

Planning medical manpower : criteria and replacement requirements

by

Deliège D.

Health System Research, School of Public Health,
Catholic University of Louvain (UCL)

Abstract

Purpose. To assess replacement requirements for medical manpower in the French-speaking Community of Belgium (2004-2023).

Methods.

- Assessing out-flows per age and sex.*
- Assessing in-flows on basis of various scenarios about number of future medical degrees and % of specialization.*
- Assessing the impact of extra women's share and MDs off duty.*

Results.

- 1. The out-flow will strongly increase from 2012 on: from more than 300 up to more than 500 MDs for the French speaking Community. The extra women's share induce an extra requirement of 6 to 4%. The expected MDs off duty further increases the replacement needs by an extra 15-20 MDs per year.*
- 2. The % of specialists among the out-flow also evolves; consequently, the % of specialists in in-flow should decrease with time. Two criteria could be retained:*
 - either an impact on stock, proportionally equivalent for GPs and specialists;*
 - or a stable share of “specialists + younger doctors in training”.*

Key-words

Medical manpower, medical manpower planning, requirements.

Introduction

After more than two decades of repeated warnings about a possible oversupply regarding medical manpower, Belgium has finally undertaken a process of “planning” medical and dental manpower. At least, this is the official name of the Federal Committee in charge of advising the Minister of Health about numbers of professionals who will be entitled to be registered as practitioners and, as such, will be allowed to have their services financed through the National Health Insurance Scheme. In fact, it is hardly a “planning Committee”, but rather a Committee advising about how to regulate the (over)supply*. We call this function “tertiary planning”, i.e. aiming at alleviating the consequences of the lack of previous decisions in the field.

Until now advice has been given about advocated numbers of registration for 2004-2006: only 700, 650 and 600 new medical doctors will be entitled to obtain an official licence from the Minister of Health, of which 40% for the French speaking Community, i.e. about 60% of the annual number of new medical doctors in the nineties. Decisions have been implemented. French speaking students will obtain a green or a red light after three years of studies.

The problems which should now be solved by the Committee are the following ones:

1. In the short run, and first for the medical doctors:
 - a) How many professionals should be entitled to register from 2007 on?
 - b) How many for each Community, i.e. the French and the Flemish ones?
 - c) How many specialists and GPs?
 - d) How many for each specialty?

* The working of the Planning Committee is described elsewhere (1).

2. Then, similar questions will have to be answered about other medical and paramedical professions.
3. In the long run, this exercise raises more important questions which should be addressed:
 - a) Which are the most efficient ways of substituting one profession to the other, while keeping a high standard of care?
 - b) Which are the most efficient ways of producing health in the country?But it is doubtful whether the various interest groups which sit on the Committee will ever be able to tackle such problems.

As to the impact of the regulation on the field, questions are numerous too, mainly:

- a) How will we replace (or not?) the attrition?
- b) How can we manage the hospitals with much fewer "younger doctors", particularly as the latter bear the heaviest burden of the duties?

Objectives of the present paper

This paper aims at providing information for a few pieces of the puzzle:

- a) We will first assess the "replacement requirements" for drop outs and increasing percentage of women.
- b) Further on, we will assess the *impact of various scenarios* of in-flows on the expected manpower, for the medical manpower as a whole, as well as for GPs and specialists separately.

The *consequences in terms of further action and policy* will be discussed at each step.

This approach differs from other contributions in the field of manpower planning in Belgium, the latter aiming at assessing the level of future supply in various scenarios (2) and the impact of demographic evolution (3) or the overall requirements for only one category of doctors, e.g. the GPs or the anesthesists (4); it corresponds to part of our previous work (5), but is restricted to the French speaking Community (although the model can be applied to the Flemish one too).

The next stage will be to assess other types of needs and also the level of oversupply. Only afterwards will one be able to appreciate

whether the overall requirements exceed or lie under the replacement requirements. This will be dealt with in future research work.

Methods

We will first propose a *scheme* for answering the initial question: expected and advocated numbers for the future.

We will also discuss the *criteria*: the classical ones proposed in the literature, and the new ones which should be taken into account in the context of “tertiary planning” which is now prevailing.

Then we will assess the first part of the scheme: the “*replacement requirements*” for the French speaking community; they will be assessed as follows:

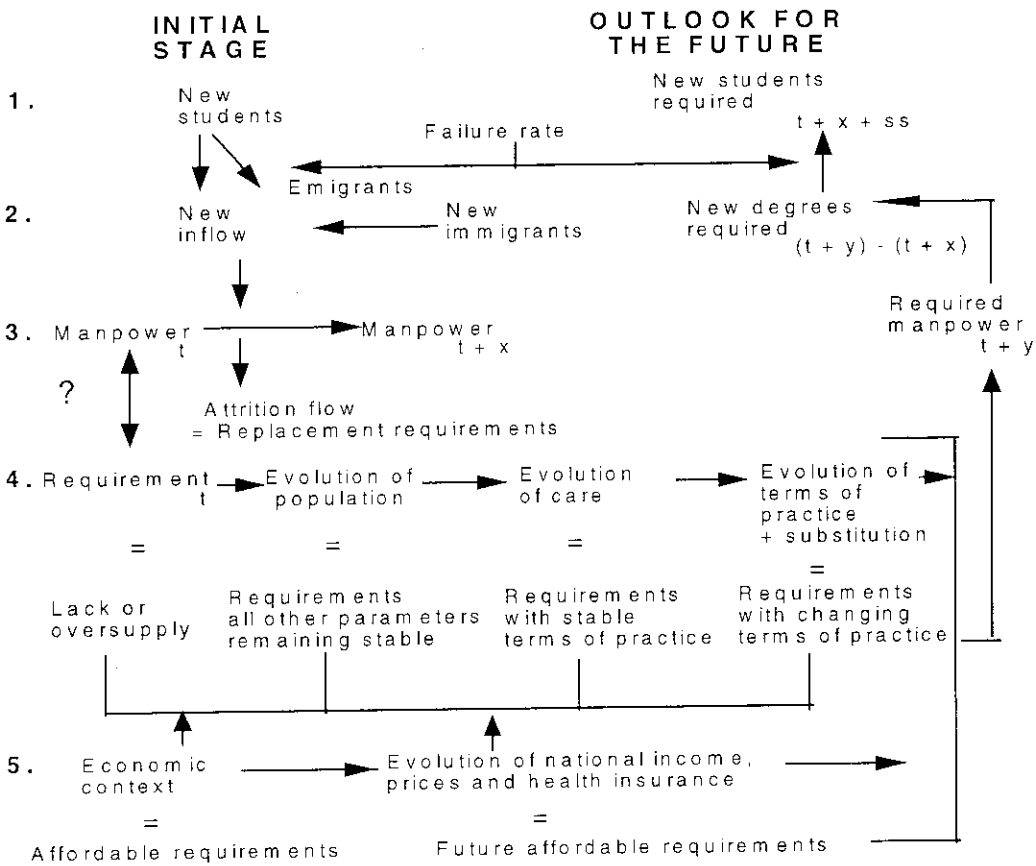
- The *stock of medical manpower* in 1994 has been registered and subdivided by age, sex, language, specialty, (non)activity and type of activity.
- The *mortality rates* and survival rates have been assessed for the French (+ German) community and for the Flemish speaking one, on the basis of the tables per region, published by the National Institute of Statistics, and the regional subdivision of medical whole time activities, as observed in 1994 for each linguistic stock.
- The assessed *attrition numbers* are the sum of
 - a) all surviving doctors reaching age of 65 and
 - b) the deaths expected among the expected survivors (including assessed in-flows but excluding those registered as being off-duty in 1994).
- The impact of the increased number of *women* entering the profession and of the unavoidable rate of professionals *off-duty* has then been assessed, in order to compute the expected difference between in and out flow in whole time equivalents (= WTE).

