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KCE reports 72B

Federaal Kenniscentrum voor de Gezondheidszorg
Centre fédéral d'expertise des soins de santé
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PRÉFACE

Il y a une dizaine d'années, les autorités belges se sont lancées dans une politique de réduction de l'offre médicale pour contenir la croissance des dépenses de santé et garantir la qualité des soins. Le moyen utilisé a été d'agir sur le nombre d'étudiants de sorte que les effets ont mis quelques temps à se faire sentir et que peu de questions se sont posées dans les premières années. Aujourd'hui, certaines craintes se manifestent et les décideurs souhaitent à juste titre prendre les précautions nécessaires pour une fixation adéquate des quotas. Le spectre de voir se former des files d'attente ou d'être forcés à un moment donné de faire appel à des médecins étrangers, incite à la prudence et à la réflexion.

Réguler l'offre médicale est une tâche complexe, car fondamentalement la production de la force de travail médicale est influencée, directement ou indirectement, par un ensemble de facteurs sociétaux et institutionnels. De plus, il n'y a pas une réponse théorique toute faite à la question de savoir à quelle hauteur le numerus clausus doit être fixé. En effet, cela dépend des niveaux de service, de qualité et d'accessibilité attendus et la fixation de ces niveaux relève plus d'un choix de société que de l'application d'un modèle mathématique, aussi sophistiqué soit-il. Enfin, quand on sait que l'objectif visé est de réguler un marché belge fortement tributaire d'un marché européen garantissant la libre circulation des étudiants et des médecins, on peut se demander si la tâche ne relève pas du défi.

Par conséquent, le présent rapport ouvre des pistes de réflexion et vise à donner toutes les dimensions du problème plutôt qu'à fixer un chiffre qu'il suffirait d'insérer dans un Arrêté Royal. Pour répondre à cet objectif, nous avons adopté une méthodologie mixte, associant analyses statistiques, revue de la littérature scientifique et des textes légaux, et comparaison internationale.

Nous formons le vœu que ce travail puisse être utile à une planification de l'offre médicale qui soit en phase avec un système de santé complexe et en rapide évolution.

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Résumé

INTRODUCTION

La planification de l’offre médicale consiste à évaluer les effectifs de médecins nécessaires pour couvrir les besoins en soins et à développer les stratégies permettant de répondre à ces besoins. Une offre médicale trop abondante peut induire une augmentation de la demande en soins et engendrer une augmentation des coûts des soins de santé tandis qu’une offre insuffisante peut mener à des besoins en soins non couverts. Les deux situations sont susceptibles d’altérer la qualité des soins délivrés. L’objectif est donc de s’assurer que les praticiens ayant les compétences requises soient affectés au bon endroit et au bon moment. Les stratégies et moyens utilisés pour atteindre un tel objectif sont cependant loin d’être simples, des facteurs sociétaux et institutionnels influençant directement ou non la force de travail dans le secteur de la santé. Réguler l’offre médicale est une tâche complexe, comme l’illustrent les variations de l’offre médicale, tantôt excédentaire tantôt insuffisante, dans des pays tels que les Pays-Bas, la France et l’Australie.

Par conséquent, l’objectif de ce projet est de fournir une vue d’ensemble de la situation actuelle, des pratiques et des difficultés rencontrées dans l’exercice de la planification des effectifs médicaux en Belgique. Le chapitre 2 présente une analyse approfondie des effectifs de médecins en Belgique et des initiatives mises en œuvre pour les réguler. Dans le chapitre 3, sur base d’une revue de la littérature internationale et de l’analyse des données belges, nous étudions le phénomène de la demande induite par l’offre, argument généralement avancé pour limiter le nombre de médecins. Dans le chapitre 4, nous révisons de façon critique la disponibilité et la validité des modèles prévisionnels de l’offre médicale. Le chapitre 5 compare la planification de l’offre médicale en Belgique aux politiques et pratiques mises en œuvre dans un certain nombre de pays (France, Pays-Bas, Allemagne, Autriche et Australie). Enfin, le chapitre 6 propose des recommandations pour la planification de l’offre médicale en Belgique.

MÉTHODES

Étant donné la portée et les objectifs de ce projet, quatre sources d’informations ont été utilisées. Premièrement, une base de données, fournie par l’Agence Intermutualiste (AIM) et regroupant tous les médecins actifs dans le secteur curatif belge en 2002 et 2005, a été analysée afin de décrire les effectifs, la distribution géographique et les niveaux d’activité des médecins. Deuxièmement, afin d’évaluer les politiques et mécanismes institutionnels relatifs à l’offre de médecins en Belgique, nous avons examiné les textes légaux publiés entre 1996 et 2007. Troisièmement, nous avons étudié en profondeur la littérature scientifique sur la planification de l’offre médicale, les modèles prévisionnels et la demande induite par l’offre. Enfin, des questions spécifiques ont été posées et débattues avec des experts de la planification de l’offre médicale (Commission de Planification de l’Offre Médicale, professeurs d’université, membres du Service Public Fédéral de la Santé Publique et de l’Observatoire social européen). Chaque étude de cas pour les 5 pays étudiés dans le cadre de la comparaison internationale a été revue et commentée par un expert national.

RÉSULTATS

SITUATION BELGE

Des différences notables sont relevées entre le nombre de médecins inscrits dans les registres nationaux (Ordre national des médecins et Service Public Fédéral Santé Publique) et le nombre de médecins dont l'activité est enregistrée par les mutuelles sur base des données de facturation. En 2005, selon le registre national (SPF Santé Publique), 42 176 médecins étaient enregistrés en Belgique, soit une densité médicale globale de 41 pour 10 000 habitants. Seule une partie de ceux-ci délivrent des soins remboursés dans le cadre de l'Assurance Maladie-Invalidité et sont considérés comme « praticiens », 53.3% (11 626/21 804) parmi les médecins généralistes et de 65.4% (13 328/20 372) à 87.4% (17 799/20 372) parmi les spécialistes, suivant la définition de médecin praticien utilisée. Un cinquième à un tiers des médecins actifs travaillent dans d'autres secteurs d'activité que celui des soins thérapeutiques. La densité des médecins praticiens est donc en réalité entre 23.8 et 28.1 pour 10 000 habitants. Il existe d'importantes variations de la densité médicale dans le pays, au niveau des provinces et des arrondissements.

Entre 2002 et 2005, le nombre de praticiens en médecine générale a diminué de 7%, tandis que le nombre de spécialistes praticiens est resté stable. La diminution de la densité de généralistes, observée dans toutes les provinces, provient vraisemblablement d'un taux d'abandon important.

Le sexe et l'âge des médecins influencent leur productivité. La profession médicale vieillit (en 2005, la proportion de médecins de plus de 50 ans était respectivement de 47.7% pour les généralistes et de 45.6% pour les spécialistes) et se féminise (30.1% des effectifs médicaux actuels sont des femmes, tandis que chez les jeunes diplômés cette proportion atteint 59.5%). Ce changement démographique aura un impact sur l'ensemble de la force de travail. L'ampleur et l'évolution de cet impact dans le futur restent encore méconnus.

L'environnement général de l'exercice de la médecine et les changements introduits dans les règles de financement ont aussi un impact sur la productivité. Entre 2002 et 2005, on observe une forte diminution du nombre des visites à domicile de la part des généralistes, non compensée par une augmentation des autres activités médicales.

Depuis 1997, un numerus clausus limite le nombre de médecins qui peuvent pratiquer dans le cadre du système d'assurance maladie-invalidité avec l'objectif de contenir les dépenses en soins de santé et d'équilibrer les densités de médecins entre les deux Communautés. La régulation de l'offre médicale est relativement souple et adaptative. Les quotas sont révisés annuellement sur proposition de la Commission de Planification de l'Offre Médicale, sur base de scénarios de projection et de consultations d'experts nationaux.

Les quotas sont répartis entre les Communautés (à raison de 60% pour la Communauté flamande et de 40% pour la Communauté française) et entre les titres professionnels (43% pour les généralistes et 57% pour les spécialistes). La limitation du nombre d'étudiants dans le but de respecter les quotas a été mise en oeuvre différemment en Communauté flamande (examen d'entrée) et en Communauté française (sélection après la première année à l'université). Malgré l'imposition de quotas, le nombre d'étudiants dépasse les nombres fixés dans les deux Communautés (on prévoit un dépassement de +/- 300 en Communauté flamande et de +/-500 en Communauté française pour 2011).

Selon les projections, les quotas actuels (700 de 2004 à 2011, 833 en 2012 et 975 en 2013) devraient permettre d'atténuer progressivement la différence de densité médicale entre les deux Communautés et de stabiliser la force de travail au niveau actuel de la Communauté flamande, utilisé comme point de référence.

Bien que les quotas globaux aient été respectés au cours de la période 2004-2006 (dépassement de 0.2%), 25.5% des quotas pour les généralistes n'étaient pas atteints. Le phénomène est plus important en Communauté flamande.

Sur la même période, les nouveaux spécialistes dépassaient les quotas (+ 19.5%) dans les deux Communautés, le dépassement étant plus prononcé en Communauté française.

Le nombre de visas délivrés à des médecins porteurs d'un diplôme étranger est en augmentation (169 en 2006). En 2006, 106 médecins étrangers ont commencé à exercer, soit 12.1% des nouveaux praticiens. Un marché du travail aussi libre complique la planification nationale de l'offre médicale. L'impact du flux étranger sur les effectifs médicaux et leur planification doit être étudié de façon approfondie.

Jusqu'à présent, l'estimation du nombre de médecins nécessaires a été essentiellement basée sur une modélisation centrée sur l'offre médicale et repose sur l'idée que les tendances observées dans le passé perdureront. Certaines données importantes pour une analyse détaillée de l'offre médicale ne sont pas prises en compte ou restent mal connues, comme l'organisation de la pratique, le temps de travail, la pratique de groupe, la délimitation du rôle et le transfert de compétences entre les professionnels de santé, le taux d'abandon ou de migration des médecins, les innovations technologiques, les changements dans l'accessibilité aux soins de santé et l'évolution des pathologies. De même, les incertitudes associées au processus de modélisation et au résultat du modèle lui-même restent mal expliquées. En outre, nous n'avons qu'une vision floue de la manière dont les densités médicales sont liées aux besoins sanitaires.

Finalement, il n'existe aucun cadre général explicite de la planification de l'offre médicale. Jusqu'à présent, la Commission de Planification de l'Offre Médicale s'est limitée à effectuer des recommandations sur le nombre de médecins à former annuellement. Par conséquent, la planification de l'offre apparaît déconnectée des autres initiatives politiques relatives aux effectifs et aux pratiques médicales (comme par exemple les nouvelles règles de pratique ou les nouveaux mécanismes de financement) mais aussi des autres groupes de professionnels, même si le domaine de compétence de la Commission a été élargi aux kinésithérapeutes (depuis 1997), aux infirmières, aux sages-femmes et aux logopèdes (depuis 1999).

