MEDICAL WORKFORCE IN BELGIUM : ASSESSMENT OF FUTURE SUPPLY AND REQUIREMENTS *

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SUMMARY

The regulation of human resources is a controversial subject. In Belgium, after some years of political disputes, student strikes, and procrastination, quotas have been applied to new graduates in medicine (since 2004), dentistry, and physiotherapy. In this particular context, various models have been developed in order to forecast, on the assumption of an unchanged health system, the future workforce and the appropriate number of future medical graduates.

By focusing on three of these models, we identify 1) some parameters which should be included in a forecast supply model and 2) the consequences of the Belgian regulation.

The overall methodology of these models is similar. The projections are based on a base-year stock of physicians. The size of this stock will vary according to future inflows and outflows and the corresponding full-time equivalents will suffer from ageing and feminisation. In order to assess requirements for new medical graduates, these supply forecasts must be compared with the predicted future demand and requirements for medical doctors, inter allia the replacement requirements, taking into account the predicted outflow. Although they have used different parameters and estimates, the models have nonetheless reached similar results about the long-term future (2015-2020) ; if the present quota is maintained, some authors conclude that there might be a shortage of doctors.

Some parameters of these models appear to us to be absolutely essential, in particular retention rates, volume of activity, impact of feminisation and ageing of the medical workforce. Projections for requirements also depend on the type of MDs considered, on the base year chosen in the model and on any oversupply that may exist in that base year and the size of the outflow.

But, even if one regards the present situation as one of oversupply, there is reason to fear shortages in the future. Consequently, enlarging the present quota after 2013 would not bring about an increase in the future global workforce. The reasons: the retirement of substantial cohorts of graduates in the years 2015-2025

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and an overly restrictive quota that, if remained unchanged, will not compensate for these departures. The introduction of these quotas came too late: a numerus clausus would have been very useful in the years between 1975 and 1990 (given the uncontrolled expansion in the numbers of new graduates at that time); being finally enforced, it will be appropriate for a few years (2004-2012), but afterwards it should be enlarged: at a time when European regulations aim to limit the working hours of young specialists in training, and when both the number of doctors leaving the profession and the needs of an ageing population are set to increase. Such enlargement has already begun (for 2012) and should be increased.

INTRODUCTION

The regulation of human resources is a controversial subject. In Belgium, after some years of political disputes, student strikes, and procrastination, quotas have been applied to new graduates in medicine (since 2004), dentistry, and physiotherapy: under these, only certain graduates will be able to work within the framework of the health insurance system. In this particular context, various models have been developed in order to forecast, on the assumption of an unchanged health system, the future workforce and future requirements. Although they have used different parameters and estimates, a number of models have nonetheless reached similar results about the long-term future (2015-2020): if the present quota is maintained, some authors conclude that there might be a shortage of doctors.

The introduction of these quotas came too late: a *numerus clausus* would have been very useful in the years between 1975 and 1990 (given the uncontrolled expansion in the numbers of new graduates at that time). Being finally enforced, it will be appropriate for a few years (2004-2012), but afterwards it should be enlarged: at a time when European regulations aim to limit the working hours of young specialists in training, and when both the number of doctors leaving the profession and the needs of an ageing population are set to increase. Such enlargement has already begun (for 2012) and should be increased.

In our first section we will describe the regulation of human resources in the Belgian context and the specific characteristics of the medical profession (Section I). After outlining our objectives (Section II), we will describe (in Section III) the methodology used in the three Belgian projections of the supply of and requirements for doctors; we will then compare their results (Section (IV), before drawing some conclusions.

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I. PLANNING HUMAN RESOURCES FOR HEALTH (MEDICAL DOCTORS) IN BELGIUM

1. Capping the numbers of medical doctors (numerus clausus)

During the 1950s, 1960s and 1970s, in a context of economic growth, an expansion of human health resources was planned in many countries, including Belgium. This was followed some years later by a growing concern about oversupply: as a consequence, in the 1980s various restrictions were introduced. In Belgium it was more than 20 years before regulation of human resources was imposed via quotas in medicine, dentistry, and physiotherapy. In the meantime, however, the numbers of graduates in medicine (and dentistry) had already fallen (Fig. 1).

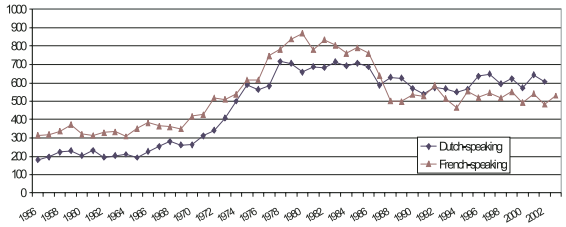
Until 2004, all medical graduates could practice medicine in Belgium: they all obtained a licence that allowed them to have their services financed through the National Health Fund (INAMI/RIZIV). Since 2004, quotas (called "*numerus clausus*") regulate the number of new MDs allowed to register with the National Health Fund after having obtained their official licence. In other words, the *numerus clausus* aims to limit the number of practitioners in the health-care sector. Consequently, some graduates will not qualify for such licences.

The limit is applied after the seven-year training common to all, i.e. before specialisation. After this common training, future general practitioners follow a supplementary two-year training course, while, depending on their specialty, future specialists have to follow from four to six years of further training.

The overall quota is distributed by discipline and specialty, as well as by linguistic Community[2]: 57% for specialists and 43% for GPs; 60% for the Flemish Community and 40% for the French-speaking Community (corresponding to the distribution of the population between the two communities) (Table I).

In addition, minimum numbers of graduates, who will be registered with the National Health Fund, have been fixed for certain groups of specialties. Nevertheless, some specialties fall outside this limitation («out-of-quota»): management of health data, forensic medicine, occupational medicine, and child psychiatry (the latter within a quota of 20 per year). Those students who will not have access to the licences subject to the *numerus clausus* will be able to gain access to those specialties that are not subject to the *numerus clausus*.

Figure 1 – Cohorts of graduates in medicine, by language and year.



Source: University Foundation, French Rectors' council and Flemish Interuniversity council, in InfoSanté (1)

Table I

Overall number of new licences from 2004 to 2011, by linguistic Community and discipline

	Flemish Community			French-speaking Community		
	GPs	Specialists	Total	GPs	Specialists	Total
2004-2006	180	240	420	120	160	280
2007-2011	(a)	(a)	420	(a)	(a)	280
2012			500			333

(a) Still pending
Source: AR 2002-05-30 and AR 2005-07-11

[2] In Belgium, there are three linguistic Communities: Flemish or Dutch-speaking (in northern Belgium) and French-speaking and German-speaking (in southern Belgium). Brussels is in the centre and is bilingual (French-Dutch), with more French-speaking inhabitants. In the context of the numerus clausus, a distinction is made between the Flemish (Dutch-speaking) Community (6 million inhabitants) and the French-speaking and German-speaking communities (4 million inhabitants). Education is under the authority of the Communities, whereas access to the National Health Fund ("INAMI» in French, «RIZIV» in Dutch) is controlled by the federal authorities.