The women’s share is assessed at 50%; this is a minimal assumption, since their share among medical students is already above that threshold; each of them is supposed to produce about 80% of an average man’s load: they work 17% less time (for their profession!) and the time devoted for each patient contact is 10% longer (6).

As to the level of younger doctors off-duty, very careful assumptions have been retained: 3.6% for GPs 26-30 and 2.8% for specialists 31-35, i.e. only half the level observed in 1994 for young as well as for middle age French speaking graduates (according to our special file of medical activities, based on a careful review of about twenty types of rosters, published by cc 90 different sources).

Context

The global scheme for assessing future supply and future requirements can be shown as follows:



Graph 1: Global scheme for assessing future supply and future requirements.

As can be noticed, the theoretical process is a long one, and each step can require an extensive work.

For assessing requirements, the literature proposes four *classical* criteria (7):

- a) The “*health-needs*”: one should assess i) the most prevalent diseases, based on data from epidemiology ii) an adequate key about recommended manpower for care, iii) the resulting overall requirements.
- b) The “*services*”: the present ones and also those which might be expected in the future, together with the staff required for an adequate functioning.
- c) The “*demand*” or utilization of health services, now and in the future, based on a market approach: how much care will the population wish to buy, within the prevailing (or expected) financing system.
- d) The *medical demography*: how do we compare with other countries or regions and which level should one attempt to reach?

Such criteria were adequate for “primary planning”, i.e. in a context where decisions could be taken ahead of time; they were mainly of use for situations where extension had to be planned, in order to catch up for delays. They seem much less adequate in a context of “tertiary planning” or regulation.

In this latter context, we suggest that following *new* criteria should be taken into account:

1. The *replacement requirements* and the impact of *evolving sex-structure*.
2. The assessment of the amount of *oversupply*, *inter allia* through the assessment of level of activity.
3. The *economic possibilities* of the country: how much can we afford, or how much do we wish to devote to health care, or which is the rate of increase which we accept?
4. The requirements based on “needs” as assessed through
 - a) the evolution of the *population* and
 - b) the changes of *age-structure*.
5. The future requirements based on *progresses of science* in the various laboratories of the world and the specialties where prospects are the most promising.
6. The requirements based on the efficacy/efficiency of services, *inter allia* the assessment or the amount of services with “*low added value for health*”.

7. The *distribution of health resources among the practitioners*: which are the possibilities of integrating more young practitioners when unemployment prevails in so many professions?
8. The possible *substitutions*: between medical services, between professions, between health programmes and other programmes conducing to health.

In this paper, only the replacements requirements are assessed (= section 3 of the global scheme above). Whether the overall target should be a stable one, or another one is left for future appreciation (= sections 4 and 5 of the scheme).