Pourquoi un contingentement ?

Malgré le nombre important de documents relatifs à l'induction de la demande par l'offre, la revue de la littérature scientifique sur la relation entre la densité de médecins et l'utilisation des soins de santé n'a apporté aucune réponse concluante. Les cadres et méthodes d'analyse divergent, ainsi que la qualité des données disponibles, ne facilitant pas la comparaison de l'existence et de l'ampleur de la demande induite par l'offre. Néanmoins, lorsque la demande induite par l'offre est avérée, son ampleur est faible et ne peut être extrapolée à d'autres spécialités, régions ou pays.

Conformément aux résultats de la revue de littérature, les résultats de l'analyse empirique de la demande induite par l'offre dans le marché ambulatoire belge sont en demi-teinte. Au niveau géographique de la commune, les résultats relatifs à la densité de généralistes apportent peu de preuves en faveur de l'hypothèse de l'induction. Une densité élevée de généralistes génère une légère augmentation du nombre moyen de visites par patient (intensité des soins), mais l'effet obtenu dépend de la spécification du modèle mathématique. Les résultats obtenus dans l'analyse du lien entre densité de généralistes et volume des soins (nombre de contacts par généraliste) sont en accord avec l'hypothèse de l'induction. Cette relation disparaît cependant quand le niveau de l'arrondissement est pris en considération, pour tenir compte de la mobilité des patients. Les preuves en faveur de l'hypothèse de l'induction sont plus concluantes pour les spécialistes. Tandis que le nombre moyen de consultations par patient (intensité des soins) est liée positivement à la densité de spécialistes pour les psychiatres uniquement, les résultats concernant le nombre total de consultations par spécialiste (volume des soins) soutiennent l'hypothèse de l'induction, et ce pour toutes les spécialités.

Comment choisir le bon nombre de médecins ?

Quatre approches principales pour la projection des effectifs médicaux ont été identifiées. L'approche basée sur la projection de l'offre définit l'influx nécessaire pour conserver ou atteindre, dans le futur, un niveau d'offre déterminé, exprimé en 'nombre de médecins par habitants'. L'approche basée sur la demande, aussi appelée approche basée sur l'utilisation, évalue le volume de services de santé qui sera utilisé par la population pour estimer les besoins en médecins. L'approche basée sur les besoins, aussi appelée approche épidémiologique, définit le nombre de praticiens ou de services nécessaires pour conserver la population en bonne santé. Les besoins sont définis par des experts médicaux. Enfin, le benchmarking, ou comparaison, se base sur un système de santé de référence pour définir le niveau désiré en effectifs médicaux.

Ces différentes approches peuvent être combinées et modulées afin de prendre en compte la disponibilité des ressources ou les préférences individuelles mais aussi les changements relatifs aux conditions du marché, aux dispositions institutionnelles et aux barrières à l'accès. Toutefois, chacune de ces approches repose sur un nombre d'hypothèses qui devraient être reconnues étant donné leur large influence sur les résultats du modèle. Il n'existe en fin de compte aucune approche unanimement acceptée pour prévoir les besoins en médecins.

Les modèles peuvent être utiles pour générer des scénarios mais doivent être utilisés avec prudence pour les prévisions quantitatives. Trois groupes de facteurs auront une influence sur la validité d'un modèle : l'incertitude des paramètres dans la population de référence (la qualité des données importées dans le modèle) ; le caractère plausible des scénarios (la vraisemblance des hypothèses sous-jacentes) ; l'ajustement du modèle aux données disponibles (prise en considération des facteurs de confusion et d'interaction). L'incertitude des projections pourrait être évaluée par le biais d'une analyse de sensibilité ou d'une simulation stochastique.

Comparaison transnationale

On observe d'importantes variations du nombre de médecins praticiens[1] pour 10 000 habitants, de 12.2 pour 10 000 habitants aux Pays-Bas à 37 pour 10 000 habitants en Allemagne (36.4 pour 10 000 en Belgique selon cette définition). Toutefois, la comparaison des densités médicales doit tenir compte d'une analyse globale du système de santé des différents pays.

La France, la Belgique, l'Allemagne, les Pays-Bas et l'Australie ont mis en place un numerus clausus, tandis qu'en Autriche, l'accès aux études de médecine est encore libre. Le numerus clausus contrôle l'admission des étudiants en médecine via un examen d'entrée ou, dans le cas de la France et de la Communauté française de Belgique, la sélection des étudiants ayant accès à la deuxième année dans les facultés de médecine. Aux Pays-Bas, les étudiants sont sélectionnés par l'application d'un tirage au sort.

Le numerus clausus est appliqué depuis plusieurs dizaines d'années aux Pays-Bas et en France, alors qu'il fut instauré dans les trois autres pays au milieu des années 90. En Belgique et en Allemagne, l'objectif est toujours de limiter le nombre d'étudiants. Au contraire, la France, les Pays-Bas et l'Australie réagissent à la chute des effectifs médicaux en augmentant de nouveau l'influx des étudiants. L'expérience de ces trois pays montre la difficulté d'atteindre et de conserver un niveau adéquat d'effectifs médicaux.

Deux options politiques ont été mises en oeuvre pour contrebalancer les déséquilibres géographiques dans la force de travail. La France, la Belgique et l'Australie se concentrent sur les incitants financiers, pédagogiques ou administratifs. L'Allemagne et l'Autriche adoptent des mesures coercitives en interdisant aux nouveaux médecins de s'installer dans des zones à forte densité médicale.

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1 Dans les données internationales, un médecin praticien est celui qui fournit au moins un service médical par an.

Des changements au niveau du partage des compétences ont été expérimentés dans un certain nombre de pays pour alléger la charge de travail des médecins généralistes, principalement via le transfert de tâches entre médecins et infirmières. L'impact de la substitution médecin/infirmière sur le besoin en médecins et sur les dépenses en soins de santé est très mitigé et dépend fortement du contexte.

Le faible attrait pour la médecine générale est observé dans tous les pays et différentes stratégies sont mises en place pour le contrer : créer des quotas pour garantir des postes de formation en médecine générale, réviser le programme d'étude en médecine, subventionner la formation en médecine générale. L'efficacité de ces stratégies n'a pas encore été évaluée.

Alors que la planification de l'offre médicale reste une responsabilité nationale, la libre circulation des étudiants et des diplômés dans l'Espace économique européen court-circuite la régulation. C'est un nouveau défi que le système éducatif et la planification des effectifs médicaux doivent relever, particulièrement dans les pays qui souhaitent restreindre leur offre médicale.

Enfin, des initiatives pour améliorer la collecte des données sur les effectifs médicaux ont été mises en place dans plusieurs pays afin de permettre une planification efficace de l'offre médicale. Toutefois, des efforts supplémentaires sont nécessaires, particulièrement en ce qui concerne l'harmonisation des données au niveau international. L'évaluation appropriée des initiatives touchant l'offre médicale est tout aussi nécessaire. Soulignons également que dans la plupart des pays, la planification de l'offre médicale est toujours conduite de manière isolée de la planification des autres professions de la santé sans tenir compte du système de santé global.

RECOMMANDATIONS

On ne peut prétendre fixer ni « le » nombre juste ni « la meilleure » composition en professionnels de la santé. Au contraire, les besoins en professionnels de santé sont déterminés par des décisions sociétales plus larges qui concernent entre autres les ressources, l'organisation et le financement des programmes de soins de santé. La valeur des projections ne réside pas dans leur capacité à déterminer des nombres exacts mais dans leur utilité à identifier les tendances actuelles et émergentes auxquelles les décideurs politiques doivent répondre. Les besoins en médecins sont déterminés de manière endogène par des choix politiques ou sociaux qui sont à la base du système de soins de santé. Lorsque les choix politiques et sociaux concernant l'accès aux soins sont explicites, les méthodes scientifiques peuvent alors être utilisées de façon systématique pour déterminer les besoins en professionnels de soins de santé dans une population donnée.

Même si des preuves en faveur de la demande induite par l'offre ont été relevées, limiter le nombre de médecins n'est qu'une des mesures pour garantir la qualité des soins et contrôler les coûts des soins de santé. Une solution alternative est de proposer des incitants financiers aux médecins afin de moduler leur pratique. En outre, simplement compter le nombre de médecins ne permet en aucune façon de tenir compte ni de la qualité ni du caractère approprié des soins. Toutefois, nous pouvons adresser certaines recommandations utiles aux futurs décideurs politiques :

- Alors que la collecte et l'analyse de données de qualité, obtenues en temps opportun, sont cruciales pour permettre une planification flexible, pertinente et valide de la force de travail, l'accès à de telles données n'est actuellement pas aisé. Par conséquent, il est important d'améliorer la coordination et l'harmonisation des collectes de données sur les « stocks et mouvements » des effectifs médicaux. Les données sur le nombre de médecins, le niveau actuel d'activité, le taux d'abandon ou de migration devraient être validées et mises à la disposition des acteurs de la planification de l'offre médicale et des chercheurs. Le Registre national des professions médicales (« cadastre ») devrait remplir cette fonction. De plus, la collecte complémentaire de données plus spécifiques, relatives par exemple à l'organisation de la pratique, aux indicateurs de charge de travail ou aux facteurs de productivité médicale, est recommandée. Effectuer des études régulières, tant quantitatives que qualitatives, auprès d'un échantillon de professionnels des soins de santé est une option. Cette approche est déjà utilisée aux Pays-Bas et en France. Pour permettre une véritable analyse de carence (gap analysis), il est également important d'identifier et de mesurer des indicateurs de besoins de santé, tels que l'émergence de nouvelles pathologies et de nouveaux modes de prise en charge de la maladie.