The method of selecting these individuals is not fixed by law, so different approaches are taken: examination at the beginning of their studies in the Flemish Community and selection at the end of the first year in the French-speaking Community. On the French-speaking side, an excess («over quota») of 15% of degrees has been promoted. These additional numbers will make it possible to fill posts not directly involved in health care, as well as in those types of care that are not reimbursed by the National Health Fund (homeopathy, acupuncture, preventive medicine, etc.).

The quota is intended to maintain approximately the same workforce in Belgium and to gradually equalise the doctor-to-population ratios of the two Communities. The norm that is believed to underlie this is that of the Flemish Community in 1999, the year taken as the base year of the Public Health Ministry model.

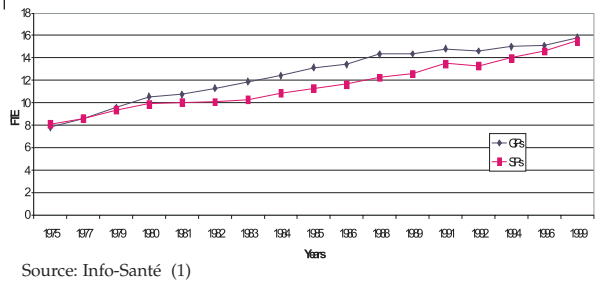
The official justification provided for introducing this limitation has been threefold:

– For political reasons: the number of physicians must be balanced between the two communities, according to the size of their respective populations
– For financial reasons: a context of oversupply may induce unjustified demand (from the point of view of medical need) and cause an increase in expenditure.
– For reasons of quality of care: in a context of oversupply, too little contact with patients on the part of physicians may interfere with the quality of care.

Besides, the professional organisations are usually eager to improve physicians' income. Finally, the increasing ratio of specialists to general practitioners among young doctors was regarded as becoming too expensive (Fig. 2). Before the *numerus clausus*, one third chose general practice and two thirds specialised medicine[3].

The official justifications were provided without scientific proof and are based on controversial concepts: oversupply is difficult to measure and to quantify; supply-induced demand is a matter of controversy in economic literature; quality of care

Figure 2 – Number of FTE MDs participating in the health system per 10 000 inhabitants, per discipline, 1975-1999.



Source: Info-Santé (1)

TABLE II

HEALTH PROFESSIONALS REGISTERED WITH NATIONAL HEALTH FUND, 1975-2000

	1975	1980	1985	1990	1996	2000	Index 2000 for 1975 = 1
Physicians	18726	23895	28826	32960	36644	39519	*2.1*
GPs and specialists in training	10497	13881	16818	18976	20254	21415	*2.0*
Specialists	8229	10014	12008	13984	16390	18104	*2.2*
Pharmacists					9692	10724	
Dentists	3117	4753	6427	7352	7992	8465	*2,7*
Midwives	1448	1696	2403	3272	4146	4508	*3,1*
Nurses	13566	13419	25005	40975	50428	55406	*4,1*
Physiotherapists	7734	10368	14469	19028	24331	27053	*3,5*
Opticians	2620	2967	2504	2825	3095	3280	*1,3*
Orthopaedists	539	602	617	502	521	551	*1,0*

Source: UCL-SESA, Info-Santé (1)

[3] Data from the Public Health Ministry

has not been measured and is not controlled for medical doctors overall. Furthermore, the specificities of the two Communities have not been studied, although poverty is higher in the French-speaking Community and this is linked to poor health. Moreover, the productivity of French-speaking practitioners working in health care is, on average, 17% to 26% lower that of their Flemish colleagues (2); this makes it possible to distribute the work among more professionals, which can be beneficial when the unemployment rate is high in the population. Finally, other health professions have developed over recent decades, including professions that do not depend on MDs' prescriptions (Table II).

This kind of limitation will influence the evolution of the health system. For example, with the present quotas we will see a restriction of the number of future specialists as against GPs.

2. The Belgian medical profession

Not all physicians work in the health system in Belgium. Those who leave the profession are regarded as "lost" for jobs useful for the country's health services and should not be included in the health workforce. According to data from the Catholic University of Louvain (UCL - Socio-Economie de la Santé), there were 41 007 MDs under the age of 76 in 1999. Of these, 87% were participating in the Belgian health system, i.e. 35 817. Of this latter group, only 83% worked directly in the health care sector (i.e. 73% of all graduates) (Table III). There were 158 GPs and 155 SPs for 100 000 inhabitants, plus specialists in training.

Over the last decade the proportion of those not participating in the Belgian health system has increased: from 11.2% in 1990 to 12.7% in 1999. If one adds those who do not work directly in the health care sector, the proportion of those not providing care has increased more, from about 12% to 17-19% of those participating in the late Nineties.

In 1999, 24.1% of the GPs and 13.1% of the SPs participating in the health system did not provide care. The numbers of GPs showed more losses than SPs, both in the health system and in health

Table III

Practising and non-practising physicians in Belgium, 1975-2002

	1975	1990	1996	1999	2002
1. Medical Graduates					
Registered with Health Funds	18 726	32 960	36 644	38 769	40 167
Total <76 years UCL-SESA	18 723	34 957	38 758	41 007	
2. Participating in the health system					
<76 years UCL-SESA (b, c)	17 744	31 024	34 053	35 817	
3. Health care sector					
Health Funds (a)	***	28 850	32 414	31 659	32 642
UCL-SESA in person equivalent (d)	15 608	25 979	28 687	29 842	
4. Not participating in the health system					
as % of <76 years UCL-SESA (person equivalent)	5.2 %	11.2 %	12.1 %	12.7 %	
5. Not providing care					
- as % of those registered with Health Funds	***	12.5 %	11.5 %	18 %	19 %
- as % of < 76 years participating in the health system	12.0 %	16.3 %	15.8 %	16.7 %	
- as % of total <76 years	16.6 %	25.7 %	26.0 %	27.2 %	

(a) At least one item of service paid through Health Funds during the year
(b) At least one activity in the Belgian health system
(c) Including those graduates in training for GP licence or specialisation
(d) The various activities are registered and their sum equals one for each MD, irrespective of the number of hours.
Source: UCL-SESA, InfoSanté (1)

care tasks (Table IV). Those who remain in practice also suffer from more career difficulties, particularly in the capital (3).

People leaving the profession is not a phenomenon specific to the medical profession; within the profession, however, the percentage is increasing with time. These findings highlight a number of factors that should be taken into consideration in the framework of projections of supply: the extent of the non-care sector and of activity outside the health system, which reduce the workforce within the care sector. In addition, increasing feminisation also reduces potential activity, given the persistence of a traditional division of labour that leads to a smaller volume of work on the part of women (in the professional sphere, that is).

GPs work mostly in their own surgery: in 1996, 68% were in a solo practice and 14% in a group practice (4). Specialists work mostly in a hospital: 80% of them; 60%, however, have a surgery. Hospital work constitutes 60% of their activity and the surgery 30% (4).

In Belgium, patients are free to choose any physician, whether GP or SP. There is no gatekeeping system as in the Netherlands. There is both a decreasing trend for patients to consult GPs and a growing concern on the part of the authorities about increasing their role. Physicians also have therapeutic freedom and can choose where to establish their practice.

