Also, there is rarely a dichotomy here, how is partial employment considered? Serbia officially reports the physical persons, though the partial employment exists. The required description of private practice is provided in the Manuscript Discussion section (Study limitations on page 6, paragraph 2). The change in rates could be supported by a table or chart to give us a sense of how the percentages were calculated. The discussion of ratios of practitioners to population for districts should also give a sense of whether those should be equal. (Major change): We have provided the required table and discussion in the Manuscript Background section (page 2, paragraph 2 and table 1).

8. The description of the variables and their sources and the methods used are understandable, but a very clear explanation of the dependent variables is needed beyond what is provided. The dips in the trend need explanation (Necessary change): We clarified the variables in Manuscript Method section (page 2 paragraph 1 and in statistical analyses page 3 paragraph 3).

9. There needs to be a full table that lists the variables and their characteristics (rather than the list at the end of the complex table of output statistics, e.g., max, min, net change. We described all variables in new table 2. I realize this is a moving process and the charts provide some description, but the figures are too numerous and a fairly detailed table would help. All figures are described in tables 2, 3, 4 and 5. About the process, we use multivariate ARIMA (or Transfer Function – TF) model (as starting model), we don’t use MA process.

10. The use of the word “correct” is not appropriate in several parts of the article; as in this sentence: “Both physicians and nurses’ employment models have been statistically correct” (P. 7). “Robust” or “stable” are more appropriate. Or, some term used that conveys the means of what they analysis is meant to do—which is apparently to determine if moving average values are correlated with physician and nurse supply. "Stable" word is more correct than "correct" word. Again, what is the dependent variable? We have (separately for two periods) six multivariate ARIMA (or TF) models, so we have than six dependent variables. Two main dependent variables were physicians and nurses, and other dependent variables were inpatient care discharges, outpatient care visit, students enrolled at the first year, and graduated medical doctors. We think that new tables 2, 3 and 4 (instead old tables) would help to understand the complex design of our model. Also, please see table 5.

11. I cannot follow the sentence: “With regard to forecasting, for the period from 2009 to 2015, the annual enrolment rate will be higher by about 20% than the graduation rate at public medical faculties (in absolute numbers 1771 v 1415). Thus, it will equal to the public workforce generation ratio [35-36] of about 6.68 % calculated as the ratio of the number of physician graduates and the total number of physicians in public sector.” I understand this to mean that the graduation rate will be less than 100%, but the use of the term “ratio” confuses me. Is 6.68% the new entry proportion for supply? Please, we refer you to the 13 reference,
and therefore: “The annual workforce generation ratio \(^{[13]}\), calculated as ratio of the number of physician graduates and the total number of physicians employed in public sector will be around 6.58\% for every year in the forecasted period. It will be far less than the new deployments of physicians per year, which is forecasted at 0.7\% on average. The sum of annual differences between the new supply of physician graduates and their deployments in public healthcare sector is forecasted at 8759 persons (9905 vs. 1207).”

12. The paper draws inappropriate cause and effect inferences: “This study revealed that in Serbia the GDP rate has influenced the number of inpatient care discharges” (P. 12). The discharge rate may be associated with the change in GDP. Yes, discharge rate is in relationship with the change in GDP, and it can be clearly see in new table 4.

13. P. 12 also makes a bold claim: “This study has provided evidences of the inadequate inter-sector coordination at the highest HRH authority level in Serbia.” I do not think that can be said based on the presentation. There are no data on inter-sector coordination. Yes, you were right. There is evidence that production exceeds need. We have rephrased it as you suggested.

14. The paper should contrast this form of projection with alternatives, such as stock and flow. It should also provide direct references to good examples of this form of projection and how it might be used. We refer to the studies – references 8 and 15.

15. The paper references projections of physician shortages and nurse shortages that have been superseded by newer data. We refer to the studies – references 36 and 38.