- Ces données doivent alimenter le modèle de projection afin de refléter au mieux le système dans son ensemble et de produire des scénarios utiles. Il est aussi essentiel d'évaluer l'incertitude du modèle par le biais d'une analyse de sensibilité ou d'une simulation stochastique. D'autres modèles peuvent aussi être pris en considération et combinés. L'approche basée sur la demande effective, qui tient compte à la fois des besoins de santé et des paramètres économiques est un exemple parmi les solutions possibles.
- La planification de l'offre médicale n'est pas seulement une question de quantité de professionnels, elle englobe aussi la définition du partage des compétences désiré (skill-mix), l'interaction patients-médecins, le niveau de disponibilité et d'accessibilité des services médicaux, le contrôle de la qualité et la responsabilité des professionnels de la santé, les mesures réglementaires pour moduler la demande en soins de santé, le financement du système de santé et les modes de paiement des médecins. Par conséquent, il est souhaitable de développer un cadre général de la planification de la force de travail qui soit intégré, cohérent, basé sur des éléments objectifs (les décisions sont prises sur base d'informations suffisamment fiables et de méthodologies solides) et évolutif (flexible et qui s'adapte au système de santé qui change rapidement). La Commission de Planification de l'Offre Médicale, qui est composée d'un large éventail d'experts nationaux et dont le mandat légal comprend déjà la formulation de recommandations eu égard à tous les aspects liés à la force de travail dans le domaine de la santé, devrait endosser ce rôle.

Scientific Summary

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Glossary

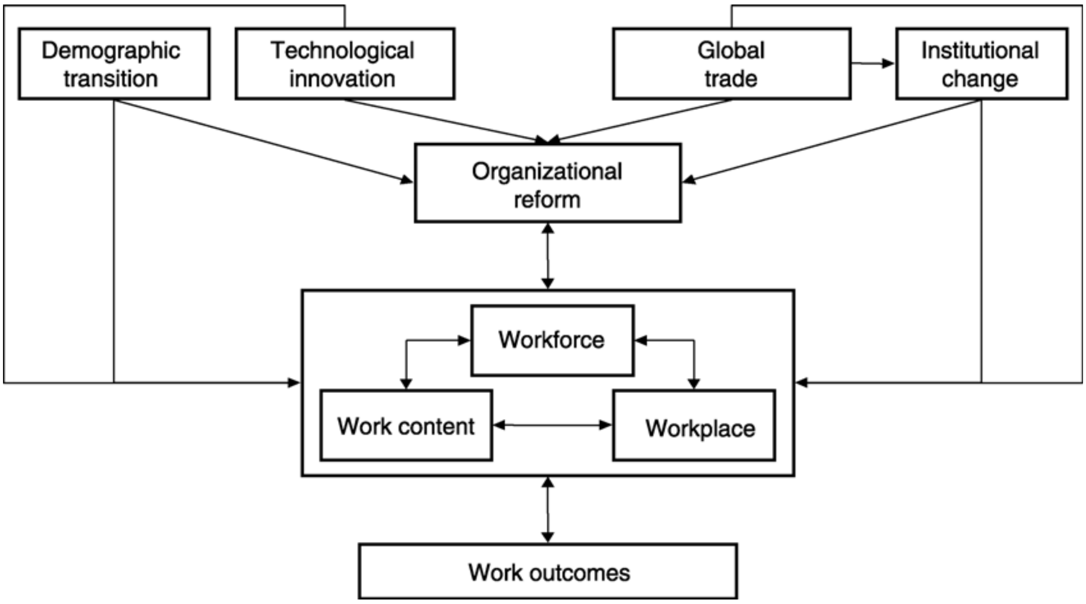
AHWAC	Australian Health Workforce Advisory Committee
COGME	Council of Graduate Medical Education
EC	European Community
ENT	Ear-nose-throat
EU	European Union
FPS	Federal Public Service
FTE	Full-time equivalent
GDP	Gross Domestic Product
GP	General Practitioner
HMO	Health Maintenance Organization
HRH	Human Resources for Health
IMA	Intermutualistic Agency (Agence Intermutualiste / Intermutualitisch Agentschap)
INAMI/RIZIV	Institut National d'Assurance Maladie-Invalidité / Rijksinstituut voor Ziekte- en Invaliditeitsverzekering
MB / BS	Moniteur Belge / Belgisch Staatsblad
MD	Medical Doctor
MSP	Medical Supply Planning
Municipality	Commune (français) / Gemeente (Nederlands)
NHS	National Health Service
NP	Nurse Practitioner
OECD	Organisation for Economic Cooperation and Development
RD	Royal Decree
SID	Supplier Induced Demand
SP	Specialist
WHO	World Health Organization

1 INTRODUCTION

1.1 WHY PLANNING MEDICAL SUPPLY?

The healthcare sector is labour intensive and human resources are the most important input into the provision of health care and represent the largest proportion of health care expenditure.[1] Planning human resources for health (HRH) is the process of estimating the health workforce to meet future health service requirements and the development of strategies to meet those requirements. Essentially health workforce planning aims at matching workforce supply with requirements. Simplistically, it may be defined as ensuring that the right practitioners are in the right place at the right time with the right skills.[2,3] Processes and means to attain such an objective are far from simple however, as fundamental societal and institutional dimensions are impacting, directly and indirectly, on health workforce production. Dubois et al. recently proposed a neat analysis of factors affecting the health care workforce, as synthesized in Figure 1.[4]

Figure 1. A framework for analyzing future trends in HRH, courtesy of C-H Dubois [4]



Within this global framework of HRH planning, forecasting supply and requirement remains a necessary step to ensure that resources will adequate the needs, an equation of utmost importance for the health sector. Human capital decisions include the appropriate quantity, mix, and distribution of health services that will be required to meet population health needs at some identified future point in time.[5] Medical supply turns out to be a crucial axis within this framework. Both oversupply and undersupply might alter the quality of health care delivered. Moreover, an oversupply might inflate health care costs through a possible supplier induced demand, whereas an undersupply might result in unmet health needs. Potential costs of workforce imbalance are summarized in Table 1. Thus Medical Supply Planning (MSP) tends to preserve a quantity of physicians that is balanced with demand and to ensure access to high-quality and cost-effective healthcare.

Table 1. Costs of workforce imbalance (adapted from Duckett[6])

Costs of undersupply	Costs of oversupply
• Poor access, unmet needs, potentially poorer outcomes	• Unnecessary costs incurred in education sector in training workforce
• Overworked and stressed workforce	• Unnecessary services provided (in case of supplier induced demand)
• Increased costs of alternative provision	• Potentially lower quality of health care because of insufficient consultation rate

Some have argued that this field of activity should, as any other ones, follow the market rules.[7] However, the Australian Health Workforce Advisory Committee has pinpointed that neither the health nor health education sectors are "free markets": health care is subject to market failure, due to imperfect information and unpredictable and irregular demand; information asymmetries; and the separation of the consumer, practitioner and payer in many situations. Moreover, the labour market is constrained by licensing and professional regulation, restrictions on education places, and wages are often negotiated on a state-wide or national basis for groups of health professionals, making 'price' inflexible to changes in demand and/or supply.

A last, but not least, argument towards medical supply planning, is guiding and informing workforce policy. Medical supply planning is not only a matter of regulating numbers, it can also assist in the developing of new approaches to health service delivery that result in changes in medical supply, distribution and functioning.[2]

1.2 THE MEDICAL SUPPLY IN BELGIUM

Taking into account the overall number of physicians, Belgium is characterized by one of the highest physician/population ratios in industrialized countries (35 physicians per 10 000 inhabitants in 1995) as well as by large differences in density between the two main Communities, i.e. Flemish and French Communities.[8] At the end of the 90s, the overall physician density was relatively higher in the French-speaking South of the country, and, within the federal scheme of health care financing, this was considered neither politically acceptable nor financially sustainable. The supplier induced demand hypothesis, assuming a positive relationship between physician densities and health care utilization, has been a major argument in favour of medical supply restrictions.[9] The potential relationship between medical density and quality of care was secondary in the political debate. Since 1996, the Practice of Medicine Act empowers the Federal Ministry of Public Health to limit the number of physicians that may practise under the national health insurance system. On the advice of the Belgian Committee of Medical Supply Planning, a *numerus clausus* mechanism was proposed in 1997 (article 170 from Framework Law). Since 2004, quotas regulate the number of new physicians allowed to submit a training plan and to further register with the National Institute for Sickness and Disability Insurance (INAMI/RIZIV). The federal government has computed the quotas in such a way that the existing discrepancy in medical density between the North and the South of the country should gradually disappear.

Following its meeting on July 20, 2006, the Belgian Council of Ministers required that the KCE conducted a study that (letter 2002A71750.373 on July 21, 2006):

- explores the goal attainment of the numerus clausus (NC) implemented in 1997, i.e. the reduction of the difference in densities between the two Communities;
- benchmarks the medical supply in Belgium against selected foreign countries.

1.3 SCOPE AND OBJECTIVES OF THE REPORT

The complex picture of human resources can not be appraised in the frame of a unique report if one wants to bring out the finer. This report focuses on one piece of the global puzzle, i.e. regulating physician numbers. While zooming in on a specific aspect of human resources planning, the global picture should remain apparent. A containment measure such as *numerus clausus* is only one among a battery of measures to shape the field of human resources for health. Therefore, mechanisms and impact of *numerus clausus* should be examined in the light of those accompanying measures. Other important themes relating to medical workforce and medical activities have been or will be examined by KCE: “Feedback: research on impact and barriers for implementation” (2005 and 2006); “Clinical Quality Indicators” (2006); “Quality indicators in general practice” (2007); “Attrition and retention of GPs” (2007-2008); “Accountability and quality: what works?” (2008).

As regards medical supply planning, the important questions to address are: What is the current practice of medical supply planning in Belgium? Can requirements and supply be accurately forecasted so as to achieve an adequate balance? How do other countries define such balance and through which policies do they achieve it? What would be the impact on health care consumption of not restricting physician numbers? What are the challenges of medical supply planning in Belgium and how can they be addressed?

The objectives of this report are to:

1. Analyse the medical supply planning in Belgium and to benchmark it against a panel of selected countries.
2. Review the supporting evidence for supplier induced demand (SID) in the international literature and in Belgium.
3. Review in the international literature the availability and effectiveness of medical supply forecasting methods.
4. Propose recommendations as regards medical supply planning in Belgium.

After this introduction, chapter two presents an in-depth analysis of the current physician workforce in Belgium and the initiatives to shape it. In chapter three, we review the evidence base for the argument generally put forward for limiting physicians’ numbers: cost-containment. The analysis is based on the results of a systematic literature review and a statistical analysis of health care provided in Belgium in 2005. Chapter four overviews, on the basis of a systematic literature review, the medical numbers forecasting techniques. It also addresses the validity of existing forecasting models. Chapter five benchmarks the Belgian way of dealing with medical supply planning against policies and practices in a number of selected countries: France, Austria, Germany, the Netherlands, and Australia. Finally, chapter six analyses strengths and weaknesses of medical supply planning in Belgium, and draws subsequent recommendations.

2 THE BELGIAN MEDICAL WORKFORCE

2.1 METHODS

In view of the scope and objectives of this project, it was important to gather information from various sources to provide a comprehensive view of the current situation, practice and issues in the field of medical workforce supply and its planning in Belgium.