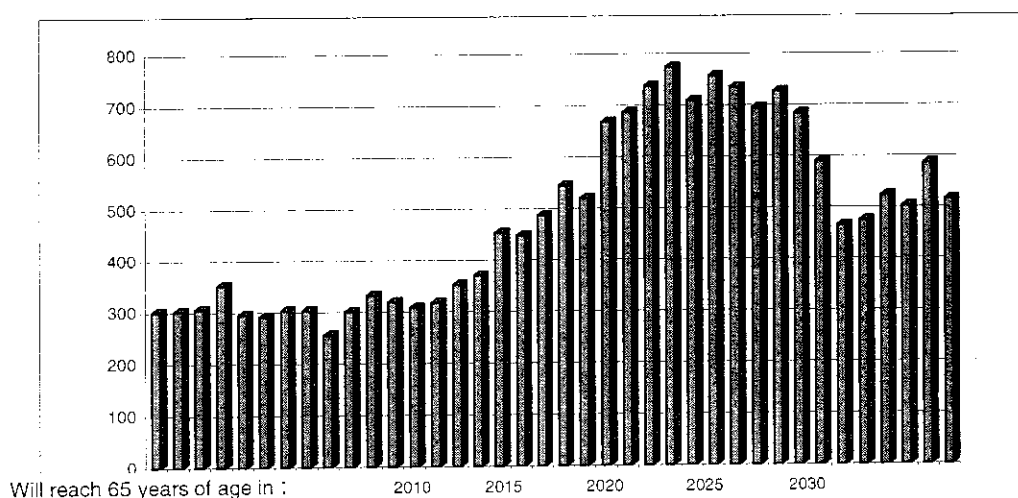
Results and discussion

1. Replacement requirements and sex-structure

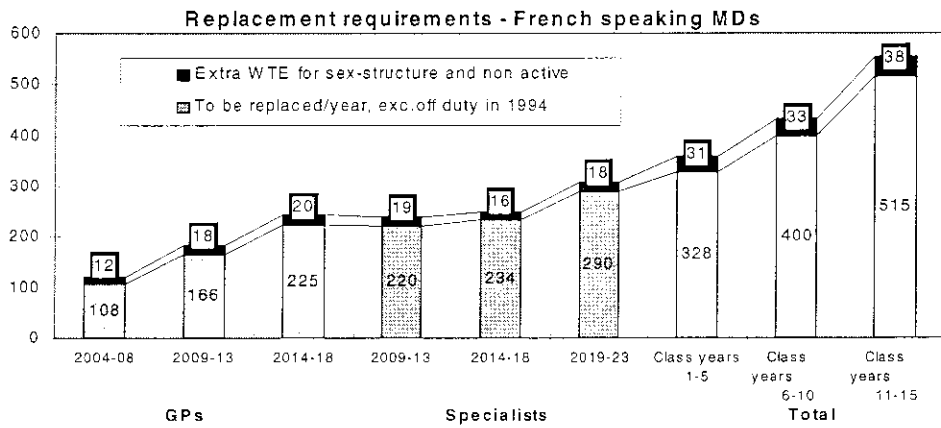
1.1. Results

Since a few decades, the number of medical degrees has strongly evolved, with a range from 1 to 2.6 (see Graph 2).

It is thus important to foresee the attrition flows for various periods and to compare them to the possible in-flows (see Graph 3 and Table 2 in appendix).



Graph 2: Number of degrees — French speaking Universities.



Graph 3: Replacement requirements.

1.2. Conclusions about the out-flow and the replacement requirements

Even for such basic requirements, options regarding ways of assessments introduce some uncertainty.

The expected attrition numbers will strongly evolve: from more than 300 annually up to more than 500 annually, within about a decade. They are always much higher than the numbers which have been fixed for 2004-2006 (260 on average for the French speaking community).

The specialists' share among those who should be replaced will evolve too: from 67% down to 56%, within the period considered.

The growing women's share increases the replacement requirements. If half of the in-flow is female (i.e. a minimum), the extra whole-time equivalents required will reach c. 20 per year, i.e. from about 6 to 4% according to the period.

A number of medical doctors are known to be off duty at the base line year (1994): they do not need to be replaced; crude requirements are thus reduced by about 20 annually. However, a small % of MDs is always off duty, even among younger class years; consequently, a further 15-20 are required to compensate newcomers' inactivity, even though the latter has been assessed at a low level (see above). There is thus a close compensation between in and out-flows, as far as inactivity is concerned.

Anyway, whatever the level of overall requirements which will be advised for the future, when the whole model will be assessed, the requested in-flow after 2009, should take into account the expected changes of attrition flows.

2. Impact of restrictions according to scenarios

2.1. Which Scenarios?

The number of French speaking MDs admitted to provide patients' care will be limited to cc 260 between 2004 and 2006. For assessing future medical manpower, one should thus: a) assess the amount of in-flow until 2003 and b) test the impact of various in-flows from 2007 on.

Such exercise can help orienting future decisions on more objective basis.

Until 2004, we expect that the number of GPs who will settle a practice will be similar to those observed in the recent years and we expect the number of specialists in training to remain stable; we also assume the latter to remain in the country in the same proportion as in the past [about 80% with a few exceptions (70% for internal medicine and general surgery, 90% for cardiology and gastro-enterology)]. Those hypothesis seem relevant, because the number of medical students has remained almost stable since a few years.

For the French Community, we test hereunder "plausible" scenarios, i.e. those which could lead to a slow decrease of medical manpower, taking into account a) the replacement figures above and b) the fact that the Federal Committee for medical manpower planning has advocated that the medical manpower "would be stabilized for a few years" at the level which will be reached when the restrictions will play their role and c) the fact that its Flemish members further urge that the differences of medical densities decrease. Consequently, the French Community (which now has larger medical densities) will reduce its medical manpower at the benefit of the northern neighbours.

We thus test:

- Scenario L: 260, 320 and 400 for the periods 2004-08, 2009-13 and 2014-23.
- Scenario M: 260, 340, 440.
- Scenario N: 260, 360, 480.

We also test continuous scenarios, even if we do not advocate them: Scenario A = 260, B = 320 and C = 400 MDs, i.e. stable class years for 12 years, from 2007 on.

We expect all such new graduates to remain in Belgium.

As to the percentage of specialists among them, we test two scenarios which we advocate:

y: 71% in 2004-08; 59% in 2009-13; 57% in 2014-18;
or z: 65% in 2004-08 56.5% in 2009-13 50% in 2014-18

for scenarios LMN;

or 65%, 57% and 46% for A; 63%, 56.5% and 48% for B;
61%, 56.5% and 49.5% for C.

- Scenario y would induce a similar proportional impact for GPs and specialists (without specialists in training).
- Scenario z would induce a stable share of the combined stock “specialists + specialists in training”, at the 1994 level (= 55% of the whole stock <66 years of age).

We also test scenarios, which we do not recommend, but which might be tempting at first sight:

- 40% of specialists, i.e. the minimum required by law;
- 50% of specialists, i.e. the recommendation in U.S.A.;
- 55% of specialists, i.e. the present share in the stock;
- 65% of specialists, i.e. the present share among younger class years.