16. The paper makes much of its being “correct” when, in fact it is primarily projecting a continued upward trend in numbers of physicians and nurses. It is the trend and its relative dimension that is important, not the specific accuracy. Thank you; we have included that in the Manuscript Conclusion section (page 7, paragraph 3). That paper also needs to condition this on the absence of other specific factors that affected the downward slopes from time to time. Thank you; we have described those factors in the Manuscript Results section (page 5, paragraphs on outliers), in Discussion section (page 5, paragraph 1, and Study limitations page 6 paragraph 2) and Conclusion section (page 7 paragraph 1).

17. The analysis is also a bit awkward in that the hospitalization rate (in patient care discharges) is very endogenous to the supply. That trend is also important for its upward slope that ought to be correlated with the age structure of the population. Discharge rate is in relationship with the change in GDP, and thus indirectly to the physician supply, which is predicted by the GDP and population number. Population age structure was not analyzed in the study.

18. Table 2 is labeled “Requirements”. But that is clearly not what that is, it is supply. We have rephrased it as you suggested.
Dear reviewer,
Thank you very much for your time and useful comments. We have used the official editing services to re-write paper in standard English.

Sincerely,
Milena Santric-Milicevic, for all authors

Review of the Article entitled “Towards a better approach for physician and nurse requirement planning – learning from the past”

Title of the Article
This article may be categorized as a Case Study since it refers to an application of a statistical model only in the Serbian context and the discussion relates mainly to Serbia. I am of the view that the title of the article itself needs to be revised if it is to be published. A reader cannot infer that it presents ‘a better approach’ since he or she has not been briefed by the authors about the HRH planning approach normally used in Serbia. Further, perusal of the article also does not indicate that it has really led to ‘learning from the past’ except to a very limited extent. The authors may revise the title as: “Physician and nurse requirement forecasting in Serbia using time-series data: A Case Study.” Thank you; we fully accepted the suggestion.

Background
The question posed by the authors is not new since it is well-known that physician and nurse requirement is related to income, population size and case loads. The authors seem to suggest that the erstwhile approach of HRH planning in Serbia is deficient and it would change for the better if the methods propounded by the authors are adopted. However, in the absence of an exposition of the previous approach, it is difficult to appreciate how the authors’ approach helps in improving physician and nurse requirement planning. Hence, in my view, the issues are not sufficiently well defined, at least so it will appear to readers uninitiated to the Serbian healthcare system.

The authors may add a paragraph explaining the HRH planning approach used in Serbia prior to 1961, during 1961-1982 and 1983-2008. Thank you; we explained the HRH planning in Serbia in the Manuscript Background section page 1, paragraph 5, page 2 paragraphs 1, 2 and 3.

Methods
The methods used by the authors are appropriate to the authors’ purpose and well described, and fairly adequate details have been provided for others to replicate the work if they so desire. However, I personally have the following reservations about the soundness of the methodology. The time periods 1961-2008 and 2009-2015 are too long for one to assume, as the authors have assumed “that there will be no significant changes in the planning approach of physician and nurses’ requirements, population size and macroeconomic growth rate, production of physicians and healthcare service utilization in Serbia by 2015”. (The authors themselves have referred in the Background chapter to certain “fundamental political changes, the shift from socialist and centrally planned economy system toward liberal market-oriented economy.”) Forecasting based on such unrealistic assumptions cannot be expected to be helpful in pragmatic physician and nurse requirement planning. Having been personally
involved in country-level HRH planning in a country for about two decades, I must state that national HRH planning involves much more detailed and elaborate exercises (both short-term and long-term) as well as pro-active involvement of multiple stakeholders, which include the top echelon of policy-makers, planners, administrators and health professional leaders. The data requirement for such pragmatic HRH requirement planning at multiple levels is of an enormous variety / complexity and goes much beyond just the historical data used by the authors of the study under review. Hence, I am of the view that while the data used by the authors were sound and well controlled from the perspective of the methodology used by them, it is not adequate for meaningful inferences to be drawn about a country’s HRH requirement planning strategy. With regard to your concerns we searched the relevant literature to find facts that might describe the significant changes in the time series. In previous study we did the joint point analyses which provided almost the same results as ARIMA/TF. This study, apart from analyses had objective to indentify the predictors. To yield valid predictors and highlight the outliers in time-series, the ARIMA /TF modeling was used and its methodology required minimum 20 years, please see references 30 and 31.