We used 3 main sources of information. First, current medical workforce working within the social security framework was assessed by the analysis of a dataset encompassing the medical doctors (MDs) active in Belgium in 2002 and 2005. This dataset was provided by the Intermutualistic Agency (AIM-IMA)[a]; its building up is extensively described in Appendices B7 (for general practitioners) and B8 (for medical specialists). The analysis of physicians' activity levels was limited to ambulatory care services, both for general practitioners and medical specialists. Second, to assess policies and institutional mechanisms regarding workforce supply, we reviewed all legal texts published between 1996 and 2007. Finally, specific questions were addressed to and debated with a number of stakeholders (members of the Committee of Medical Supply Planning; university staff; members of the Ministry of Public Health and The Observatoire social européen).

2.2 THE CURRENT MEDICAL WORKFORCE

2.2.1 Head counts

Within the present frame, the following definitions were used:

- Physicians: holders of a degree in medicine
- Active physicians: physicians currently working in the country (alive, not retired and not dropped out), whatever the professional field (curative sector, administration, research centre…). Active physicians include general practitioners (GPs) and specialists (SPs). It is important to underline that the denomination 'GP' encompasses different physicians groups, identified through distinctive codes from INAMI/RIZIV[b]: 001-002 (general practitioners with granted rights), 003-004 and 007-008 (licensed general practitioners), 005-006 (general practitioners in training). Specialists in training are identified by an INAMI/RIZIV code from 010 to 097 according to the speciality considered.
- Practising physicians: general practitioners or specialists performing at least 1 contact a year to at least 50 individual patients (a contact is defined as medical consultation, visit or advice provided to a patient and billed to the social security). It should be noted that, according to the international definition, a physician is considered practising (active in health care) when at least one clinical service has been registered during the year under consideration. We considered it a too minimalist definition of activity. In fact, in Belgium, a lot of doctors record a limited number of contacts without being really practising GPs or SPs. For the choice of the cut-off of 50 patients, please see appendices B7 and B8.
- Accredited physicians: Accredited GPs are practising GPs reaching at least 1 250 contacts a year. The cut-off of 1 250 was set by INAMI/RIZIV. To obtain and keep the accreditation, the practitioner has to complete a Continuing Medical Education program, keep

a www.cin-aim.be

b www.inami.fgov.be

medical records for each patient, respect specific guidelines in practice and engage in a minimum level of activity. For SPs, the minimal level of activity is determined by specialty, and takes into account visits, consultations and technical acts. This accreditation, a quality label which is financed, is voluntarily requested by physicians who would like to be recognized for their activity levels as well as for their continuous training.

The overall number of physicians almost doubled in the last 25 years, going from 22 763 in 1980 to 42 176 in 2005, including 21 804 GPs and 20 372 SPs, respectively (Table 2).

Table 2. Evolution of registered physician numbers (GPs and SPs) from 2002 to 2005

	2002	***2003***	***2004***	***2005***
GPs	21 698	22 000	21 898	21 804
SPs	19 065	19 447	19 836	20 372
Total	**40 763**	**41 447**	**41 734**	**42 176**

Source: Federal Public Service of Public Health, Food Chain Security and Environment, Directorate-General for Primary Health Care, Database "CADASTRE", 2005; INAMI/RIZIV (annual reports, various years)

These figures form the common basis to compute physician-to-population ratio, notably by international institutions such as WHO or OECD.[8,10,11] On the basis of these figures, in 2005, OECD ranked Belgium third in terms of physician/population ratio (**41 physicians per 10 000 inhabitants**).

However, it is crucial to note that these physicians are not all professionally active, and that only a proportion of active physicians do provide curative health care, other fields of activity being scientific research, administrative service, employment in pharmaceutical companies and insurances (see Table 3).

Table 3. Evolution of number of active physicians (GPs and SPs) from 2002 to 2005

	2002	***2003***	***2004***	***2005***
Active GPs	18 205	18 224	18 279	18 332
Active SPs	18 565	19 069	19 462	19 872
Total active physicians	**36 770**	**37 293**	**37 741**	**38 204**

Source: INAMI / RIZIV, 2005

In 2005, among the 38 204 active physicians, 24 954 MDs were practising in the curative health care sector under social security rules. The proportion of practising physicians was lower among GPs than among SPs (53.3% versus 65.4% among global numbers). According to data presented in Table 4, the proportion of practising GPs among all active GPs was 63.4%. More than one third of active GPs work in other fields than general practice (school medicine, occupational medicine, teaching, research, administration…).

Table 4. Evolution of active GPs and practising GPs from 2002 to 2005

	2002	***2005***
Active GPs	18 205	18 332
Practising GPs*	12 531	11 626
% practising GPs among active GPs	68.8%	63.4%

* Source: IMA, 2005

It is noteworthy that the proportion of practising GPs (among active GPs) slightly declined over the recent years, from 68.8% to 63.4%.

Some preliminary studies brought up associated factors such as long working schedules or low wages.[12,13,14] However good quality evidence to better understand the phenomenon is still lacking[c].

During the same period, the number of active SPs increased by 7%. Nevertheless, the proportion of practising SPs also decreased over time (Table 5).

Table 5. Evolution of active and practising SPs from 2002 to 2005

	2002	*2005*
Active SPs	18 565	19 872
Practising SPs*£	13 466	13 328
% practising SPs among active SPs	72.5%	67.1%

*Source: IMA, 2005; £: KCE definition of practicing MD

However, in tables 4 and 5, the definition of a practising physician was based only on ambulatory care. While this definition is adequate to appraise the global workforce in general practice and in the majority of specialties, it underestimates the actual numbers of practising physicians in mainly hospital-based specialities, i.e. anaesthesiology, biology, nuclear medicine, radiology and anatomo-pathology. Therefore, to provide the reader with a more complete view of numbers at stake, we present in table 6 the numbers of active (according to the INAMI/RIZIV definition) and accredited specialists per speciality.

Table 6: Number of active and accredited SPs per speciality in 2005

Specialties	Number of active SPs on 01/02/2005**	Number (%) of active SPs with at least 1 medical service within INAMI/RIZIV during year 2005*	Number of accredited SPs on 01/02/2005**
Anatomo-pathology	287	253	214
Anaesthesiology	1 758	1 548	1 145
Biology	709	486	431
Cardiology	864	817	597
Dermatology	660	643	536
ENT*	604	563	439
Gastro-enterology	442	448	331
Gynaecology - obstetrics	1 344	1 241	885
Internal Medicine	2 061	1 753	1 310
Neurology	227	237	165
Neuropsychiatry	562	345	270
Neurosurgery	163	163	77
Nuclear Medicine	319	285	224
Ophthalmology	1 012	944	802
Orthopaedics	922	877	583
Paediatrics	1 400	1 207	871
Physiotherapy	452	415	334
Plastic surgery	202	196	95
Pneumology	367	356	275
Psychiatry	1 448	1 494	1 010
Radiology	1 498	1 338	1 133
Radiotherapy	164	142	109
Rheumatology	250	208	170
Stomatology	307	264	134
General surgery	1 490	1 250	734
Urology	360	326	248
TOTAL	**19 872**	**17 799 (89.6%)**	**13 122 (66%)**

Sources:
* INAMI/RIZIV, Annual report 2006,http://www.inami.fgov.be/presentation/fr/publications/annual-report/2006/index.htm
** Organe du Groupement des Unions Professionnelles Belges de Médecins Spécialistes – Rapport annuel 2005 ; Groupe de direction de l'accréditation de l'INAMI [18]

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c KCE is currently launching a research project on factors of retention/attrition among GPs (2007_19_HSR General Practice Motivation).

So there were 19 872 specialists declared active on 01/02/2005, according to INAMI/RIZIV. It should be noted that in the INAMI/RIZIV database, SPs are labeled as "active" when they have not been declared dead, retired, dropped out or permanently living in a foreign country. Therefore, a proportion of "active" SPs actually provide very low level of activity or no medical activity at all. Indeed, 89.6% (17 799/19 872) of SPs provided at least one medical service during year 2005.

Number of practising SPs, as defined by KCE and number of accredited SPs are remarkably close, 13 328 and 13 122, respectively. However, both parameters present limitations. The KCE definition of practising SPs underestimates numbers for mainly hospital-based specialities. On the other hand, it is also difficult to utilize the number of accredited SPs as a reference number, because a proportion of practising SPs do not request the accreditation. Therefore, the number of specialists actually practising as such lies between the numbers reported as having provided at least 1 medical service during 2005 by INAMI/RIZIV (17 799, i.e. 89.6% of the 19 872 "active" SPs) and the active SPs who are accredited (13 122, i.e. 66.0% of the 19 872 "active" SPs). However, any of these 2 parameters provide accurate information on activity level per individual, i.e. the productivity (number of medical services provided per year). One additional difficulty is the pooling of activities within hospitals, implying that a proportion of the SPs with low or no medical activity level might be indeed provide medical services but are not individually identified as such through the INAMI/RIZIV database

(P. Meeus, INAMI/RIZIV, personal communication). Finally, a proportion of medical services are provided outside the INAMI/RIZIV frame.

These elements of discussion underline the need to develop and harmonize the management of data on human resources for health in the Belgian system.

	Summary for GPs in 2005	
Registered GPs	= 21 804	100%
Active GPs	= 18 332	84.1% among all registered GPs
Active GPs with at least 1 medical service per year in the INAMI/RIZIV	= 13 761	63.1% among all registered GPs
Practising GPs£	= 11 626	53.3% among all registered GPs
	Summary for SPs in 2005	
Registered SPs	= 20 372	100%
Active SPs	= 19 872	97.5% among all registered SPs
Active SPs with at least 1 medical service per year in the INAMI/RIZIV	=17 799	87.4% among all registered SPs
Practising SPs£	= 13 328	65.4% among all registered SPs

£: KCE definition of practicing MD

Considering overall physician numbers gives an erroneous view of the medical workforce available for health care. In sharp contrast with the figures presented in international reports (physician-to-population ratios: 41 per 10 000 inhabitants), the density of practising physicians was between **23.8 and 28.1 per 10 000 inhabitants** in 2005 (11.1 GPs per 10 000 inhabitants and between 12.7 and 17.0 SPs per 10 000 inhabitants). One fifth to one third of active physicians works in other fields of activity than the curative sector.

2.2.2 Levels of activity

Medical manpower does not only amount to head counts, but is also a function of activity levels. To our knowledge, no recent data is available on employment indicators such as mean weekly work hours, or percentage of part-timers or over-timers.[15-17]

But volume of physician services can be known with great accuracy through the IMA database. Within the frame of this project, we restricted our analysis to ambulatory care services, i.e. consultations and home visits.

