

Long-term Estimate of the Need for Physicians

Estimación a largo plazo de las necesidades de médicos

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Asenjo (1, 2) has listed thirteen factors influencing hospital attendance and explaining the huge differences between countries. (3) According to WHO, (4) the number of doctors per 1,000 inhabitants varies from 0.2 in Indonesia to 7.74 in Qatar and 7.17 in Monaco, with a world average of 1.28 doctors per 1,000 inhabitants, and 45.8% of WHO member countries having less than one doctor per 1,000 inhabitants. In Europe, the average number of doctors per 1,000 inhabitants is 3.7, with a maximum number of 4.8 for Austria and 3.7 for Spain. In America, the number of doctors per 1,000 inhabitants is 2.45 in the United States, 2.1 in Mexico, 6.72 in Cuba, 1.89 in Brazil, 3.9 in Argentina, 2.7 in Uruguay and 1.02 in Chile. The number of doctors is not directly related to health expenditure expressed as a proportion of the nation's gross domestic product, or the healthcare model: *liberal healthcare model* that considers health as a market commodity not necessarily needing public power protection in its full extent (United States); *socialist healthcare model* which promotes health care funding in its entirety by the State, through taxes or the state budget; *mixed health model*, mostly in Europe, in which there is state funding, but also admits and needs support from the private and insurance sectors. (5, 6)

It is questionable whether a higher rate of health professionals is a guarantee of greater health and life expectancy. The answer is no. The longer life expectancy corresponds to Japan with 83.4 years and 2.14 doctors per 1,000 inhabitants, generating a large number of patients rejected from hospitals due to lack of beds or staff. The Spanish population is second with a life expectancy of 83.2 years, ranked in the 9th place of WHO member states in the number of doctors per 1,000 inhabitants and in the 49th place in the number of nurses. (4) The reasons for this discrepancy lie in the population's geographical-distribution characteristics and mainly because the healthcare system to which 90% of expenditure is devoted only contributes with 11% to health, while the environment and life-

style contribute with 62% and 3% expenditure. (1, 2) In this issue of the *Journal*, Borracci et al. (7) publish an excellent study on the long-term estimate of the number of doctors in Argentina and its relation to the number of inhabitants, in order to coordinate human training resources in universities according to the sanitary requirements of the country. A merit of this work is the development of a simulation model with different scenarios in 2007 and its validation with real data in 2014. It is clear that the offer of doctor training must always exceed the demand estimates, both to ensure the availability of resources as to stimulate healthy competition. However, the supply/demand ratio should keep some proportion to guarantee that the human and economic effort made to train our doctors does not lead to frustration and failure.

The implementation of future health surveys faces great difficulties. As in any simulation model, the future evolution of the model variables is in turn determined by the dynamic changes in the rest of the model. (6, 8) We must congratulate Borracci et al. (7) because the 2007 model validation with data observed in 2014 showed that the simulation approached the actual figures, underestimating by 13.4% the number of doctors for that year. It is a good result, if we consider the weakness of official data, and it is probable that they are based on the use of cautious assumptions that have reduced excess errors.

The immediate future is predictable; the future of the present offers difficulties that rise exponentially if we try to predict the future of the future. Projections on the number of doctors needed should be made in periods of more than ten years which is the period required for the physician's education, if we add medical studies, specialization and subspecialization in some disciplines. Medical practice is an activity subjected to multiple influences, some rapidly changing, with the risk of carrying out sharp corrections when generating an offer that has its effects many years later, when the circumstances are very different from the initial one. (6)

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An example of the above is the prediction on the need for cardiologists in the United States. In 1965, the United States faced a critical shortage of cardiologists. (9) In 1981, a report of the Graduate Medical Education National Advisory Committee, predicted 94% excess of cardiologists by the year 1990, which finally did not occur. (10) In 1993, the 25th Bethesda Conference, sponsored by the American College of Cardiology concluded that there was an excess of cardiologists in the United States and that this trend would increase, especially in interventional cardiology. As a result, the number of cardiology residents decreased by 13%. (11) The 35th Bethesda Conference, whose results were published in 2004, concluded that we were facing a serious and growing shortage of cardiologists. (12)

Among the factors that hinder mid-to long term prediction scenarios, the following should be highlighted:

1. *Data sources of practicing physicians with medical care dedication of more than 20 hours per week.* Particularly striking is the discrepancy of data on the number of doctors per 1,000 inhabitants in the different countries, according to either WHO, the Organization for Economic Co-operation and Development (OECD), the European Commission or the National Registries. (3, 4)
2. *Immigration and emigration of doctors.* Borracci et al. (7) attribute the underestimation in the number of doctors to the fact that the model did not adequately consider net migration of professionals between 2007 and 2014. This balance depends largely on the economic cycle and expert economists are very reliable to explain the reasons of what has happened but they have very poor reliability to predict what will happen. In Spain, the immigrant community, including doctors, has been one of the most affected by the economic crisis of the last decade. The idea of Spain as a land of opportunity has faded, leaving behind it a turnaround tendency pointing to the departure of many doctors. The number of foreign doctors who homologated their title to practice in Spain during the 2001-2014 period was 60,924, similar to that of Spanish Faculties of Medicine graduates during the same period (Medical degree: 57,613, certified foreign specialist: medical degree 3,311). Separating the figures per years shows that the number of titles homologated during 2008-2011 doubled the figures of the annual titles homologated before 2008 and after 2011. The emigration of Spanish doctors was 2,561 during the 2006- 2010 period and it has doubled during 2011-2015.
3. *Doctors' labor market and its relationship with the economic cycle.* The age of the medical population and proximity to retirement age determines the generational change and can absorb an increase of training doctors. Slowdown in pensions by prolonging the working age, coupled with economic difficulties in the health sector by the economic crisis, have resulted in job insecurity in Spain with a loss of doctors' purchasing power of 20-30%, which has impacted on motivation, depreciation of working places, and accumulation of temporary work and medical on-call contracts. (8) Mid- to long-term simulation models cannot predict these changes related to economic cycles.
4. *Geographic distribution of doctors.* The distortion in the geographic distribution of physicians has its expression in Argentina with 55% of doctors concentrated in the City of Buenos Aires; Borracci et al. postulate that the current doctor/inhabitant ratio should be maintained but with a better distribution. (7) Telemedicine, which began its adventure in 1970, has reached maturity and offers remote medical assistance in conditions of equity, regardless of geographic location or social conditions. Its implementation will mitigate the small number of doctors in disadvantaged geographical regions.
5. *Age and cultural conditions of the population.* The Friz index expresses the ratio between the number of individuals under 20 years and those between 30 and 50. The population is considered progressive if the index is greater than 1.6, regressive if it is less than 0.6 and stationary if it is between the two ends. Progressive populations with many births and deaths at early ages need much maternal-infant preventive and anti-infective care with low need for hospital beds. Regressive populations, generally educated, with low infant mortality and with degenerative diseases, have a high need of hospitalization. The aging population is one of the most influential factors in the health model and its trends. The elderly population that will reach 71 million people in the United States in 2030, (13) associated with the increase in obesity, hypertension and diabetes increases the resources needed for the treatment of cardiovascular diseases, especially ischemic heart disease and heart failure.
6. *New technologies.* The development of new technologies generates deep changes that linked to the difficulty in foreseeing its impact produces disparities in the predictions of the human resources needed for the specialties involved. The development of new imaging techniques (computed tomography, magnetic resonance imaging, ultrasound, interventional radiology), generated a deficit of radiologists which had not been foreseen. The excess of cardiologists expected by the 1990 predictions was not fulfilled due to the development of imaging techniques and interventional cardiology. The Association of Medical Colleges report, published in 2009, (13) on the need of cardiothoracic surgeons in the United States in 2020 predicted that the reduction of coronary revascularization surgery (39% of surgical activity) in favor of percutaneous revascularization, would be compen-

sated by the rise of arrhythmia, ventricular remodeling and aortic pathologies of the elderly surgeries. Seven years after this report, arrhythmia and ventricular remodeling surgery have not met the desired expectations and percutaneous aortic valve replacement, not mentioned in the report, has emerged with a power reminiscent of the development of coronary percutaneous revascularization. (6, 14)

In conclusion, the predictions of the number of doctors, through simulation models with various scenarios, are necessary and must be guided by means of the integration of technical experts and representatives of scientific societies, because leaving it to the politicians, with their short-sightedness, is very dangerous. Hence the need to strengthen initiatives like the one made by Borracci et al. (7) However, mismatches due to the unpredictable behavior of some variables, especially those related with economic cycles, requires to have short- to mid-term alternative possibilities of action.

Conflicts of interest

None declared.

(See authors' conflicts of interest forms in the website/Supplementary material).

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