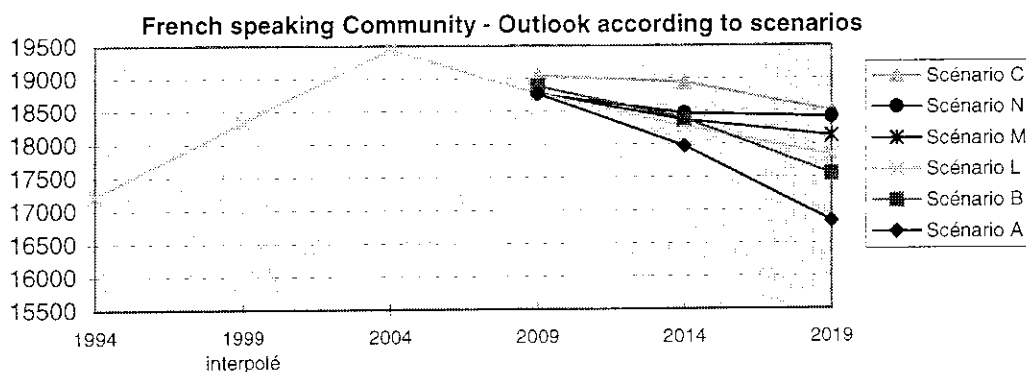
Such stable specialists' share among in-flow, would mean that no consideration is given to the structure of out-flow.

2.2. Medical manpower in the French speaking Community as a whole

2.2.1. Results: expected manpower according to scenarios

Graph 4 shows the impact of the various scenarios on the expected stock (without consideration of the expected WTE due to % of women and off-duty).

Between 1994 and 2004, medical manpower in the French Community will still expand by 13%, conducting to c. 19 400 MDs <66 years of age (i.e. 213 inhabitants per medical doctor <66). After 2004, a moderate decrease of medical manpower is expected according to scenarios LMN: 18 720 medical doctors <66 years of age in 2009, down to 17 800-18 400 in 2019, i.e. between 227 and 234 inhabitants per MD <66 years. The more radical scenarios A and B would



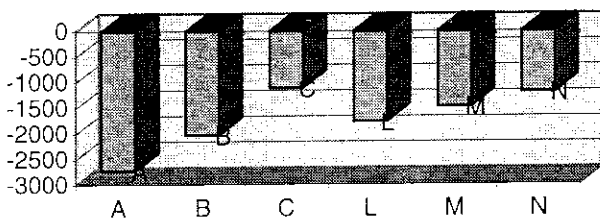
Graph 4: Number of MDs <66 years.

intensify the decrease, reducing the expected stock around or even under the level of 1994 (see Table 1 in appendix).

After 15 years of restrictions, the overall *crude* balance between in and out flow reaches -3.4% down to -12.6% , according to the hypothesis. But due to the increased women's share and the unavoidable share of newcomers off duty (due to drop-outs, migration, illness,...), the *actual* balance will be more severe: reaching $\pm -1\ 100$ to $-2\ 720$ WTE, i.e. -6.6 to -10% according to scenarios LMN, down to -11 to -15% , in case scenarios B or A would prevail (see Graph 5 and Table 2 in appendix). Such results do not include the specialists in training.

As explained above, the French speaking medical manpower is bound to decrease, at least temporarily. However, if the target would be maintained at the level as fixed for 2004-06 (on average 260 per year for the French Community), the decrease would become large: minus 280 WTE per year after 2014; such stable targets of graduates

GPs and specialists - WTE without younger doctors in training
French speaking Community



Scenarios for cumulated balance of WTE on 15 years, corrected for extra women's share and younger MDs off duty, outside further mortality

Graph 5: Balance after 15 years of restriction.

would thus induce unstable effects on the overall stock. Even if the target would be raised at 480 (i.e. 1 200 at federal level), there would still be a small decrease: -70 WTE per year.

2.2.2. Discussion about manpower in the French speaking Community as a whole

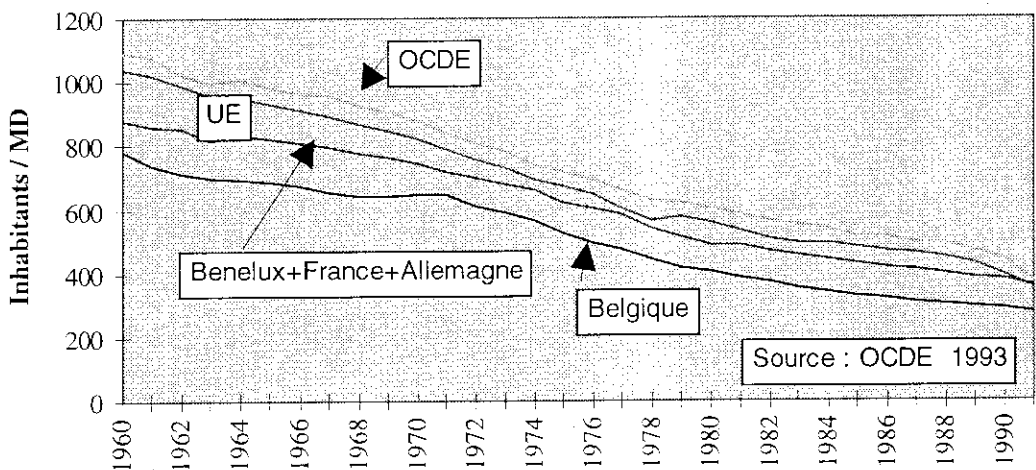
The crude ratios of expected number of inhabitants per MD are very low, in a context where Belgium already holds a “leading position” since more than 30 years. However, neither such low ratios nor a continuous downward trend are negative signs *per se*: such trends are common to all countries of OECD (see Graph 6).

The interpretation can be twofold:

- either Belgium has the worst position; its oversupply would thus be confirmed;
- or Belgium has had and has kept a leading position as far as health care is concerned and its early start has enabled the country to keep its position in a trend of continuous progress!

The important questions are rather:

- a) Are the expected reduction of medical manpower and the expected level of medical supply “adequate” taking other variables into account?
- b) How far is the utilization rate dependent of supply?



Graph 6: Evolution of ratio "Inhabitants/MD" within OECD.

- c) Would such a relation be confirmed, why is it so: either because an abundant supply enables to meet health needs previously unattended, or because it induces a superfluous use?
- d) Can we afford the utilization of corresponding health services?
- e) How far are the services provided really necessary or even useful for health, i.e. which is the amount of "added value for health"?
- f) Is an extra amount of supply for medical care still advisable, or should it be reduced more drastically, taking into account the potential impact of other services useful for health? Such questions remain unanswered and are not addressed in this paper.