2.2.2.1 Practising GPs' level of activities

The median number of contacts per practising GP per year was 3 805 in 2005. However, contacts, a proxy of volume of clinical activity, are not evenly distributed. A quarter of all GPs have less than 3 000 contacts yearly, while 10% provide more than 5 300 contacts (Table 6).

Table 7. Distribution of annual contacts by practising GP in 2005

Percentiles	***Annual number of contacts per GP***
Percentile 10	1 948
Percentile 25	2 845
Percentile 50	3 805
Percentile 75	4 838
Percentile 90	5 314

Source: IMA, 2005; calculation: KCE, 2007

Table 7 reports the activity levels of practising GPs. In 2002, 145 GPs did not reach 500 contacts per year, i.e. 1.1% of all practising GPs. In 2005, 19 GPs did not reach this activity level, i.e. 0.3% of all GPs.

Considering the cut-off adopted by INAMI/RIZIV for accreditation (1 250 contacts per year), it is noticeable that 4.4% of all practising GPs did not reach this activity level in 2002, i.e. 557 GPs. In 2005, there were 302 GPs (2.7%) in this situation.

Table 8. Proportion of practising GPs by activity levels

Activity levels (contacts by year)	**Practising GPs 2002**		**Practising GPs 2005**	
	n	**%**	**n**	**%**
< 500	145	1.1	19	0.3
500 < 1 250	412	3.3	283	2.4
1 250 < 2 500	1 916	15.3	1 746	15.0
2 500 < 3 500	2 637	21.0	2 918	25.1
3 500 < 4500	2 288	18.2	2 678	23.0
> 4 500	5 133	41.1	3 982	34.2
Total	**12 531**	**100.0**	**11 626**	**100.0**

Source: IMA, 2005; calculation: KCE, 2007

The global amount of contacts followed a declining trend from **49 067 688** contacts realized by practising GPs in 2002 to **43 736 602** contacts in 2005 (minus 10.9%). The global number of home visits by GPs decreased from 16 983 513 in 2002 to 13 509 667 in 2005, i.e. a global decrease by 21.6% in 3 years or a mean decrease by 7.8% per year (week and non-week visits). This important decrease in home visits could partially be explained by the increasing patient out-of-pocket payment since 2003, a policy specifically aimed at reducing such visits, considered too expensive and poorly justified.[8] Apparently, home visits were not substituted by office consultations, which stayed quite stable over the period (- 2.6%, from 28 600 358 in 2002 to 27 851 583 in 2005).

2.2.2.2 *Practising SPs' level of activities*[d]

For specialists, the activity levels vary amongst specialties (Table 8).

Table 9. Distribution of patients and activity levels in ambulatory care by speciality (2005)

Specialties	Overall number of specialists	Global number of patients	Global number of consultations
Anaesthesiology	597	180 477	291 666
Biology	53	3 277	5 392
Cardiology	703	639 425	948 988
Dermatology	602	1 103 975	1 940 413
ENT*	510	745 936	1 286 493
Gastro-enterology	374	342 210	558 907
Gynaecology - obstetrics	1 150	1 598 805	3 235 478
Internal Medicine	1 579	1 044 523	1 993 069
Neurology	175	127 791	210 412
Neuropsychiatry	1 130	414 525	1 303 560
Neurosurgery	126	87 266	164 714
Nuclear Medicine	88	52 333	62 538
Ophthalmology	849	1 794 510	2 706 006
Orthopaedics	792	1 173 866	2 353 793
Paediatrics	1 050	803 861	1 912 221
Physiotherapy	379	364 230	786 686
Plastic surgery	167	103 620	210 518
Pneumology	262	167 180	305 878
Psychiatry	580	131 419	606 807
Radiology	149	2 739	7 571
Radiotherapy	123	63 049	135 297
Rheumatology	199	188 270	439 252
Stomatology	230	175 431	263 228
General surgery	1 084	833 605	1 554 101
Urology	304	346 804	655 663

*ENT = ear-nose-throat
Source: IMA, 2005; calculation: KCE, 2007

Nine specialties totalized 76% of all ambulatory consultations (gynaecology, ophthalmology, orthopaedics, dermatology, paediatrics, internal medicine, surgery, neuropsychiatry and ENT).

The proportion of practising SPs decreased between 2002 and 2005. In 2005, 67.1% of all active SPs had minimum 50 consultations a year, i.e. 13 328. Among all SPs, 13 122 were accredited by INAMI/RIZIV (Table 9).

Table 10. Evolution of active, practising* and accredited SPs

	2002	2005
Active SPs	18 565	19 872
Practising SPs	13 466	13 328
Accredited SPs*	12 571	13 122

*One practising physician was defined as providing at least 1 ambulatory medical service to 50 individual patients per year.
Source: Organe du Groupement des Unions Professionnelles Belges de Médecins Spécialistes – Rapport annuel 2005 ; Groupe de direction de l'accréditation de l'INAMI [18]

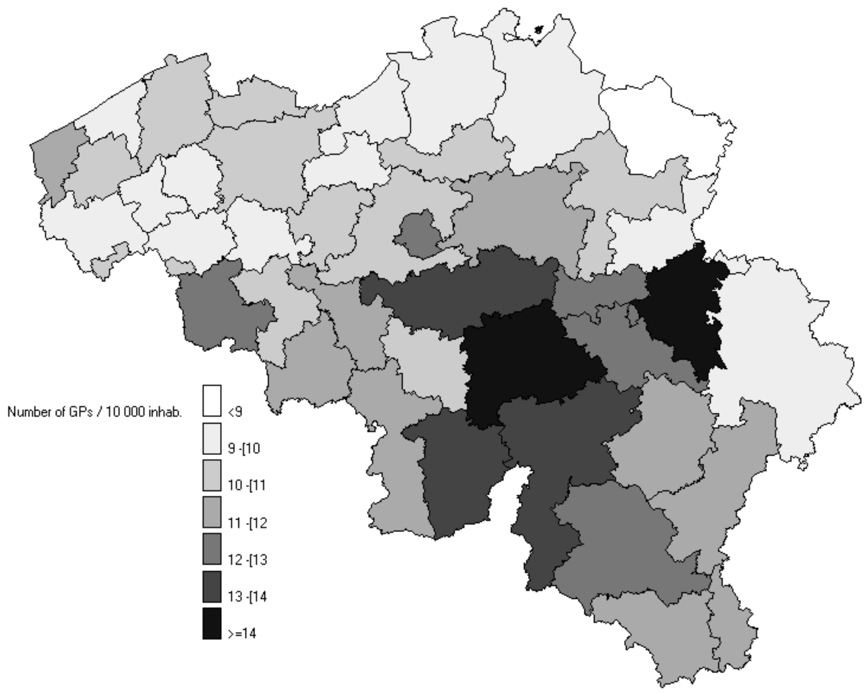
d Concerning SPs, it is important to note that technical acts were not included in our analysis because they are absent in the available IMA dataset.

2.2.3 Geographical distribution[e]

2.2.3.1 GPs distribution

The density of practising GPs varies between provinces and even among arrondissements in each province (Figure 2). In 2005, the lowest densities were observed in Antwerp, Limburg, West Flanders and East Flanders with 9.8, 9.9, 9.9 and 10.2 GPs per 10 000 inhabitants whereas the highest densities were observed in Luxembourg and Namur with 14.2 and 14.4 GPs per 10 000 inhabitants. Intermediate densities were observed for Flemish Brabant, Hainaut, Liège, Brussels and Walloon Brabant (respectively 11.1, 11.4, 13.1, 13.2 and 13.6 per 10 000 inhabitants) (Source: IMA, 2005; calculation: KCE, 2007)[f].

Figure 2. GPs density per arrondissement (per 10 000 inhabitants) in 2005

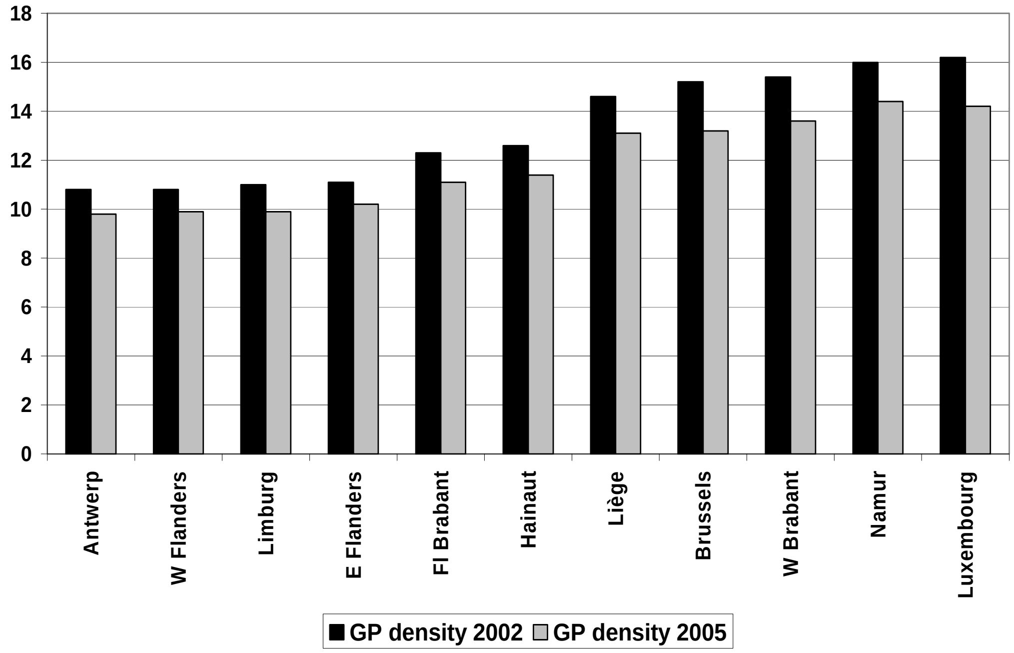


It is noticeable that, for each Belgian province, the density of practising GPs decreased over time (Figure 3). The decrease was more important in provinces having a high GP density in 2002, in Brussels (by 13.2%), Luxembourg (by 12.4%) and Liège (by 10.3%) than in other provinces (by 3.4% to 6.5%).

e Based on home address not on practice location (which is not available in the IMA dataset).

f The terms lowest, intermediate and highest are arbitrary defined on the basis of densities distribution.