II. OBJECTIVES

Manpower planning finally drew the attention of the various actors, including both political and academic ones, during the mid-nineties. Three models have been developed recently in order to assess the future medical workforce and the requirements for medical graduates in Belgium[4]:

- Dercq et al. (5)
- Deliège et al. (6)
- Bogaert et al. (7)

Our objective in this paper is to compare and assess these three models. Each model produces different results, which can be explained by the parameters, sources, and hypotheses they adopt. Neither do these models have the same base year or the same timescale. Consequently, their results are not quite comparable.

We begin with a description of these three models, in order to assess the influence of some parameters in the field of supply and future requirements for medical manpower. We will further attempt to assess some of the consequences of the Belgian *numerus clausus* regulation.

TABLE IV

GPS AND SPS: % OF "LOSSES", 1992-2002

	1992	1994	1996	1999	2002
GPs					
% not participating in the health system among total <76 years (a)	11.4 %	12.8 %	13.7 %	14.2 %	14.97%
% not providing care among those participating in the health system	22.9%	22.7%	23.5%	24.1%	27.07%
% not providing care among total <76 years	31.8%	32.7%	34.0%	34.8%	37.99%
SPs, not including those in training					
% not participating in the health system among total <76 years (a)	10.3 %	11.8 %	12.9 %	13.4 %	14.94%
% not providing care among those participating in the health system	12.4%	13.3%	11.8%	13.1%	13.54%
% not providing care among total <76 years	21.6%	23.6%	23.2%	24.8%	26.47%

(a) no activity in the Belgian health system - in person equivalent
Source: UCL-SESA, Info-Santé (1)

[4] Buntinx et al. have also developed a model for supply projections, set out in an article published in 1995 (8). The base year for this model is 1993 and, as far as we know, the model has not been updated. Moreover, the estimates for certain parameters were based on Dutch estimates, as in the Bogaert et al. model. One hypothesis in this model, which we regard as incorrect, is that each doctor is regarded as being equivalent to 1 FTE whatever the age and gender (51.6 hours a week).

III. METHOD

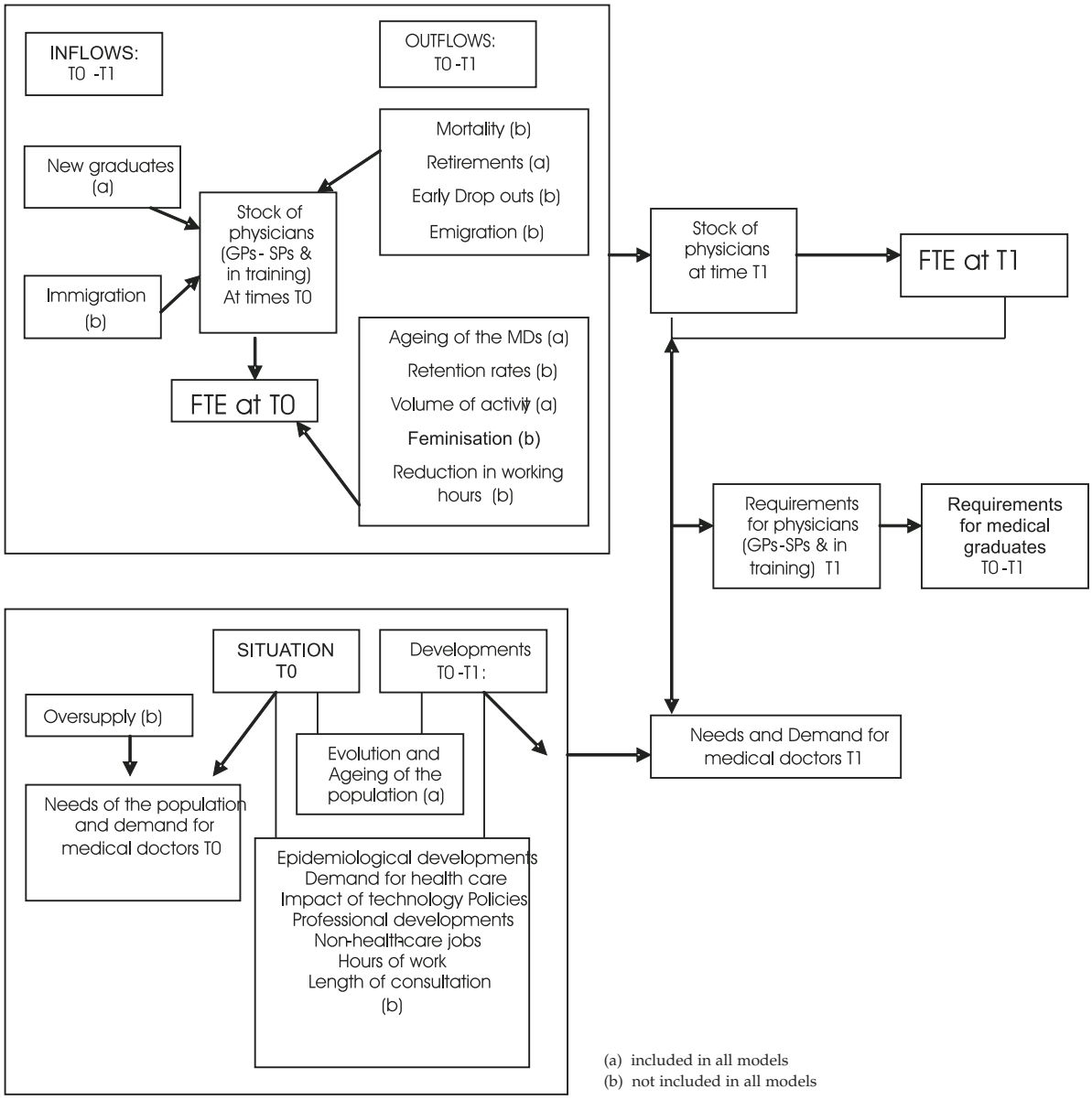
In this section, we describe the overall methodology of these models, we compare them, and we examine the differences between them. We will examine the concept of "activity" (=participation) in these models (volume of activity, retention rates, etc.). This will enable us to further explain the results of the various forecasts.

1. Overall methodology of the Belgian models

The overall methodology of the three models is similar. The projections are based on a base-year stock of physicians. The size of this stock will vary according to inflows and outflows in the future. The models work either in "person equivalent" (PE)[5] or in full time equivalent (FTE); the latter corresponds more closely to reality and to the concept of a workforce. The FTEs are computed in hours or in relative amount of services, compared to a reference category. These supply forecasts are compared with the forecasts of future demand and requirements (the latter being a broader concept) for medical doctors, in order to assess requirements for new medical graduates (Fig. 3).

The three Belgian models attempt to answer at least two of the three questions highlighted by

Figure 3 – Global model of supply, demand, and requirements for medical doctors .



[5] Each person equals 1, irrespective of the number of hours worked. His/her activities are split into fractions of 1, according to the number of different activities recorded.

O'Brien-Pallas et al. (9) : - how many physicians are required to continue to serve populations in the way they are currently served? (cf. supply forecast taking into account the population's use of services and the demographic evolution of the population), - how many physicians are required to support the services required to meet all, or a proportion, of the expected needs of the population? (supply and needs of the population (epidemiological) forecasts), - how many physicians are required to satisfy the expected development and plans for the future provision of health care services? (forecasts for supply, needs of the population, and requirements for medical doctors).