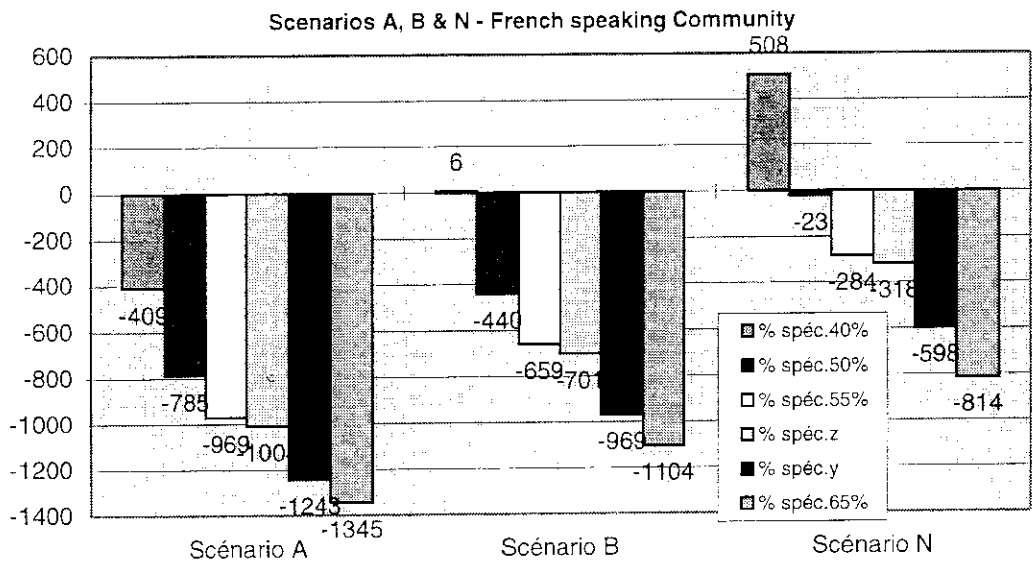
2.3. *General practitioners, specialists and specialists in training*

2.3.1. *Specific results per category*

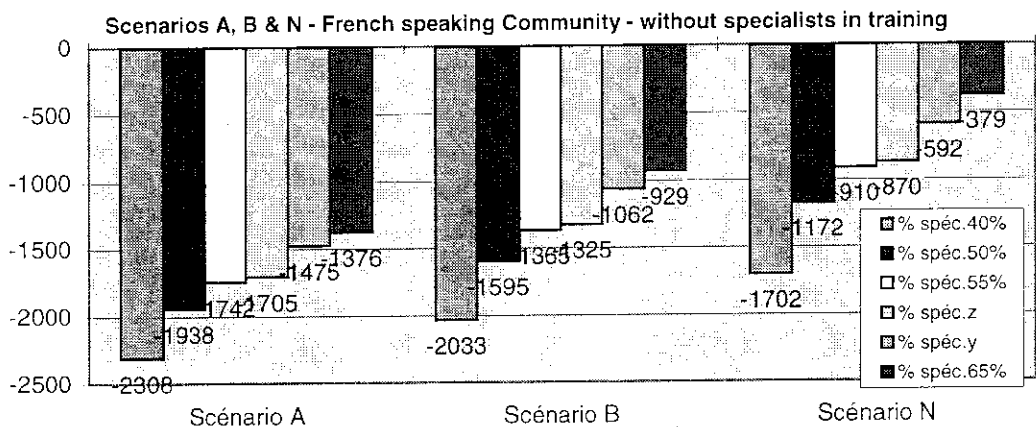
The planning Committee has not issued any advice yet regarding the specific restrictions for *general practitioners and specialists*. The possible impact is of course very sensitive to such decisions. If stable shares among in-flows would be applied (e.g. 40% up to 65%), results of such scenarios clearly show that the latter would be inadequate, because they do not take into account the structure of the out-flows. Two other scenarios have thus been drawn, taking into account the evolution of the specialists' share among the out-flow, with two cases (see above):

- a) an impact proportionally similar for GPs and specialists (= scenario y);
- b) a stable share of the combined group "specialists + specialists in training" at the 1994 level (= 55%, i.e. scenario z). Obviously, decisions about the type of scenario strongly influence the future balances, as shown in Graphs 7 and 8 (scenarios A, B and N). The complete list of expected numbers appear in Table 3 in appendix.

After 15 years of restrictions, scenario y induces $\pm -6\%$ to -15% WTE for both Gps and specialists (excluding specialists in training). Even if scenario z intends to stabilize the whole stock of "specialists + in-training", it induces a loss of -3 up to -12% for Gps, between -9 and -18% for the stock of specialists; this is related to the fact that the impact occurs with a time-lag of about 5 years for specialists and that the % of loss is computed on a stock aged 31-65 rather than 26-65 for



Graph 7: Balance due to 15 years of restriction, GPs < 66 years.



Graph 8: Balance due to 15 years of restriction, Specialists < 66 years.

GPs. Other scenarios about the specialists' share produce extreme results outside these ranges (see Table 2 in appendix).

As to *specialists in training*, their number will drop drastically at least temporarily. In 2009 there might be only 890 to 960 left, according to scenarios LMN suggested above, whereas 1930 were practicing in 1994! This means about a 50% decrease, knowing that foreign medical doctors will not be entitled to obtain a complete training any more. This situation will raise a particular problem for hospitals, because such manpower amounts to about 10 to 20% of their total medical staff.

