Author's response to reviews

Title: Forecasting the need for medical specialists: the application of a System Dynamics model in Spain

Authors:

Patricia Barber (pbarber@dmc.ulpgc.es)
Beatriz González López-Valcárcel (bvalcarcel@dmc.ulpgc.es)

Version: 3 Date: 11 April 2010

Author's response to reviews: see over
Las Palmas de Gran Canaria (Spain), April 8, 2010

Dear Editor,

Please find enclosed the reviewed version of our manuscript entitled “Forecasting the need for medical specialists. Application of a System Dynamics model to Spain”, submitted for your consideration for publication in HUMAN RESOURCES FOR HEALTH. We also attached the document with “tracked changes”. As we did not send the tracked-changes manuscript of the second version of the paper (first revision), we have colored differently both changes: in red, the first revision, in green, the second one (this one).

We answer in the following paragraphs point-by-point all the comments of Dr Garcia (reviewer 2) as you suggested

- **Major Compulsory Revisions**

  - The paper discusses a system dynamic simulation model without presenting any equation; it is thus quite difficult to both interpret results and offer additional commentaries on the underlying model. Whether the decision to publish the whole set of equation, although suggested, will depend on the editorial policy, equations should be submitted for a complete review.

The file with the complete set of equations load 60.9 megabytes. We sent it by e-mail to you in December 2009, but we do not know if it was received correctly. This time we provide an ftp internet address, free access: [http://docs.google.com/fileview?id=0B1I98yomz-7NW1zYzNdATMDk2YS00OTc0LWFmNzQtMmMwYjk3ZTE0MTZi&hl=es](http://docs.google.com/fileview?id=0B1I98yomz-7NW1zYzNdATMDk2YS00OTc0LWFmNzQtMmMwYjk3ZTE0MTZi&hl=es)

so that equations can be reviewed, as Dr Garcia suggested. In our opinion, they should not be published because they are seventy-page long and they are not of general interest for most readers. They could be sent by e-mail by request of interested readers.

- Some important bibliographical references about methodology are missing. In particular, the importance of delays, feedback loops, policies and rationality constraints of policy makers, which play an important role in a System dynamic model is not discussed.
We added 5 new references (in green in the tracked-changes text, numbered 43-45 and 47-49) to accomplish with this request. We also discuss the importance of delays, feedback loops, policies and rationality constraints of policy makers in the following new paragraph in the discussion section:

The main objective of our model was to simulate the consequences of different policies aimed at improving the capacity of the Spanish health system. Schools of Medicine take six years to “produce” a physician, and the MIR system takes four to five additional years to train a specialist. From the point of view of the model, these are time delays that affect the behavior of the entire system. From the point of view of the planner, he has to make choices one decade before the effects of his policies start to be effective. Ideally, the model could treat the policy variables – numeros clausus, number of MIR positions- as functions of the estimated number of needed health professionals, which in turn depends on the lagged choices, in a feedback loop. We decided instead to introduce those policy decisions as model's parameters, because our model was designed to be used by the planner for simulating the effect of potential changes in their choices. The model does not provide “a solution”, it is rather a tool to know what would happen if...."

- **Minor Essential Revisions**

  *Figure 1: The level variable “Especialists” should be relabeled as “Specialists”.*

  Done

- **Discretionary Revisions**

  - The model should be explained in terms of feedback loops, as those induced by the opportunism of health professionals, for instance. In fact, the analysis of feedback loops would help to better understand the topic being studied.
The model can be represented with a Forrester diagram, as we did, and with a causal loop. In figure 2, we show the Forrester diagram, and in the first revision we added figure 1, that illustrate the elements of a system dynamics model (causal loops diagram, stock and flow diagrams and equations) with a simple example of medical workforce.

- The contribution of system dynamics, as applied to health system problems, should not be limited to the estimation of future values of interest variables. In fact, its main objective is to simulate the consequences of different policies aimed at improving the capacity of the Spanish health system. In order to include this feature in the model, a number of policies may be considered. The number of students admitted to the Faculty of Medicine each year (the "numerus clausus") should not be set as a parameter, which the policy makers can modify depending on their objectives and preferences. Actually, the "numerus clausus" should be a function of the estimated need of health professionals, for example, where estimation methods themselves could be the object of different policy options. In other words, choice variables should not be seen as decision parameters, but as the result of different policies among which a policy maker might choose. Simulation, thus, will provide the results of the implementation of different policy options, and not the estimation of interest variables depending on the value of parameters. To clarify this point, and to propose another idea for improving the paper, one additional example of choice variable, which might be replaced by different policies, is the number of physician admitted as intern residents by specialty: the model should identify the mechanism through which the number of residents is fixed instead of setting it as a parameter.

We designed the model according to the explicit needs of the Ministry of Health of Spain, specified in the research contract. The persons responsible for the planning fixed the parameters they wanted to manage. They asked us to design a tool to
monitor the expected consequences of their alternative choices on strategic parameters, which should be fixed in an annual basis, in collaboration between the central government and the Regional Governments. That is the reason why in our model the forecasted need of physicians does not determine the numerus clausus in a feedback loop. Our model does not provide an “optimal” solution for the planning problem, but the possibility of simulating different scenarios and policies.

The new paragraph included in the discussion refers to the potential use of the model for policy decisions, in line with the reasoning of reviewer 2: some of the parameters could be modeled as a function of the needs, so that the model would work automatically, providing solutions in a way similar to optimal control models.

We thank you in advance for your interest.

Yours faithfully,

Patricia Barber, Ph.D. pbarber@dmc.ulpgc.es

Beatriz González López-Valcárcel, Ph.D. bvalcarcel@dmc.ulpgc.es

Corresponding Author:
Patricia Barber
University of Las Palmas de Gran Canaria
Campus Universitario de Tafira
35017 Las Palmas de G.C.
Canary Islands, Spain
Phone 00 34 928 451823
Fax 00 34 928 45 18 25
Email: pbarber@dmc.ulpgc.es