Reviewer’s report

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

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Reviewer: James Anderson

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1. The authors address an important issue that confronts all of the developed countries, namely, the need for long range planning to balance the supply and demand for health professionals. Shortages of health professionals in certain specialties appear to be a major problem in many of the OECD countries. The paper begins with a good review of the problem and factors that complicate planning.

2. The investigators use system dynamics to model and simulate the dynamic structures of the physician workforce in Spain. System dynamics is an excellent method for planning and projecting health manpower resources. This approach uses diagrams involving stocks (manpower), flows (rates of change) and causal loops involving variables that affect rates of change and feedback loops. The model and the software allow investigators to easily alter parameters such as the number of residencies, immigration, etc. to determine the sensitivity of the model as well as the effects of various policies regarding health manpower.

3. The authors discuss problems in obtaining data for their model. The Spanish government has not created a national registry of medical professionals. The survey of hospitals provides information on the number of physicians broken down into only four groups of specialists. Professional organizations publish information on their members but not by specialties. Autonomous Communities under report the number of doctors because memberships in these organizations is not mandatory. In order to obtain data for this study the authors requested that all regional health departments provide data on employed physicians by specialty, gender and age. The Health Ministry also provided information on the number of doctors in specialty training. The total number of doctors in each specialty and the corresponding age pyramids had to be estimated from these data. Population projections and mortality rates were obtained from the National Institute of Statistics. Standards for the need for specialists (the full-time equivalent doctors per 100,000 population) were established by experts using a Delphi-type method. While these data are incomplete, the investigators did the best that they could under the circumstances. Moreover, the model and its predications provide and excellent aid to policy makers considering various options.

4. The manuscript clearly reports the methods and data used in this study. However, I would suggest that the description of the simulation model be elaborated for those readers who are unfamiliar with system dynamics. The
Figures need descriptive titles and legends or footnotes.

5. The discussion and conclusions are based on the findings from the simulations. The authors clearly state the limitations of their approach.

6. The title and abstract accurately convey the nature of the study, how it was conducted and the principle findings and conclusions.

7. The paper is well written and should be easy to understand by the readers of the journal.

**Level of interest:** An article of importance in its field

**Quality of written English:** Acceptable

**Statistical review:** No, the manuscript does not need to be seen by a statistician.

**Declaration of competing interests:**

I declare that I have no competing interests.