Figure 3. Evolution in density of practising GPs by province between 2002 and 2005 (per 10 000 inhabitants)



Source: IMA, 2005; calculation: KCE, 2007

There are also important variations in activity levels by province. Limburg, West Flanders, East Flanders and Antwerp having the lowest densities of practising GPs in 2005, recorded the highest numbers of annual contacts per 10 000 inhabitants. Provinces like Luxembourg, Walloon Brabant, Brussels and Namur, which had the highest densities of practising GPs in 2005, did not register more contacts per inhabitant (Table 10).

Table 11. Density of practising GPs and number of contacts by province in 2005

Province	*GP density (per 10 000 inh)*	*Mean annual contact per inhabitant*	*Mean annual contact per GP*
Namur	14.4	4.63	3 218
Luxembourg	14.2	3.99	2 811
Walloon Brabant	13.6	3.67	2 692
Brussels	13.2	2.89	2 198
Liège	13.1	4.24	3 230
Hainaut	11.4	4.42	3 865
Flemish Brabant	11.1	4.29	3 867
East Flanders	10.2	4.57	4 459
West Flanders	9.9	4.72	4 750
Limburg	9.9	4.44	4 475
Antwerp	9.8	4.26	4 342

Source: IMA, 2005; calculation: KCE, 2007

Figure 4 displays how the activity level, as approximated by the average number of contacts per GP per year, varies across arrondissements. However, these are crude figures. A standardisation for GPs' and patients' characteristics (age and sex of GPs; age, sex and socioeconomic status of patients, from model 4 in chapter 3) was then applied. A Standardized Productivity Ratio is computed by arrondissements (Observed mean number of contacts per GP/Expected mean number of contacts per GP).

Figure 5 shows that, after standardisation, differences in GPs' productivity across arrondissements cannot be entirely explained by the differences in GPs' and patient's characteristics.

Figure 4. Average annual number of contacts per practising GP, by arrondissement (2005)

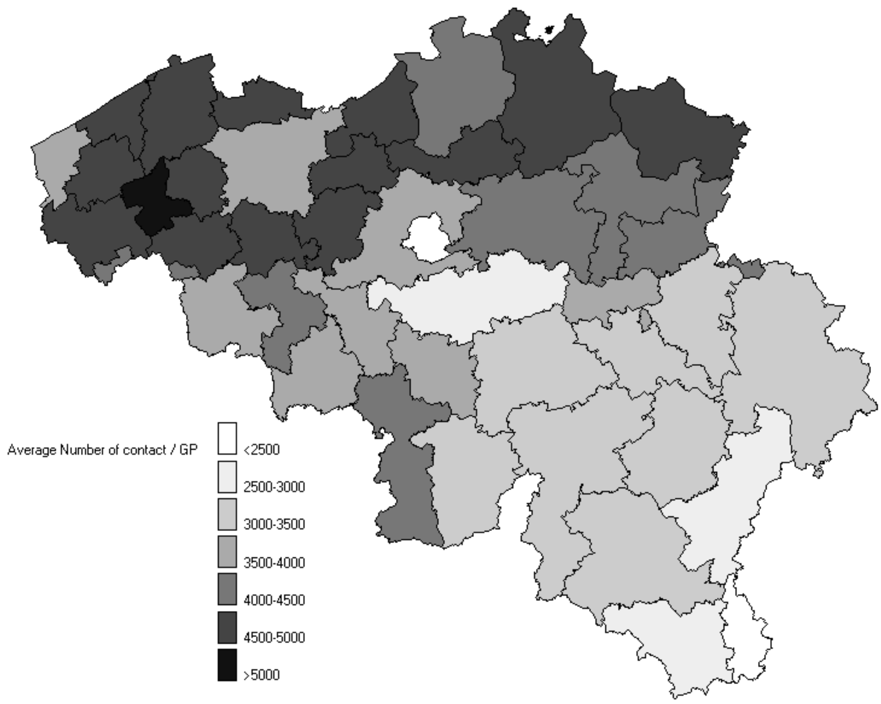
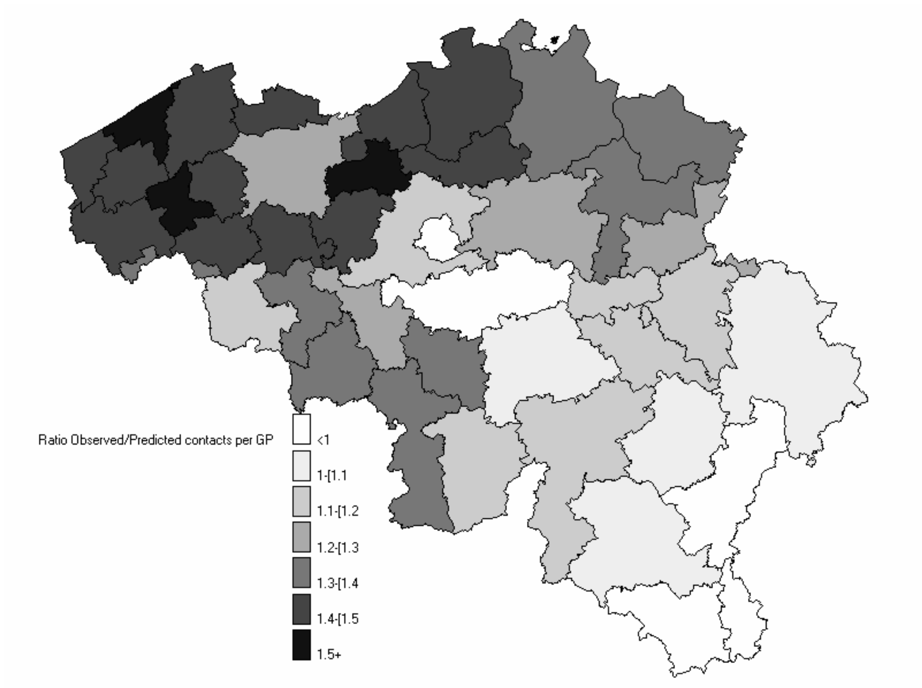


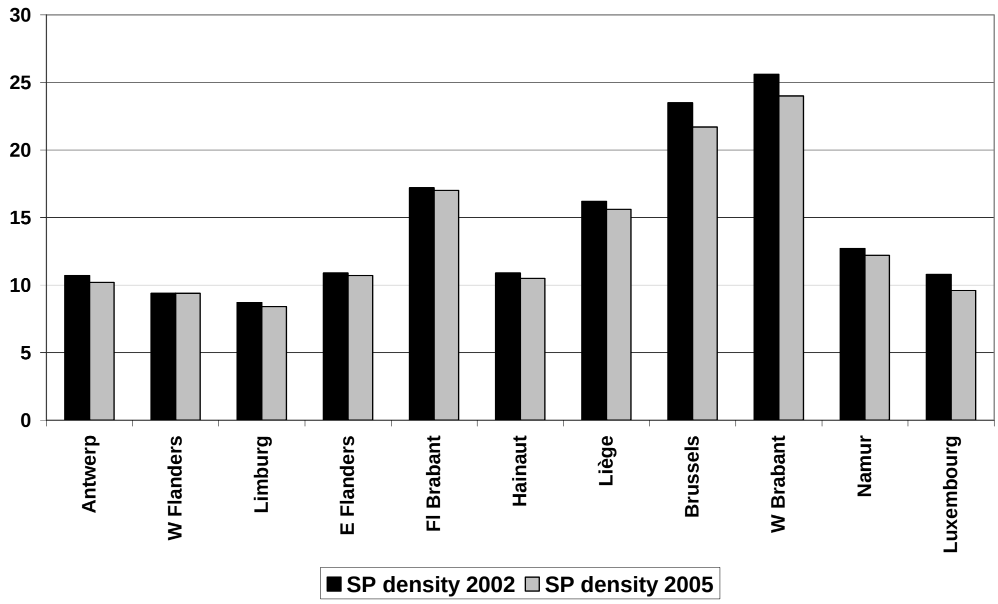
Figure 5. Standardized Productivity Ratio of practising GPs, by arrondissement (2005)



2.2.3.2 *SPs distribution*

Density of practising SPs also varies between provinces (Figure 6). In 2005, the lowest densities were observed in Limburg and West Flanders with respectively 8.4 and 9.4 SPs per 10 000 inhabitants whereas the highest densities were observed in Brussels and Walloon Brabant with respectively 21.7 and 24.0 SPs per 10 000 inhabitants. The relatively high density of SPs in Liège, Brussels, and in Flemish Brabant relates to the higher number of hospital beds in those provinces, while it is likely that an important proportion of SPs with residence in Walloon Brabant work in reality in neighbouring Brussels.

Figure 6. Evolution in density of practising SPs by province between 2002 and 2005 (per 10 000 inhabitants)

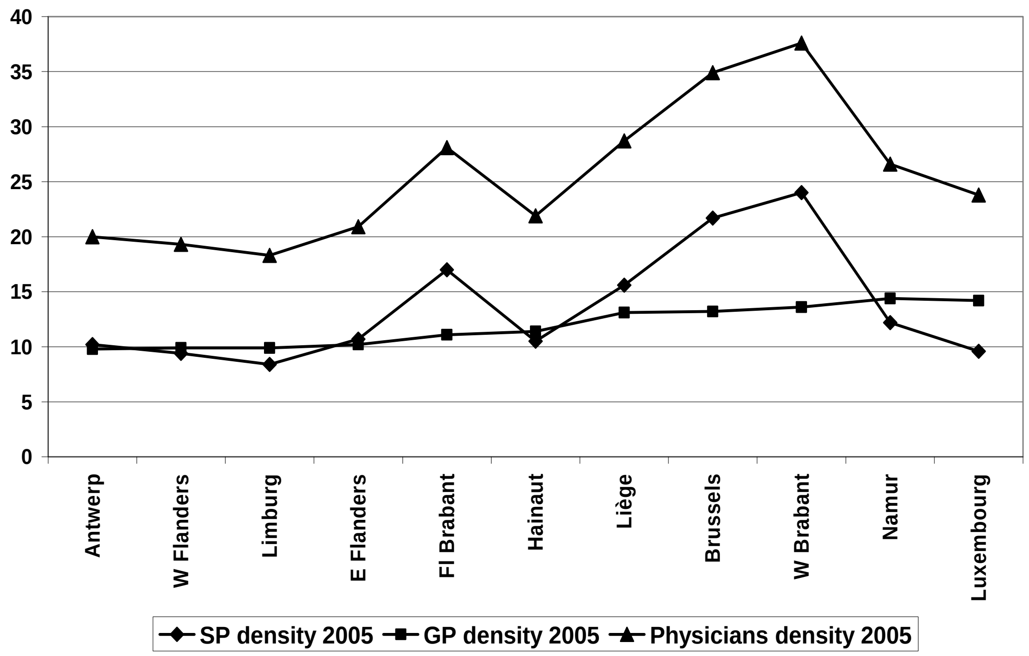


Source: IMA, 2005; calculation: KCE, 2007

The density of practising SPs also decreased over time, although not at the same pace as for GPs. The decrease was more important in provinces such as Liège, Brussels, Walloon Brabant, Namur and Luxembourg.