The parameters are assessed from past trends or foreign data. Some parameters are included in all the models: ageing of the Belgian population, inflows of graduates, ageing of the medical population, retirements, and volume of activity. These are, however, assessed in different ways.

2. PARAMETERS AND OBJECTIVES OF THE MODELS

2.1. Dercq et al. model

For supply, Dercq et al. take immigration and the increasing share of women (53% in 2000 up to 74.47% in 2030) into account within the inflows; mortality, emigration, and reductions in working hours are taken into account in the outflows (i.e. decreases in the workforce). The workforce is assessed in FTE, taking into account the lower professional workload of women and older doctors.

The authors then compute forecasts of the demand on the part of the population in order to assess the requirements for graduates. For assessing the demand on the part of the population, they consider population growth, the ageing of the population, and the impact of technology. In brief, for these last three parameters the model estimates that, from 2000 to 2020, the increase in the number of GPs required will be +14.73% and the increase in the number of SPs will be +12.58%. Consequently, the medical population (GPs and SPs) should increase by +0.63% per year.

The main objective proposed by this model was to maintain the workforce at the national level and to reduce the oversupply in the French-speaking Community. This model is, however, being improved and updated, in collaboration with two universities, and has been used for other medical professions (dentists, physiotherapists, and nurses).

2.2. Deliège et al. model

Deliège et al. take into account the mortality rate (specific rate, taking into consideration the lower mortality in the higher socio-economic group and the decreasing mortality over time), immigration, the increasing participation of women (assessed at +2% every 5 years, with a maximal level of 70%), the time lag of the arrival on the work market of future specialist graduates (because of the length of their training), and retention rates (not all graduates provide care or work in the health system).

For estimating requirements, they also assess the oversupply in the French-speaking Community, considering the doctor-to-population ratio of France in 1999 (base year of the model) as a reference norm.

For needs in the health care sector, the evolution of the population (ageing and growth) and the increasing demand for health care (trends in the rate of encounters, irrespective of the load of further services) are also introduced into the projections. In addition, Deliège et al. forecast the requirements for physicians for tasks outside health care. The growth of the population is assessed at +6% over 20 years (1999-2019, French-speaking Community). As to the ageing of the population, Deliège et al. emphasise that the number of those aged 65 years or more will increase by +20% over 20 years in the French-speaking Community. As to requirements linked to demand (rates of encounters), the trends were assessed separately for GPs and specialists, according to three scenarios (long-term trends, short-term trends, and specific care for pensioners and widows). For the evolution of the sector outside care, too, three scenarios were analysed (1999-2019): +6.2% (same rate of growth as for the population), +42% (growth in line with growth in GDP), and +22% (average hypothesis).

Two possible targets were considered: either that supply would match requirements; or that the medical workforce would be stabilised (participating MDs). The appropriate number of future medical graduates was deduced, taking into account outflows during the period of time considered. The forecasts were limited to the French-speaking Community.

2.3. Bogaert et al. model

Bogaert et al. adapted the Nivel model (10) to the Belgian context. The global equation of this model is as follows (in hours):

> Requirements in GPs at year t = Demand for health care at year t /General medicine workforce at year t

For the parameters of supply, they take into consideration reductions in working hours and, like the other authors, the volume of work and retirements.

The demand for care is expressed in hours at the base year, by taking into account the average frequency of patient encounters (5.34), their length (15 minutes), and the average number of contacts for GPs. According to the authors, the average GP has 80 contacts a week with patients. They assume, furthermore, that the GP devotes two hours a week to telephone contact, one hour to visits to hospital, and two hours to on-call services. This burden of work is distributed according to gender and age in the same way as in the Nivel model. The demand for care is, accordingly, expressed as a total number of hours: for 1997 this was 19 196 551 hours for the country's GPs.

Demographic factors (evolution of the population according to age and gender), epidemiological factors, policies, and approaches to practice (group practice, extension of tasks, prevention, delegation of tasks, home care, etc.) are taken into consideration in forecasting requirements for GPs. Thus, straightforward demographic evolution (assuming constant consumption by age) would lead to a growth in demand from the total population of +8.89% in 2010 and of +14.44% in 2020. Drawing on the findings of Hingstman et al. (10), the authors assume that the growth in the total number of contacts due to epidemiological developments will be +3% in 2010 and +5% in 2020. Developments in the profession and in the health system could also influence requirements: three scenarios are envisaged: +0%, if no measures are taken by the authorities to promote the role of GPs in the health services; +5%, if partial measures are taken; and +10%, if substantial measures are introduced (by 2010; +0%, +10% or +15% by 2020). They also take into account the development of dual and group practices: this development should increase the requirements for GPs by +0.47% in 2010 and by 0.95% in 2020 (bearing in mind that, per group or pair of GPs, 0.1 FTE is required for time devoted to management). The increase in non-health-care activities (e.g., administrative tasks), the average length of consultation, and a decrease in home visits are also incorporated into their model.

The model also aims to analyse the possible gap between supply and requirements. The forecasts are limited to GPs in Belgium.

3. MEDICAL POPULATION

The medical population considered is not the same in the different models.

In their model, Dercq et al. take into account all the physicians in Belgium, looking separately at specialists and non-specialists, and at the French-speaking Community and the Flemish Community. In total, converted in FTE: 30 852 in 1998 (specialists in training included).

In the Deliège et al. model, the medical population is the whole medical profession of the French-speaking Community in 1999 (including specialists in training), further assessed in terms of MDs participating in the health system. For assessing the workforce, those aged 66-75 years are weighted by a factor of 50% (taking into account their lower productivity). This gives a total of 17 250 active PEs. Neither supply nor requirements are limited to health care jobs. There are many tasks outside health care for physicians and we have to consider that not all MDs registered with the National Health Fund work in the health care sector, and that, even for those providing care, part of the workforce is devoted to other tasks. Besides, Deliège et al. take into account the oversupply of medical staff in the base year. To assess this oversupply, they compared the doctor-to-population ratio in the French-speaking Community with the doctor-to-population ratio in France in 1999, after adjusting for foreign medical graduates and medical doctors in training. The difference in the ratio is from +15.8% to +14.3% of the participating physicians. Consequently, the medical staff "required" in 1999 was reduced to 14 530 participating MDs.

The Bogaert et al. model is restricted to GPs who are registered with the National Health Fund, excluding GPs in training and «non-retrained» GPs (i.e. mostly outside the health care sector), giving a total, at the national level, of 12 779 in 1997[6].

[6] «Non-retrained» GPs are a category of unlicensed GP with certain rights. These are doctors who were already practising as GPs before 31 December 1994 and who do not hold the certificate of further training issued by the Public Health Ministry. Until 2005 they were allowed to continue to practise as GPs; after that date, coverage for their services under the health insurance scheme is limited and they must use a particular National Health Fund nomenclature.

4. THE LEVEL OF ACTIVITY

The level of activity can be introduced into the models at three levels: retention rates in the health system, relative volume of activity at older ages and for women (and retirements), and reductions in working hours over time.