The authors have concentrated mostly on the demand side of HRH requirement planning almost totally neglecting the supply side of the equation and the productivity of HRH utilization. It is the reality of current HRH staffing. Please, see the description of HRH planning in Serbia in the Background section, page 1 paragraph 5, page 2 paragraphs 1, 2 and 3. The study has also totally ignored HRH requirement in the non-Government sector forgetting that the national government (Ministry of Health) is the steward of the healthcare system. Yes you were right. Please see the added paragraphs in the Method section, page 3 paragraph 1, and Discussion section study limitations on page 6 paragraphs 3 and 4. The study considered only two crude HR categories, namely physicians and nurses. Understandably due to data limitations, they have not segregated physicians into GPs and physician specialists; and nurses into general nurses and specialized nurses. It should be appreciated that in an economy such as that of Serbia, the increasing sophistication of the healthcare system involves increased requirement of physician specialists, specialized nurses and technologists / technicians. Such requirements are totally hidden in the study conducted by the authors of this paper. They have also not recognized the presence and importance of other allied health professions such as laboratory technicians, radiographers, physiotherapists, pharmacists etc. Yes you were right. Please see the added paragraphs in the Discussion section study limitations on page 6 paragraph 5.

On the supply side, the authors have given no consideration to the production of physician specialists (ostensibly due to data limitations), which (as stated before) assumes increasing significance in a country desirous of extending the benefits of advances in medicine and technology to its countrymen. That was also mention as study limitation. The disaggregated data study was done previously see reference 25, and due to word limits in this paper we have chosen to highlight only two main HRH categories. As regards utilization of the healthcare system or productivity of physicians and nurses, the authors considered only curative services (as evident from the healthcare utilization indices used by them), while in the government-run / public health care system such personnel are also involved in providing a host of preventive, promotive and rehabilitative healthcare services. Please see the clarification of variables in the Methods section page 2 paragraph 1.

Results
1961-82: From the first paragraph it is apparent that the Serbian healthcare scene has witnessed major changes, as while the population grew by 15%, the number of employed physicians rose by 174% (nurses by 28%), thus signaling improved population coverage either in terms of expanded infrastructure or improved quality of care consequent to increased physician-population ratio. Such a finding challenges the basic assumptions (mentioned earlier) of the forecasting exercise. We agree, therefore we made notification about assumptions in Method section statistical analyses on page 3 paragraph 2.

1983-2008: During this period, the number of employed physicians and nurses rose by 43% while the population reduced by 6% and GDP grew by 100%. Strangely, OPD visits reduced by 11% but inpatient discharges increased by 28%. Such findings reflect that physician and nurse employment decisions were based on factors not covered in the study e.g. new projects, filling of existing vacancies and/or upgradation of services etc. Thank you for this observation. We included it in the discussion section.

The most significant finding of the study is the large gap between availability of jobs for physicians and the number of physicians available for employment as it states that 63% of physicians would not find a job in the public sector in 2015. Thank you for this conclusion. We included it in the Conclusion section.

The study should have investigated how many of the physicians would get employed in the private sector, which assumes increasing significance in the emerging economic scenario. If the study actually covered this aspect, then its finding would have been more crucial in influencing decision-making on the intake sizes in medical schools in Serbia thus preventing future mismatches between demand and supply of physicians. Thank you for this observation. We included it in the Discussion section as study limitation and the need for future research.