The density was lower for SPs than for GPs in 5 provinces, except Liège, Brussels, Flemish Brabant and Walloon Brabant (and to a lesser extent in Antwerp, West Flanders and Limburg) (Figure 7). The higher hospital density in these provinces could explain this observation.

Figure 7. Practising physicians density by province in 2005 (per 10 000 inhabitants)



Source: IMA, 2005; calculation: KCE: 2007

2.2.4 Demography

2.2.4.1 Sex ratio

PRACTISING GPS

Data from IMA (2005) indicate that the percentage of female GPs reached 27.7% in 2005 (3 226 women). This proportion differed according to age categories. Before 40 years old, female GPs were more numerous than male GPs. Proportions reversed after the age of 40 (Table 11).

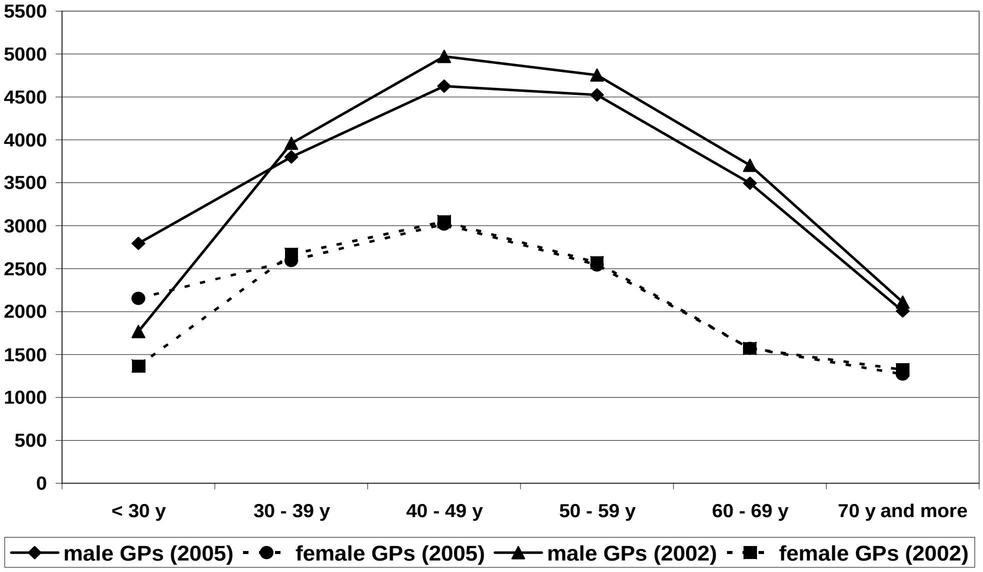
Table 12. Proportions of female GPs according to age in 2005

Age categories	*Number of GPs*	*% female GPs*
< 30 years	151	65.6
30 – 39 years	2 156	56.2
40 – 49 years	3 771	32.3
50 – 59 years	3 949	16.1
60 – 69 years	1 131	4.5
≥ 70 years	468	2.3

Source: IMA, 2005; calculation: KCE, 2007

The sex ratio impacts on volume of activity (Table 12). At the early ages of the career path, activity levels were somewhat similar for all GPs. From the age of 30 onwards, male GPs provided a higher mean number of contacts (more or less 2 times more contacts) than their female counterparts (Figure 8). The lower level of activity after the age of 40 might be due to early withdrawal but could also result from a "generational effect", younger female cohorts possibly having a different activity profile than their elders. For instance, like young male GPs, young female GPs in 2005 tend to have a higher activity level than their counterparts in 2002, as can be seen in Figure 8.

Figure 8. Mean contacts made by practising GPs according to age and sex (2002 and 2005)



Source: IMA, 2005; calculation: KCE, 2007

Table 13. Number of practising GPs by sex and by activity levels

Activity levels (contacts by year)	Practising GPs 2002				Practising GPs 2005			
	Women		Men		Women		Men	
	n	%	n	%	n	%	n	%
< 500	87	2.5	58	0.6	7	0.2	12	0.1
500 < 1 250	244	7.0	168	1.8	167	5.2	116	1.4
1 250 < 2 500	1 171	33.7	745	8.2	1 013	31.4	733	8.7
2 500 < 3 500	1 340	38.5	1 297	14.3	1 475	45.7	1 443	17.2
3 500 < 4500	534	15.3	1 754	19.4	497	15.4	2 181	25.9
> 4 500	101	3.0	5 032	55.7	67	2.1	3 915	46.6
Total	**3 477**	**100**	**9 054**	**100**	**3 226**	**100**	**8 400**	**100**

Source: IMA, 2005; calculation: KCE, 2007

PRACTISING SPS

In 2005, the percentage of female SPs reached 32.1%, i.e. 4 283 women. The ratio male / female SP was estimated 2.1.

The proportion of female SPs significantly varied between specialties as can be seen in Table 13. The sex ratio was close to 1 in dermatology, psychiatry, radiotherapy, ophthalmology and paediatrics whereas there are very few female SPs in orthopaedics, urology, neurosurgery and cardiology.

Table 14. Proportion of women by specialty among practising specialists£ (2005)

Specialties	*Number of female specialists*	*Proportion of female specialists (%)*
Anaesthesiology	183	30.7
Biology	25	47.2
Cardiology	115	16.4
Dermatology	386	64.1
ENT	171	33.5
Gastro-enterology	86	23.0
Gynaecology-obstetrics	432	37.6
Internal Medicine	417	26.4
Neurology	80	45.7
Neuropsychiatry	282	25.0
Neurosurgery	10	7.9
Nuclear Medicine	38	43.2
Ophthalmology	473	55.7
Orthopaedics	43	5.4
Paediatrics	559	53.2
Physiotherapy and revalidation	138	36.4
Plastic surgery	35	21.0
Pneumology	73	27.9
Psychiatry	336	57.9
Radiology	57	38.3
Radiotherapy	71	57.7
Rheumatology	71	35.7
Stomatology	46	20.0
Surgery	116	10.7
Urology	17	5.6

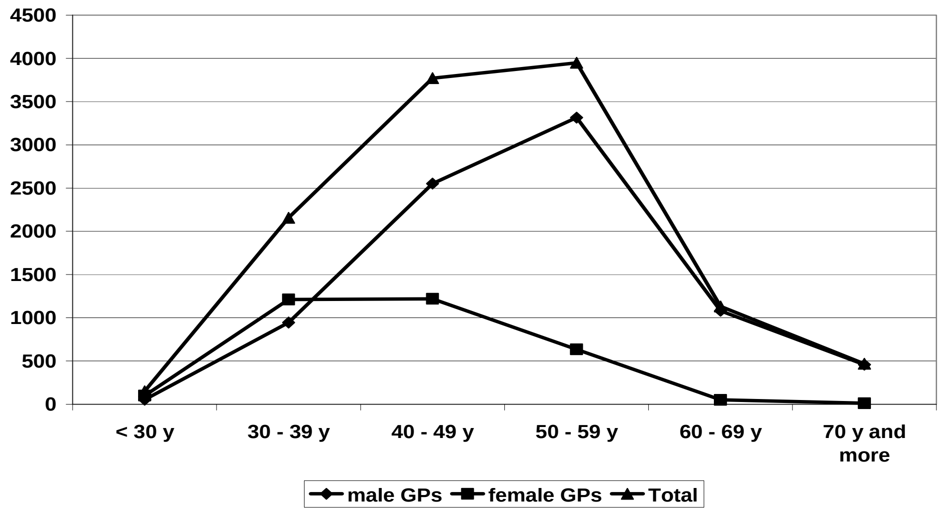
Source: IMA, 2005; calculation: KCE, 2007; £: definition KCE of practising SPs

2.2.4.2 *Age distribution*

PRACTISING GPS

The mean age of GPs in 2005 was 42 years for women and 51 years for men. The age structure of both female and male GPs is presented in Figure 9. The largest part of female GPs was in the 30-50 years range whereas the largest part of male GPs was in the 40-60 years range. The number of female GPs decreased significantly after the age of 50 while the decline was after the age of 60 for men. Among all practising female GPs, 1.9% were older than 60 years old whereas among all practising male GPs, 18.3% of male GPs were in the same age category. However, the feminization process is a quite recent phenomenon and current levels of activity are probably due to a cohort effect, i.e. not applicable to new students. It is possible that, in the future, women will adopt the same working behaviour as their male colleagues to face the activity increase.

Figure 9. Distribution of practising GPs by age categories and sex (2005)



Source: IMA, 2005; calculation: KCE, 2007

The part of GPs aged between 30 and 50 years reached 57.5% in 2002. This proportion lowered to 51% in 2005. In 3 years time, the proportion of GPs older than 50 years evolved from 36.8% to 47.7%, reflecting the ageing of the medical workforce.

Age impacts on activity levels, as can be seen in Figure 8. Obviously, the maximum of professional activities per individual can be found in the age range 40-49 years, for both men and women, in year 2002 as in 2005. The activity level decreased gradually from 50 years onwards. However, it is striking to note that, except in the beginning of the career, the activity level decreased for male GPs between 2002 and 2005. Activity levels of female GPs remained more stable over time. Professional demography evolves, but so do activity profiles by sex and age range.

PRACTISING SPS

In 2005, the mean age of SPs was 44.4 and 50.6 for female and male SPs, respectively (see more details in Table 14).

Table 15. Distribution of age (in years) for SPs, by sex (2005)

Percentiles	*Male SPs*	*Female SPs*
Percentile 25	43	37
Percentile 50	50	43
Percentile 75	58	51

Source: IMA, 2005; calculation: KCE, 2007

The share of SPs aged between 30 and 50 years reached 54.4% in 2005, i.e. 7 349 specialists (3 019 women and 4 330 men). The part of SPs older than 50 years reached 45.6% in 2005, i.e. 6 157 specialists (1 232 women and 4 925 men). However, in specialties like biology, radiology, rheumatology, stomatology and surgery, the share was beyond 50% (Table 15).