4.1. Retention rates

It is only in the Deliège et al. model that retention rates are calculated; this is done by age and gender (observed in 1999). Keeping them stable across time is a compromise between a scenario predicting earlier retirements because of burn-out and the social trend towards placing less value on work and a scenario that assumes a contrary development because of shortages of physicians (following the introduction of the *numerus clausus*) and under the pressure of possible new policies encouraging professional activity until 65 years of age, or even later. These rates are computed by the number of professionals participating in the health system as a percentage of the number of graduates alive. They are different for specialists and non-specialists. They also reflect early retirements.

4.2. Retirement

All the models take retirement into account, although with different scenarios. In the Dercq et al. model, all individuals aged 75 or more are considered to be inactive; in the Bogaert et al. model, this is done for individuals aged 66 or more. Deliège et al. envisage two scenarios: retirement before the age of 66 and retirement before the age of 76.

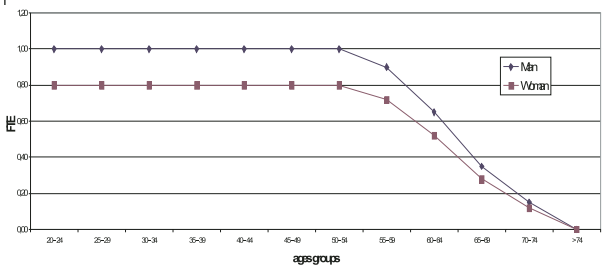
4.3. Relative volume of activity

The volume of activity is assessed in various ways by the different authors, but all assume a lower volume of professional activity for women. In Deliège et al. model, medical staff is expressed in "person equivalents": the volume of activity for women is assessed at 0.80 PE, compared to 1 PE for men and for all specialists in training. In addition, Deliège et al. takes into account only half of the 66-76-year-old physicians, as their productivity is lower; a 66-year-old physician, thus, equals 0.5 PE.

Dercq et al. use a theoretical curve, based on Saugmann's curve (11), in order to compute the volume of activity of men aged over 50. They consider that younger men potentially work 1 FTE and that women work 20% less than men (Fig. 4).

The lower volume of activity on the part of women is implicitly computed in Bogaert et al. model. Indeed, the authors take into account part-time work, which is more frequent for women. On the basis of a survey, they estimated the number of FTEs for Belgian GPs: a GP as main profession and without any minor profession corresponds to 1 FTE (or 57.5 hours per week); a GP as main profession, with a minor profession, corresponds to 0.88 FTE, and a GP as minor profession, with another main profession, corresponds to 0.28 FTE (Table V – Assessment of FTE for licensed GPs).

Figure 4 – Volume of activity according to gender and age, Dercq's model.



Source: Dercq et al. (5)

TABLE V

ASSESSMENT OF FTE FOR LICENSED GPS

	Number	Hours	Consultation forms book (a)	FTE
GPs without practice	80	0	0	0
GPs as minor profession with another main profession	22	16	27.4	0.28
GPs as main profession with another minor profession	263	50.3	96.6	0.88
GPs as main profession without minor profession	635	57.5	109.5	1

(a) One " Consultation forms book " = 50 consultations
Sources: Bogaert et al. (7) - data from survey of Belgian GPs

Thus, in order to estimate the number of FTE GPs available, it is necessary to apply a correction factor: [0+(22*0.28)+(263*0.88)+(635*1)] / 1000 = 872/1000 = 0.872

For their forecasts, the authors assume that the volume of part-time work (i.e. 0.75 FTE) will increase by 20% from 1997 to 2020 (10% to 2010), which will reduce the workforce by -8% in 2020 (-5.7% in 2010).

4.4. Reduction in working hours

The reduction in working hours over time is computed in the Dercq et al. and Bogaert et al. models. In the first of these, it is assessed at – 0.3% per year and per FTE. This figure is derived from the records of various debates in the French Senate[7]. Bogaert et al., for their part, envisage three scenarios for this parameter: -3.1%, -7% or –10.9% to 2010 or to 2020.

IV. RESULTS AND DISCUSSION

1. "Oversupply"

Shortages and oversupply are difficult to measure and depend on the choice of indicators[8] and on the context; in the case of oversupply, some shortages may be simultaneously present in a number of sectors or areas.

Thus, when a reference doctor-to-population ratio is being used, the results can vary quite considerably, depending on the choice of this reference ratio and on the method of counting doctors in the different countries. Deliège et al. and Dercq et al., moreover, arrive at different conclusions according to whether they compare the ratio in Belgium's French-speaking Community to those of France, the Flemish Community, or the Netherlands. The latter comparison appears very dubious to us, given the major differences in the organisation of the health system and in the method of counting doctors. But even a comparison between the two Belgian Communities, neighbours and operating within the same health system, is not such an easy one to make. The survey carried out by Leroy (4) showed that, despite the differences in the ratio, weekly working hours differed very little between doctors in the two Communities; average productivity shows a greater difference: the average number of patient contacts of the French-speakers was about one quarter lower and the length of contacts was longer (+11% for a home visit and +18% for a consultation in the surgery). Oversupply is, thus, accompanied by modifications in behaviour. Insofar as incomes remain «adequate» (a subjective criterion, which has not been studied), the work is shared by a larger number of individuals.

Other indicators suggest a lower rate of oversupply than those assessed by the authors cited above. Curiously enough, despite the difference in doctor-to-population ratio between the country's two linguistic Communities, the level of the oversupply indicators is very similar for the two Communities! What they have in common is the difference revealed between the situation of GPs and that of specialists: the former seem more «affected» than the latter (Table VI). Nevertheless, one cannot be certain whether this is due to difficulties arising from oversupply or from personal choices and circumstances.

Table VI

Indicators of oversupply

Type of indicator	**GPs**	**Specialists**
Earn less than € 1 800 per month	10.8%	4.3%
Feeling of being under-employed	9.0%	6.4%
Work less than 1 840 hours a year	5.3%	3.9%
Earn less than € 1 240 per month	4.2%	0.7%
Difficulties of career : prevalence for:		
- more than a third of the indicators	23 to 27%	10 to 13%
- half of the indicators	± 7%	1 to 2%

Sources: Leroy (4) and Antoine et al. (3)

[7] Session of 28 november 1996.

[8] A review is provided in Deliège et al. (12)

The last indicator in Table VI (Indicators of oversupply) was established by Antoine et al. (3): they observed a higher frequency of career difficulties for GPs in Brussels, the capital of Belgium, possibly reflecting an oversupply in this area. In the case of GPs, we note that about 15% of them are not involved in health system (section I). This is not a new phenomenon and thus it is not the result of oversupply; some of those leaving the profession, however, may do so because of working conditions such as heavy responsibilities, high level of requests from patients, long working hours, and duties linked to care. Some MDs were very dissatisfied (13).

Moreover, 63% of hospitals responding to a survey in Belgium's French-speaking Community declared that their operations were understaffed. Of the doctors surveyed, 80% reported that they had already experienced difficulties in recruitment in the past and 92.6% believed that these problems would persist in the future. Among the reasons given for these fears, the *numerus clausus* was cited by almost half of those responding; but a lack of specialist candidates was already felt by 36% of them; moreover, 36% referred to a change of mentality among young specialists, who were less inclined to accept the constraints of hospital practice. For 78.6% of hospitals, the specialists most in demand were anaesthetists, gynaecologists, and paediatricians (14).