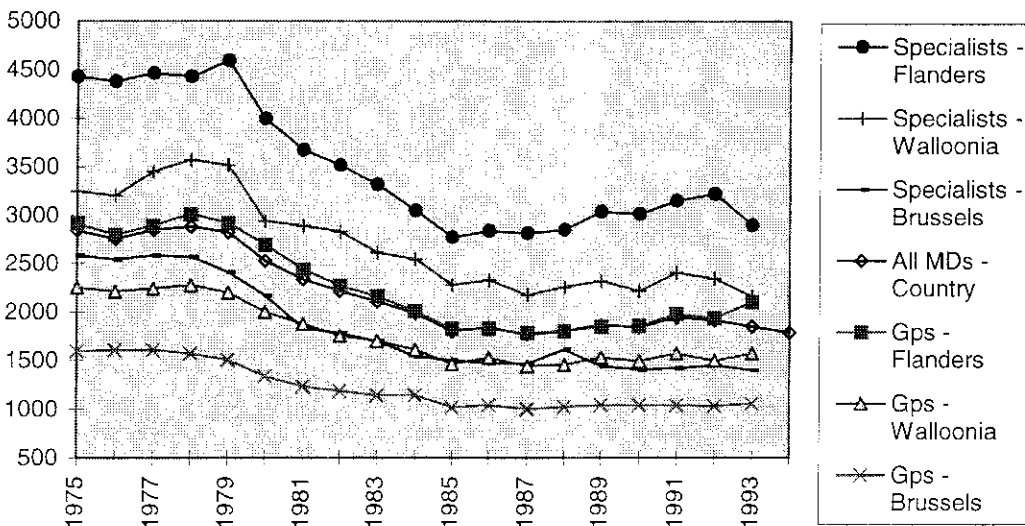
The situation would be even worse in case of lower % of specialists admitted: only 570 to 760 specialists could be trained if the specialists' share would be reduced to 40% or even 55%. However a rapid growth

could occur again if the number of graduates is increased. With scenario Ny for instance, the number of specialists in training reaches 1 250 again in 2019.

2.3.2. Discussion about results per category

1. *Is there an optimal rate of specialisation?* The international literature does not offer many answers. A few countries advocate and strive either for an equal share (50% in the United States (8)) or even for less specialists (40% in Canada (9)), but it seems to be a political option, rather than the conclusion of a scientific approach about "need".
2. In any case, there is no magic single figure for the % of specialists: neither for a supposed "ideal target", nor for the % to advocate for future generations; whatever the decision regarding the share considered to be "adequate", the % among future MDs should also evolve according to the number of future degrees and the specialists' share among the out-flow. In the case under review, it should be higher at the beginning of the period (while out-flows are rather small) and lower later on (when out-flows increase).
3. According to various indicators, *the oversupply seems to hit GPs more than specialists*: higher % of activities taking place outside the sector of care, lower hours of work with patients (6), lower average income (see Graph 9).

Consequently, the adequate share can definitely be related to the evolution of terms of practice and to regulations about the tasks



Graph 9: MDs' average professional income from private practice, as declared for tax, Belgian francs of 1955.

and functions of each group. Now, many signs show that the context is evolving: elderly will be much more numerous, particularly above 80, inducing more needs for care at home and in nursing homes; more home care will also be required, due to the shortening of hospital stays (one-day care, new technologies, projects of “all-in” budgets for hospitals, further decrease of the number of hospital beds, ...); public authorities intend to promote primary care (management of patient’s file, registration, compulsory access to health care through the GP’s “gate”, ...); and the Health Insurance Funds — which are now bound to bear part of the responsibility of deficits — will be tempted to promote agreements with practitioners inducing lower costs. If specific measures are taken indeed to promote primary care, figures lower than those of scenario z would become adequate.

Out of the possible scenarios, *we advocate scenario z, inducing a stable share of the combined stock of specialists and younger MDs in training for a specialist’s degree (but inducing a stronger decrease on specialists’ stocks compared to GPs!).* because in a system as complex as the health system, we think that adaptations are smoother for both practitioners and institutions concerned when they occur gradually. *We would advise a slow decrease of such percentage only if public authorities would take rules or financial incentives in order to promote primary care.*

4. As to the distribution of manpower among the various specialties, our opinion is that it should not occur proportionally to the structure of out-flow, nor to the present structure of specialists in training. The reason lies in the important changes which can be expected in the health system in the near future. Above those mentioned above, one should also be aware of the expected drop of about 50% of the specialists in training, at least temporarily.

The question is how to proceed for orienting the decisions. Doing nothing would enable the “noisiest to beat the neediest”. Foreign models would probably be of little use because systems are different and reflect decisions taken in the past, usually in a context of primary or secondary planning.

Consequently, *a methodology should be built ab ovo in order to orient the future distribution among specialties.* We advocate that such decisions be taken with the help of tools derived from the “strategic analysis”. The groups concerned (GPs, each specialty, hospital associations, hospital departments, ...) should be invited to discuss about

their own future, with the help of a "SWOT" grid of analysis (= strengths, weaknesses, opportunities, threats). On such a basis, a list of questions would help to forecast future trends, to set objectives, to identify strategies and to draw adaptations measures for each case. Such tools have already been used with success in various settings where strategies had to be drawn, due to perceived changes in the future; they were used in industrial settings (for instance by MIT working with such large industries as GM, IBM, ...); but they have also been transposed in the medical settings, for instance in the framework of European projects aiming at introducing telematics between health practitioners; SHINE and STAR projects are such examples.

Conclusion

Planning is always a difficult challenge, because it implies looking ahead of time in a future which is neither the same as to-day, nor the mere consequences of clear trends which could be computed. It is still more difficult for medical manpower: decisions taken to-day concern specialists who will start their career almost 15 years later, in a context which might have drastically changed, not only as far as medical knowledge is concerned, but also in the field of demography, economic level, financing of health insurance, terms of practice, and so on.

However attempting to look ahead is better than remaining blind. This paper attempts to enlighten one small aspect of the intricate puzzle: the replacement requirements. It shows that one should take into account the expected changes in out-flows: numbers will increase and specialists' share among them will decrease. Whatever the final target (which should be set on other grounds), the amount of newcomers requested for meeting such targets should evolve, taking into account the changing age and sex-structure of medical manpower.

Impact will be particularly important on specialists in-training, who will decrease by about a half, at least temporarily; strategies for coping with such a drastic change, together with decisions about the future mix of specialists should be prepared. This should be organised, for instance with the help of tools out of the strategic analysis, which have already proven to be powerful in other contexts.

Résumé

Objectifs. *Evaluer les besoins de remplacement pour les effectifs de médecins en Communauté française de Belgique (2004-2023).*

Méthodes.