Reporting and data deposition
Considering the limited scope of the study as explored by the authors, the manuscript does adhere to the relevant standards for reporting and data deposition. The discussion and conclusions, however, do not appear to be well balanced and adequately supported by the data or its analysis. In my personal view, the title and the abstract do not accurately convey what has been found. It draws more upon the authors’ personal familiarity with the Serbian healthcare scene rather than the findings of the study. Yes you were right. We tried to follow all reviewers’ comments and suggestions in order to improve it. The writing is fairly acceptable, and the quality of language is satisfactory; only minor editorial corrections are needed in some parts of the manuscript.

Suggestions to the Authors
The authors may accept the fact that the study, though it involves highly analytical and time-consuming exercises, can only draw limited conclusions about the soundness of the HRH planning approach in use by the Serbian health authorities. The authors must make major compulsory revisions to confine themselves to the findings directly derived from the study (e.g. mismatch between forecasted requirement of physicians and jobs available). Thank you for this conclusion. We included it in the Conclusion section. If they do so, then the re-written paper with a revised title and abstract has the potential to be published as a case study of time series modeling and as a pointer to decision-making on intake planning for the medical schools in Serbia. Thank you for this conclusion. We included it in the Conclusion section.
Annex 3: The response to Reviewer’s report: 1397949177968363 are given in blue words.

Dear reviewer,
Thank you very much for your time and useful comments. We have used the official editing services to re-write paper in standard English.

Sincerely,
Milena Santric-Milicevic, for all authors

Major Compulsory Revisions background
Although the paper describes the history of HRH planning in Serbia, it misses to review the existent literature about HRH forecasting in Serbia or in similar countries/contexts. Thanks we did it in Manuscript Background section page 1 paragraphs 2 and 3. This becomes even more evident in the methods section where the authors mentioned the variables chosen for the model but they do not justify why those ones were chosen and not others. For instance, I have serious doubts on the soundness of having chosen inpatient discharges as part of the model since this variable can be prone to bias (e.g., patients discharged who are latter admitted with complications due to early discharge). I do not understand why this variable, as well as outpatient care visits, was included. Are they proxies to physicians and nurses’ services production (hospital?, primary health care?)? Please, see justification in Manuscript Methods section on page 3 paragraph 1. Another important issue that is not mentioned is if, and if so, how, the skill mix was accounted for. There is not a single line in the paper mentioning how physicians and nurses skills are related, what are the scope of practice and if it has evolved throughout the years studied. The question is quite simple – can we plan or forecast looking only at number and not at context? Yes, you were right, please see skill-mix and context descriptions in Manuscript Background section page 2 paragraph 4 and Result section page 4 paragraph 3, and Discussion section the last paragraph page 6. Another issue that is linked with the before mentioned one is that the authors fail to mentioned for instance how has the educational system been financed and what is to expect in the future. Yes, you were right; please see Manuscript Background section page 1 paragraph 5 and Result section page 4 paragraph 3, and Discussion section the last paragraph before study implications for policy and practice. And what about the health service system? As it grown in the last decades? How? Was this accounted for? How? We briefed about health system changes throughout the paper, but mostly in the Manuscript Background section page 1 paragraph 5 and Discussion section in study limitations.

Methods section needs to be improved with methodological references. Please see methodological references 31 and 32. Also, it should be made more clear why were those specific time periods chosen for analysis. Please, see justification in Manuscript Background section page 1 paragraph 5 and Manuscript Methods section on page 2 paragraph 1.

The discussion should be enriched by other similar studies (especially in study limitations section) and should discuss better the contextual factors that might support or contradict study findings. Please mention the role of private sector (if any) in the provision of health services. Thanks we did all. Please, see the Discussion section for referred studies.

In figure 1, 2, 3, 5, and 6 replace number (or value in figure 4) by the description of the variables (e.g., for figure 3 – Number of inpatient discharges in public health sector of Serbia). Thanks, we did it.
Minor Essential Revisions
Please review reporting of numbers, p-values (when, e.g., p=0.00001 one should report p<0.0.1), tests (chose at maximum 2 decimal places) and confidence intervals (the format used is confusing). Thanks, we did it.