2. FORECASTS OF SUPPLY AND REQUIREMENTS

Dercq et al. worked out six scenarios, three for each Community: a) assuming growing requirements, b) assuming constant requirements (with a convergence of the doctor-to-population ratio in the French-speaking Community with that in the Flemish Community for these first two scenarios), and c) assuming convergence of ratios with those in the Netherlands. In the first two scenarios the reference ratio is that of the Flemish Community; in the third it is that of the Netherlands. In the first comparison, oversupply in the French-speaking community is estimated at 34.43% for specialists and 24.49% for non-specialists (30.98% overall). In the second comparison, the oversupply index in comparison with the Netherlands is estimated at 22.16% for the Flemish Community and 46.17% for the French-speaking Community. The comparison is a curious one: the health systems in the two countries are quite different and it is more than likely that the national statistics in each do not count the same type of individual (in particular when it comes to specialists in training, public health doctors, those working in homes, and those who are «inactive»). The results of the different scenarios are presented in Table VII .

The reductions envisaged in the workforce are obviously greater for the French-speaking

TABLE VII

REQUIREMENTS OF MEDICAL MANPOWER (1998-2018) - DERCQ ET AL. MODEL

		FTE			Individuals
		Non-specialists	Specialists	Total	Number of doctors
French-speaking					
	1998	5 523	9 887	15 410	20 105
2018	Growing requirements	4 988	7 741	12 729 or -17.40%	21 361
2018	Constant requirements	4 618	7 451	12 069 or -21.68%	20 512
2018	Convergence with the Netherlands	3 753	6 581	10 334 or -32.94%	18 286
Flemish					
	1998	6 044	9 398	15441	19 466
2018	Growing requirements	6 834	10 688	17 522 or +13.48%	26 684
2018	Constant requirements	6 004	9 476	15 480 or +0.25%	24 040
2018	Convergence with the Netherlands	5 352	8 086	13 438 or -12.97%	21 443

Source: Dercq et al. (5)

Community (by -17% to -33%), particularly in the case of convergence with ratios in the Netherlands. In all the scenarios (including when inflows are varied), the objectives of a reduction established on the basis of an assessment of oversupply in the French-speaking Community are not achieved – but these objectives appear very restrictive. In the first two scenarios, the reduction envisaged would affect specialists more than non-specialists in the French-speaking Community; the difference between the two types of discipline being almost nil in the «convergence with the ratio in the Netherlands» scenario. In this latter scenario the objective envisaged, of a reduction in ratios calculated relative to the Netherlands, could not be achieved until 2023 for the Flemish Community and is virtually impracticable for the French-speaking Community.

Deliège's reference scenario for Belgium's French-speaking Community is characterised by an unchanged *numerus clausus*, as decided at the federal level (allowing, also, for an excess «over quota» of 15%). Under this scenario, no matter what the retirement age, the number of *active* practitioners will be lower in 2019 than in 1999: down by -1000 to -2000. On the other hand, if one looks at the total of *survivors*, the numbers of those aged under 76 in 2019 will be higher than in 1999. These divergent results show the importance of taking into account retention rates, particularly in the case of an age pyramid with an ageing population.

The numbers of specialists will be down -13% from 1999 to 2019 (on the hypothesis of retirement at 66) and by more than a third towards 2030-2050. For non-specialists, although mitigated thanks to the «over quota» provision, the loss will nevertheless reach: -13% in 2019 and – 27% towards 2030-2050. For GPs, more particularly, it would be necessary to increase by 150 to 175 a year (instead of 120) the number of licences granted to them (6). Finally, a growth in numbers is unlikely, unless the *numerus clausus* were to be substantially increased and older doctors were to remain active.

In relation to the target workforce numbers, Deliège et al. envisage two hypotheses: stability of the numbers active over time or growth as a consequence of the expected growth in requirements; in the latter case, the reference scenario takes into account the growth in requirements on the basis of an average hypothesis. If oversupply were to be ignored in these scenarios, the growth in the numbers working would need to be of the order of +22 to +35% over 20 years. However, if one starts by stripping away the workforce estimated to be surplus, the growth in the numbers active could be limited to +8.6%, giving a target active workforce figure for the French-speaking Community of +/- 18 700 (under the age of 66) in 2019. In the scenarios based on alternative hypotheses, the target figures for the active workforce in 2019 would be somewhere between 17 800 and 19 600, corresponding to a growth of +3% to +14% relative to the workforce taken into account in 1999 (17 250).

The base year for the Bogaert et al. model is 1997. At that time, those GPs described as «retrained» and certified by the National Health Fund numbered 12 779 for the whole country, a figure that, according to them, would be equivalent to 11 143 FTE. At the time, the requirement for doctors was estimated to be 7 915 FTE (according to the fallacious hypothesis that these practitioners would devote themselves solely to health care). The influx of new GPs came to 400 in 1997 and is expected to decline gradually, amounting to 350 in 2006, that is to say, more than the official *numerus clausus*, and 300 from 2007 to 2020. Under this scenario the total number of GPs licensed (not including the «over quota» excess) would amount to 13 295 in 2010 and 8 372 in 2020. If only demographic developments are taken into account, it is from about 2014 that supply would begin to fall short of requirements. If all of the parameters outlined below are taken into account, however, supply will fail to match requirements around 2010-2011.

3. Demographic bump in 2015-2025

These results are affected by the particular form of the age pyramid resulting from the succession of cohorts of graduates (Figure 1 - Cohorts of graduates in medicine, by language and year): it is expected that around 2015-2025 many people will leave the profession. In those years the large cohorts of graduates who emerged between 1975 and 1985 will be retiring and shortages may occur if the present quota are not modified. But it will be necessary to make provision for these replacements well in advance of this period, given the number of years required for medical studies (between 9 and 13 years). Over the coming years, the ageing of the medical workforce will be a very serious problem and will be accentuated by the restrictions on inflow, which will be introduced precisely when they are least appropriate.

4. APPROPRIATE NUMBER OF FUTURE MEDICAL GRADUATES

The appropriate numbers for new graduates are estimated on the basis of projections not just of supply but also of requirements. In making these estimates, the authors adopt a variety of hypotheses.

In the Dercq et al. model, future inflows are intended, in theory, to meet the following objectives: maintaining the workforce within each Community (which is actually impossible with the 40/60% allocation formula, which is, however, untouchable for political reasons), reducing the oversupply in the French-speaking Community (relative to the Flemish Community), and meeting any increase in requirements. These objectives seem to us to be incompatible.

From 2004 to 2008, the number of graduates is the same in the scenario with growing requirements and in that with constant requirements (Table VIII). It is only from 2009 on that the growth in requirements is taken into account in determining the inflows in this model. Even taking only the scenario with constant requirements, the quotas that were decided on for 2009-2011 remain lower than those envisaged in this model, even though the model regards all doctors as being active (which is far from being the case, as we have already shown). The announced goal of maintaining the workforce will, accordingly, not be met in either scenario, even on the assumption of constant requirements.