- *Evaluer les flux sortants par âge et sexe.*
- *Evaluer les flux entrants, sur base de divers scénarios concernant le nombre de futurs agréments et les pourcentages de spécialisation.*
- *Estimer l'impact de la féminisation croissante et de l'inactivité parmi les médecins.*

Résultats.

1. *Les flux sortants vont fortement s'accroître à partir de 2012: de plus de 300 à plus de 500 pour la Communauté francophone de Belgique. La féminisation entraînera un supplément de 6 à 4% des besoins. En outre, l'inévitable inactivité de certains médecins accroît encore les besoins de 15 à 20 médecins par an.*
2. *Le pourcentage de spécialistes parmi les sortants évoluera aussi; par conséquent, le pourcentage de spécialistes parmi les entrants devrait décroître avec le temps. L'un des deux critères suivants pourrait être retenu:*
 - *soit un impact sur les effectifs de médecins, proportionnellement équivalent pour les généralistes et les spécialistes;*
 - *soit une part stable de l'ensemble « spécialistes + candidats-spécialistes ».*

Mots-clés

Personnels de santé, planification des personnels de santé, besoins.

References

1. DELIÈGE D. La planification de l'offre médicale. *Journal d'Economie médicale* 1998; 1: 19.
2. BRIOT J M, DERCQ J P. Medical Manpower in Belgium. *Auxim* 1993; 12.
3. DERCQ J P, BRIOT J M, SOMER A. Essai d'évaluation de l'impact du vieillissement et de la féminisation du corps médical belge sur sa force de travail, s.l., s.d.: 18.
4. BUNTINX Fr, HEYRMAN J, BEULLENS J, VANKRUNKELSVEN P, VAN DEN OEVER R, DELESIE L, VLIETINCK R, DERCQ J P, BRIOT J M. De behoefte aan huisartsen in België, Leuven: KUL, 1995; 47.
Qualité ou quantité, numerus clausus. *Symposium*, 9/3/1996. Formation des médecins spécialistes en anesthésie-réanimation. Bruxelles: Association professionnelle belge des Médecins-spécialistes en Anesthésie-Réanimation, Dossier.
5. DELIÈGE D. Offre et besoins en médecins par région, 1985-2005. Bruxelles: UCL-SESA, 1987; 106+27.
6. LEROY X. Charge de travail des médecins en 1996. Rapport de recherche au Ministre de la Santé publique, avril 1997. 27 p. + annexes. Résumé in: *Le Journal du Médecin*, Bruxelles, 22 avril 1997; pp. 2-6.

-
7. KEET M P, HENLEY L D, POWER H M, HEESE H D. Medical manpower — South African situation models for planning and recommendations. *S Afr Med J* 1990; 78 (10): 591-597.
HALL T L, MEJIA A. Health manpower planning: principles, methods, issues. World Health Organization, Geneva 1978; 311.
CLICHE P. La recherche d'une allocation plus équitable des ressources entre les régions: l'expérience québécoise. IV^e Colloque de Géographie et socio-économie de la santé. Paris: CreDES, janvier 1995.
SHIPP PJ. Health personnel projections: the methods and their uses. Report of a WHO project. Studies on country experiences, 1989 (extraits).
FOLLAND S H, GOODMAN A C, STANO M. The economics of health and health care. New York: Macmillan 1993; 726.
 8. MARTINI C J M. Medical workforce planning and medical education, attaining consensus, *JAMA*, Vol. 270/9, Sept. 1993; 1101-1104.
 9. CONTANDRIOPOULOS A P, FOURNIER M A, Planification de la main-d'œuvre médicale: l'expérience du Québec. Université de Montréal, Groupe de recherche interdisciplinaire en santé (GRIS); sept. 1992; R 92-10: 25.

Appendixes

TABLE 1
RATIO Inhabitants/Md < 66 years

	1994	2004	2009	2014	2019
All scenarios	239	213			
Scenario A			222	232	248
Scenario B			220	226	238
Scenario C			218	220	226
Scenario L			222	228	234
Scenario M			222	227	230
Scenario N			222	226	227

Number of registrations/year after 2006: A = 260; B = 320; C = 400, continuously or respectively for 2004-08, 2009-13 and 2014-18; L = 260, 320 and 400; M = 260, 340, 440; N = 260, 360, 480.

TABLE 2
 Cumulated balance of flows in the qualified manpower
 WTE* after 15 years of restrictions, according tot scenarios**

	Scenario A	Scenario B	Scenario C	Scenario L	Scenario M	Scenario N
<i>GPs if % spec. =</i>						
40%	-409	6	558	162	335	508
50%	-785	-440	20	-310	-166	-23
55%	-969	-659	-245	-542	-413	-284
z	-1 008	-701	-288	-593	-455	-318
x	-1 055	-748	-338	-608	-473	-338
y	-1 243	-969	-603	-841	-720	-598
65%	-1 345	-1 104	-783	-1 015	-914	-814
<i>Specialists if % spec. =</i>						
40%	-2 308	-2 033	-1 667	-1 922	-1 808	-1 702
50%	-1 938	-1 595	-1 138	-1 459	-1 315	-1 172
55%	-1 742	-1 365	-862	-1 213	-1 055	-910
z	-1 705	-1 325	-818	-1 165	-1 016	-870
x	-1 654	-1 274	-765	-1 145	-993	-851
y	-1 475	-1 062	-512	-923	-757	-592
65%	-1 376	-929	-335	-752	-566	-379
TOTAL except in training	-2 717	-2 029	-1 112	-1 761	-1 474	-1 192
<i>Same data in % of stock before restrictions</i>						
	Scenario A	Scenario B	Scenario C	Scenario L	Scenario M	Scenario N
<i>GPs if % spec. =</i>						
40%	-4.8%	0.1%	6.5%	1.9%	3.9%	6.0%
50%	-9.2%	-5.2%	0.2%	-3.6%	-2.0%	-0.3%
55%	-11.4%	-7.7%	-2.9%	-6.4%	-4.8%	-3.3%
z	-11.8%	-8.2%	-3.4%	-7.0%	-5.3%	-3.7%
x	-12.4%	-8.8%	-4.0%	-7.1%	-5.6%	-4.0%
y	-14.6%	-11.4%	-7.1%	-9.9%	-8.4%	-7.0%
65%	-15.8%	-13.0%	-9.2%	-11.9%	-10.7%	-9.6%
<i>Specialists</i>						
40%	-24.5%	-21.6%	-17.7%	-20.4%	-19.2%	-18.0%
50%	-20.6%	-16.9%	-12.1%	-15.5%	-13.9%	-12.4%
55%	-18.5%	-14.5%	-9.1%	-12.9%	-11.2%	-9.6%
z	-18.1%	-14.0%	-8.7%	-12.3%	-10.8%	-9.2%
x	-17.5%	-13.5%	-8.1%	-12.1%	-10.5%	-9.0%
y	-15.6%	-11.3%	-5.4%	-9.8%	-8.0%	-6.3%
65%	-14.6%	-9.9%	-3.5%	-8.0%	-6.0%	-4.0%
TOTAL except in training	-15.1%	-11.3%	-6.2%	-9.8%	-8.2%	-6.6%