For their part, the various scenarios envisaged by Deliège et al. arrive at the same conclusion: there is a risk of shortages if the quotas are not modified. In the scenario with a numerus clausus still in force, retirement at 66, and rapid growth in requirements, the reduction in the number of practitioners in 2019 could even exceed 5000. Thus any regulation fixing a compulsory retirement age would be inappropriate. With no change in the numerus clausus, only 74 to 82% of requirements would be met in 2019 and they would exceed supply in almost all the scenarios envisaged. If the numerus clausus was increased to 400 for the French-speaking Community (along with +15% as an «over quota» excess), there would still be a deficit, but a smaller one: of between 2000 and 4000 practitioners. Equilibrium in 2019 could only be achieved on the following hypotheses: very lit-

TABLE VIII

REQUIREMENTS FOR NEW GRADUATES IN THE DERCQ ET AL. MODEL

	Growing requirements			Constant requirements		
	Flemish	**French-speaking**	**Belgium**	**Flemish**	**French-speaking**	**Belgium**
2004	420	280	700	420	280	700
2005 (a)	390	260	650	390	260	650
2006 (a)	360	240	600	360	240	600
2007-2008	420	280	700	420	280	700
2009	600	300	900	450	300	750
2010	700	350	1050	450	300	750
2011-2012	800	350	1150	450	300	750
2013	875	400	1275	450	300	750
2014	875	400	1275	650	350	1000
2015-2017	875	470	1345	650	350	1000
2018	875	540	1415	650	350	1000
2019	875	610	1485	650	425	1075
2020	875	630	1505	650	425	1075

(a) Numerus clausus fixed at the time, later raised to 700 (420+280).
Source: Dercq et al. (5)

tle growth in requirements, a numerus clausus of 400, an unchanged proportion of active individuals in the older age groups, and an increase in productivity on the part of the latter to match that of their younger colleagues. This is a very unlikely combination. In reality, it is right from 2004 that the numerus clausus is inferior to replacement requirements in the French-speaking Community, according to Deliège et al. Attempting to respond to growing requirements will thus soon become politically unacceptable, given the numbers of new graduates that it would require. Consequently, Deliège et al. decided to restrict their estimates to meeting the replacement requirements for the workforce at national level. For the French-speaking Community alone, these requirements are assessed as being:

– 458 for 2009-2013 and 592 for 2014-2018, taking into account deaths, retirements, and retention rates
– 551 for 2009-2013 and 649 for 2014-2018 if one also takes into account the impact of feminisation, the time lag involved in the arrival on the market of future specialists, and the low levels of inactivity on the part of young graduates.

On the basis of the number of ageing doctors, Deliège et al. estimate that it would be necessary to double the figures for the French-speaking Community in order to achieve the appropriate number of graduates at national level: that is, to 916 and 1102 for the period 2009-2013. If one sticks to an average of 1000 a year and to the allocation formula currently in force (40% of the quotas in the French-speaking Community and 60% in the Flemish Community), this would mean a numerus clausus of 400 on the French-speaking side. This would be lower than the replacement requirements of this Community, but well above the 280 provided for in the present official quotas.

Bogaert et al. do not envisage different scenarios for inflow. They examine what would happen if the inflow envisaged by the political authorities were to be applied over a number of years. According to them, we can clearly expect a shortage of GPs by 2014 at the latest. The quotas envisaged, in other words, would be insufficient to meet requirements.

According to Deliège's and Bogaert's calculations, thus, it would be necessary to enlarge the quotas to avoid reducing the accessibility of care, all the more so as Deliège et al. adopted conservative estimates for the parameters used – not taking into account, for example, the changes in practice highlighted by Bogaert et al. A number of countries, it should be noted, have raised their numerus clausus, including the United Kingdom, France, and the Netherlands. Dercq et al., on the other hand, recommend stricter quotas; they consider fewer parameters in their model, however, and in it oversupply is estimated to be higher than in the Deliège et al. model. It should not be forgotten that the Dercq et al. model was developed within the Public Health Ministry, in the context of an ideology of restrictions, whereas the other two were developed by universities. Their position and their choice of certain parameters, rather than others, may explain the divergences in the results. All, however, show that the present quotas will not be tenable in the future.

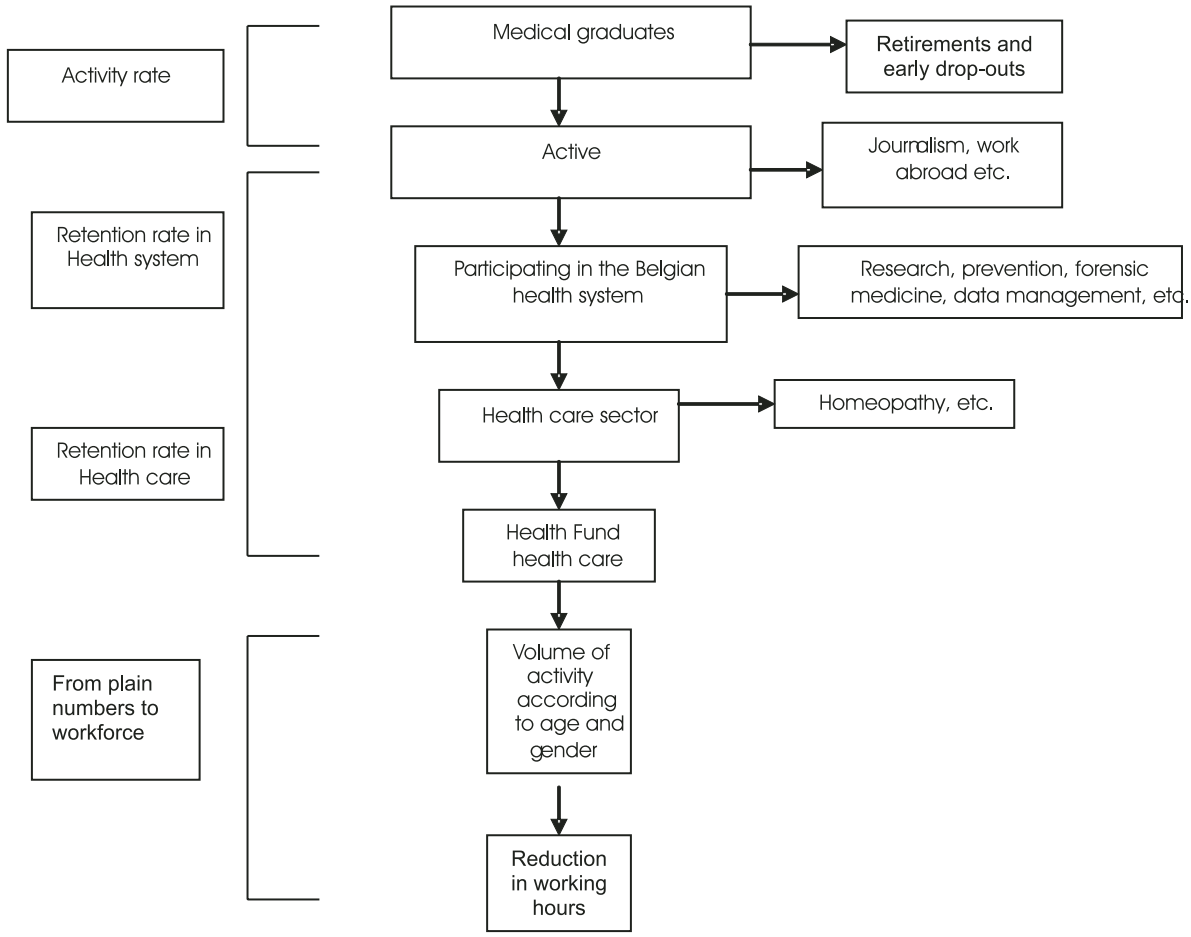
CONCLUSION

Various models have been developed in order to assess the appropriate number of future medical graduates and the quota that would be the most appropriate for the future. However, each model produces different results; this can be explained by the parameters, the sources, and the hypotheses that they select. Moreover, the different models do not look at the same medical population, nor do they have the same base year or the same timescale.

Figure 3 (Global model of supply, demand, and requirements for medical doctors) shows the different parameters taken into account by the models and the methodologies adopted by their authors with a view to working out the appropriate number of graduates, and in particular of new graduates: modelling of supply and prospects for the workforce, modelling of the demand and requirements for medical personnel, comparison of these two projections in order to work out the appropriate numbers of new graduates, whether with a view to stabilising the workforce or with a view to meeting requirements, taking into account, in particular, the replacements needed.

Possible developments of the models could be considered. At the level of the numbers in the medical workforce, and also at the level of inflows, we have noted a great variety of situations: not only should specialists be distinguished from non-specialists, but we must also make a distinction between those doctors who work in health care, those who work within the health system, and those who work outside of the health system and we must be able to quantify losses by making use of retention rates such as those applied in the Deliège et al. model (Fig. 5). By per-

Figure 5 – Flows within the medical workforce.



mitting an «over quota» excess (+15% in the French-speaking Community), the resources are provided to cope with non-care work, but this latitude can also be expected to lead to considerable dissatisfaction among the «failed», those who will be denied access to National Health Fund.

The volume of activity is considered in all three models. But its definition varies: person equivalents in the Deliège et al. model; full-time equivalents, according to a theoretical activity curve, in the Dercq et al. model; and full-time equivalents according to an observed activity curve (based on data from surveys) and on the basis of norms in the Bogaert et al model. The unit of measurement in hours (rather than in services or in individuals) seems to us to lend itself more to international comparison and has advantages from that point of view. However, repeated surveys would be necessary to make possible regular assessment of certain parameters within this approach.

Ideally, one should be able to take into account the largest possible number of parameters, to the extent that estimates specific to Belgium exist and that trends can be traced from the past; this is not yet the case for all parameters. Some parameters appear to us to be absolutely essential, in particular the impact of feminisation and of the ageing of the medical workforce, mortality (in the higher socio-economic classes), retention rates, and the volume of activity. Whether one takes into account oversupply and estimates of its extent also has a major impact on the results of projections. Substitution between health professionals is absent from all the models and current data does not make it possible to include it (it seems, moreover, to be very limited in the current Belgian context). In this connection, it would be useful to examine the planning model developed for the United States by the Joint Primary Care Workforce Working Group, which has included rates of substitution between professions (15).

The indicators suggested by Diallo et al. (16) are partially incorporated into the Belgian models:

stock of human resources in health with the distinction between GPs and SPs; migration; labour force activity (number with health-related skills currently working in the health system / total number with health-related skills); distribution of HRH by location, age, and gender; renewal and loss of HRH. The institutional sector, the cost of training, and income are not examined in the Belgian models. Productivity is introduced into the models by the volume of activity, usually in hours, sometimes in services (FTE). In Deliège et al. model, a 66-year-old physician is equal to 0.5 PE and a woman is equal to 0.80 PE. In addition, Bogaert et al. incorporated into their model the decrease in home visits and the increase in non-care activities related to care.

It is above all at the level of demand that there is still much uncertainty: there are few studies currently available in Belgium that would help us to model a number of these parameters. In a number of cases, Bogaert et al. based their work on Dutch data. This does not seem to us to be always suitable for the Belgian context.

Requirements for medical personnel and for graduates depend on developments in supply (the feminisation of the workforce and retirements reduce the workforce), in demand, and in the needs of the population and of the health system (ageing, development of home visits, requirements for non-care functions, etc.). They are also affected by the funding of the health and education systems. The federal government, for example, has restricted the numbers of new graduates by introducing the *numerus clausus* in the hope, no doubt illusory, of bringing health insurance expenditure under control (illusory, given people's capacity to adapt their behaviour and the pressure on payment rates in a context of limited supply). As for the French-speaking Community, it has accepted an excess «over quota» of 15%, without, however, having made available the increased funding for education that was promised to this end.

Projections for requirements also depend on the base year chosen in the model and on any oversupply that may exist in that base year. Even if one regards the present situation as one of oversupply, there is reason to fear shortages in the future if quotas remain unchanged. Consequently, enlarging the present quota after 2013 would not bring about an increase in the future global workforce. The reasons: the retirement of substantial cohorts of graduates in the years 2015-2025 and an overly restrictive quota that, if remained unchanged, will not compensate for these departures.

The introduction of these quotas came too late, when the cohorts of graduates had reduced and when retirements are set to increase substantially. Other developments in the profession may well worsen the picture. In Belgium, the *numerus clausus* aims to limit the number of practitioners in the health care sector. But those registered with the INAMI/RIZIV have no obligation to provide care. As in the past, some will make other career choices, outside the care sector, or even outside the health system.

Being finally enforced, the quotas will be appropriate for a few years but afterwards it should be enlarged. Such enlargement has already begun, for 2012, and should be increased.

The construction of the models – and their results – may reveal something about the way their authors perceive the health system. Thus, when Dercq et al. compare doctor-to-population ratios in Belgium's Communities to those in the Netherlands and attempts to make the former approach the latter, this could only be achieved at the price of a reorientation of the health system that is not currently on the order of the day. The same applies to the use made of certain Dutch data in the Bogaert et al. model. It is known that the health system in the Netherlands is based on the operation of gatekeeping by general practitioners. Moreover, the length of consultations there is much shorter: 8 minutes, instead of 15 to 20 (7 and 4), and waiting times are longer (14). A similar analysis could be made when comparing doctor-to-population ratios for the two Communities: in the French-speaking Community, contacts last longer than in the Flemish Community (4). Does this mean that the organisation of work is better in one of the two Communities than in the other? Better in what sense? Quality of life? Quality of care? Return on productivity? By limiting the numbers of doctors in the French-speaking Community in a way that is too restrictive, it might turn out that practitioners' productivity would rise, faced with a demand that exceeds supply (more contacts and shorter contacts).

It may be that other adaptive strategies are being considered, such as attracting foreign professionals, along with a certain amount of substitution by other professionals (which is not taken into account in the models, which assume unchanged behaviour). Obviously, it is the entire organisation of the health system that is at issue

here, and not just limits on personnel and rationing at the level of studies. Attempts to rationalise practice are increasingly emerging, such as the use of computerised medical records by GPs and evidence-based medicine.

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