* WTE = corrected for extra women's share and younger Mds off-duty, without subsequent mortality and in-training.

** Scenarios:

— Number of registrations/year after 2006: A = 260, B = 320, C = 400, continuously.

— Ibidem resp. in 2004-08, 2009-13; 2014-18: L = 260, 320 and 400;

M = 260, 340, 440; N = 260, 360, 480.

— Specialists' share:

- stable share throuhout the period: 40%, 50%, 55%, 65%;

- or variable shares according to the period: y = 71%, 59%, 57%;

- or variable shares according to the period and the number of registrations:

z = for LMN: 65%, 56.5% and 50%;

for A: 65%, 57% and 46%; for B: 63%, 56.5% and 48%;

for C: 61%, 56.5% and 49.5%

TABLE 3
 Medical manpower and outlook according to scenarios *
 French speaking medical doctors < 66 years (without Mds practising dental care)

	GPs			Specialists			Younger doctors in training		
	1994	1999**	2004	1994	1999**	2004	1994	1999	2004
Before restriction	7 636	8 078	8 620	7 552	8 249	8 946	1 931	1 931	1 931
Scenarios of restriction*									
% spéc.	2009	2014	2019	2009	2014	2019	2009	2014	2019
A	8 724	8 608	8 180	8 432	8 809	8 105	566	529	529
40%	8 594	8 349	7 793	8 433	8 936	8 364	694	661	651
50%	8 529	8 219	7 600	8 434	9 000	8 494	758	727	727
55%	8 399	8 064	7 563	8 436	9 127	8 649	886	757	613
Z	8 321	7 960	7 317	8 437	9 204	8 753	963	785	742
Y	8 399	7 960	7 213	8 436	9 127	8 753	886	859	846
65%	8 795	8 858	8 608	8 432	8 856	8 271	647	647	647
B	8 653	8 557	8 149	8 434	8 995	8 572	753	809	798
40%	8 582	8 406	7 920	8 435	9 064	8 722	823	890	890
50%	8 453	8 254	7 881	8 437	9 191	8 875	950	917	780
Z	8 355	8 116	7 601	8 439	9 287	9 012	1 047	959	911
Y	8 440	8 105	7 461	8 437	9 204	9 023	963	1 052	1 038
65%	8 891	9 192	9 178	8 433	8 918	8 493	676	805	805
C	8 733	8 635	8 624	8 435	9 073	8 849	832	1 006	996
40%	8 654	8 656	8 346	8 437	9 151	9 027	910	1 107	1 107
50%	8 528	8 501	8 313	8 438	9 274	9 183	1 034	1 140	996
Z	8 401	8 325	7 979	8 440	9 398	9 358	1 159	1 192	1 135
Y	8 496	8 299	7 792	8 439	9 305	9 384	1 066	1 308	1 294
65%	8 724	8 787	8 776	8 432	8 809	8 225	566	647	809
D	8 594	8 498	8 289	8 433	8 936	8 514	694	809	998
40%	8 529	8 353	8 046	8 434	9 000	8 658	758	890	1 112
50%	8 399	8 399	7 994	8 436	9 127	8 612	886	917	1 014
Z	8 321	8 082	7 738	8 437	9 204	8 930	963	959	1 138
Y	8 399	8 064	7 559	8 436	9 127	8 947	886	1 052	1 297
65%	8 724	8 847	8 955	8 432	8 809	8 264	566	687	887
E	8 594	8 547	8 438	8 433	8 936	8 564	694	858	1 096
40%	8 529	8 398	8 180	8 434	9 000	8 713	758	944	1 220
50%	8 399	8 243	8 136	8 436	9 127	8 868	886	973	1 113
Z	8 321	8 123	7 864	8 437	9 204	8 988	963	1 018	1 250
Y	8 399	8 098	7 663	8 436	9 127	9 012	886	1 116	1 425
65%	8 724	8 906	9 134	8 432	8 809	8 304	566	726	955
F	8 594	8 597	8 587	8 433	8 936	8 613	694	907	1 195
40%	8 529	8 442	8 313	8 434	9 000	8 768	758	998	1 312
50%	8 399	8 286	8 279	8 436	9 127	8 924	886	1 029	1 202
Z	8 321	8 164	7 989	8 437	9 204	9 047	963	1 076	1 363
Y	8 399	8 133	7 767	8 436	9 127	9 077	886	1 180	1 553
65%									

* Scenarios:
 — Number of registrations/year after 2006: A = 260, B = 320, C = 400, continuously.
 — Ibidem resp. in 2004-08, 2009-13, 2014-18: L = 260, 320 and 400; M = 260, 340, 440; N = 260, 360, 480.
 — Specialists' share:
 — stable share throughout the period: 40%, 50%, 55%, 65%;
 — or variable shares according to the period: Y = 71%, 59%, 57%;
 — or variable shares according to the period and the number of registrations: Z = for LMN: 65%, 56.5% and 50%;
 for A: 65%, 57% and 46%; for B: 63%, 56.5% and 48%; for C: 61%, 56.5% and 49.5%.

** from