Table 16. Proportion of practising SPs£ older than 50 years (2005)

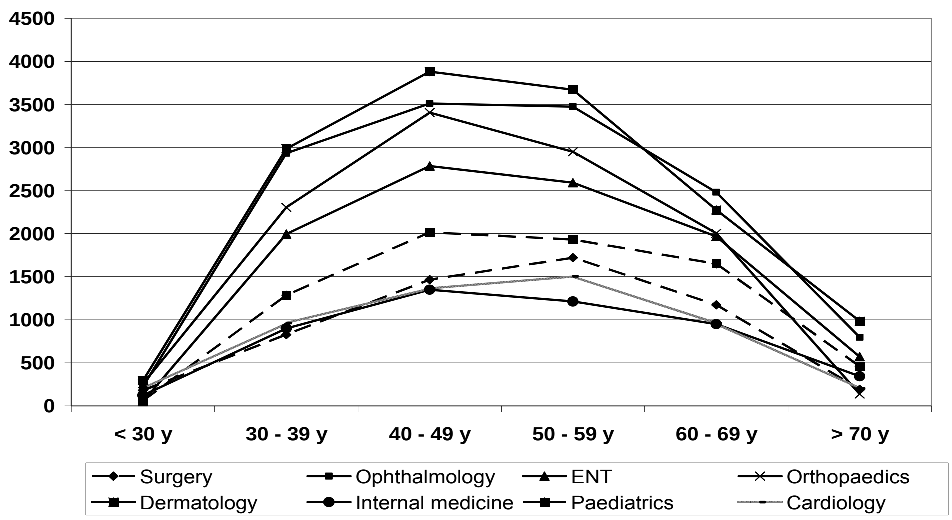
Specialties	***Number of SPs older than 50 years***	***Proportion of > 50 years old SPs (%)***
Anaesthesiology	194	32.5
Biology	34	64.2
Cardiology	286	40.7
Dermatology	254	42.2
ENT	214	42.0
Gastro-enterology	147	39.3
Gynaecology-obstetrics	529	46.0
Internal Medicine	741	46.9
Neurology	9	5.1
Neuropsychiatry*	910	80.5
Neurosurgery	51	40.5
Nuclear Medicine	9	10.2
Ophthalmology	392	46.2
Orthopaedics	332	41.9
Paediatrics	519	49.4
Physiotherapy and revalidation	156	41.2
Plastic surgery	61	36.5
Pneumology	102	38.9
Psychiatry	58	10.0
Radiology	105	70.5
Radiotherapy	32	26.0
Rheumatology	105	52.8
Stomatology	117	50.9
Surgery	544	50.2
Urology	147	36.3

* Newcomers in neuropsychiatry had recently to choose to be registered as neurologists or psychiatrists; consequently, only older specialists remained in neuropsychiatry

Source: IMA, 2005; calculation: KCE, 2007; £: definition KCE of practising SPs

For SPs, activity levels gradually increased with age to reach a ceiling in 40-49 years age range. From the age of 60 onwards, activity levels progressively declined (Figure 10).

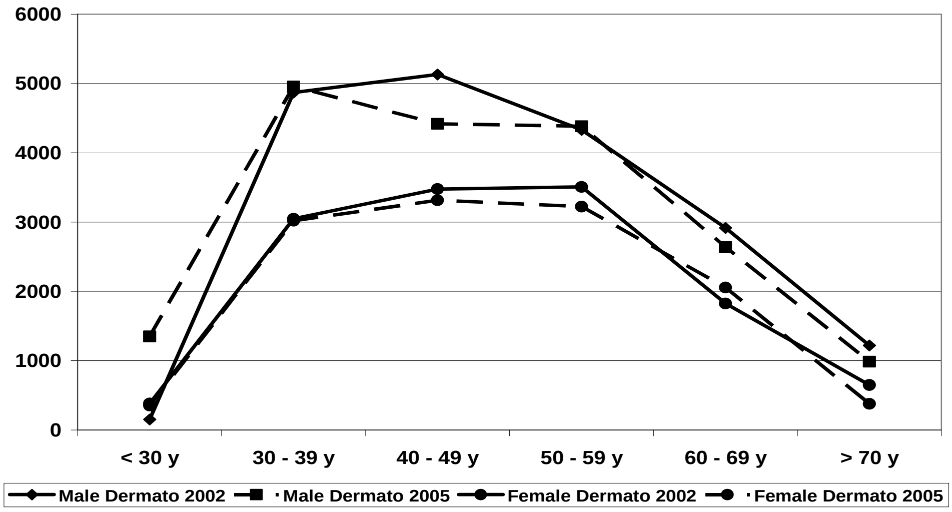
Figure 10. Mean number of ambulatory consultations by specialty and age groups (in 2005)



Source: IMA, 2005; calculation: KCE, 2007

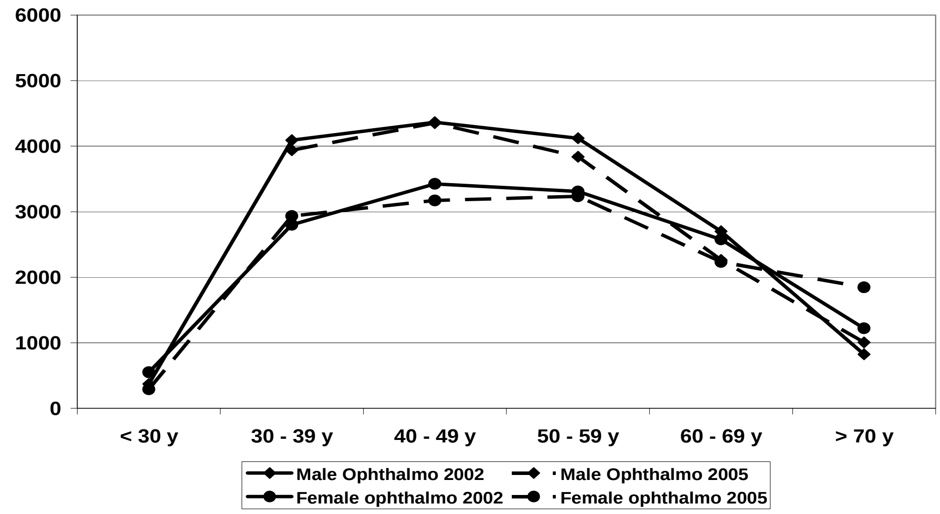
As seen in the above figures for GPs, activity levels of female SPs were lower than male SPs at each age. The maximum of professional activities per SP was reached in the age range 40-49 years, for both men and women, in year 2002 as in 2005. The activity level decreased gradually from 60 years onwards, i.e. ten years later than GPs. Unlike GPs, the activity level did not lower between 2002 and 2005 but remained stable. Figures were presented for 3 specialties in which proportions of female doctors are over 30% (Figure 11, Figure 12 and Figure 13).

Figure 11. Mean annual ambulatory consultations made by dermatologists according to age and sex (2002 and 2005)



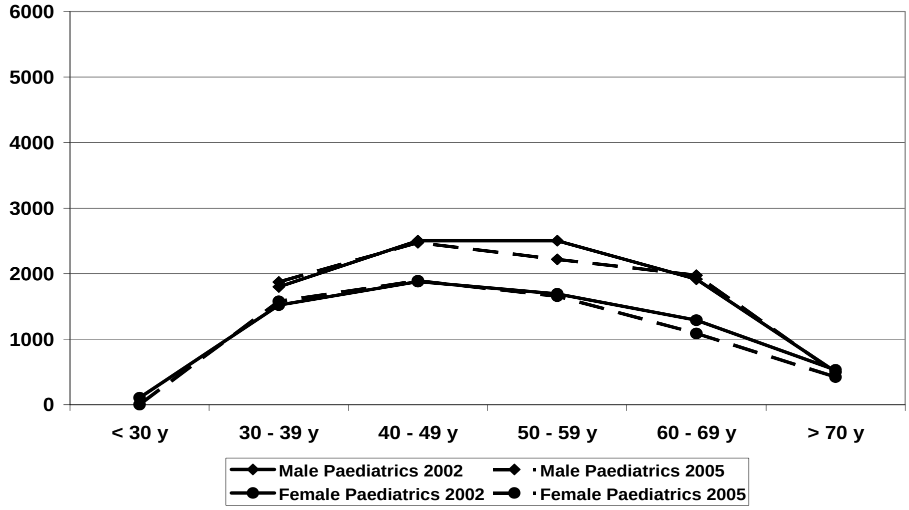
Source: IMA, 2005; calculation: KCE, 2007

Figure 12. Mean annual consultations made by ophthalmologists according to age and sex (2002 and 2005)



Source: IMA, 2005; calculation: KCE, 2007

Figure 13. Mean annual ambulatory consultations made by paediatricians according to age and sex (2002 and 2005)



Source: IMA, 2005; calculation: KCE, 2007

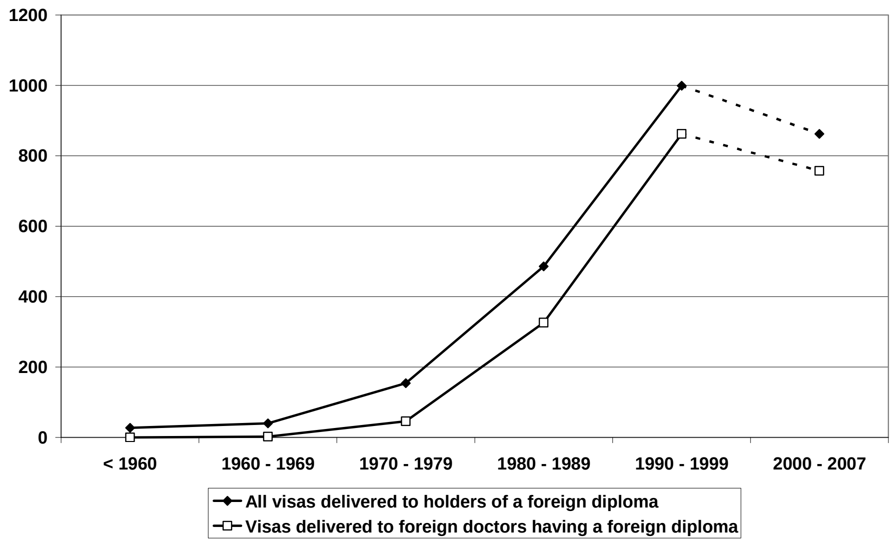
2.2.5 Migrations

European regulations allow foreign MDs to practise in Belgium. Data about immigrant doctors are given by the FPS Public Health, Primary Health Care & Crisis Management (DG2) - Federal register of health practitioners.

The total number of physicians, holding a foreign diploma of medicine, having received a visa either to practise or to follow a specialisation in Belgium (as GP or SP) until 2007 was 2 568. The inflow originates largely from the neighbouring countries (France, the Netherlands and Germany) and to a lesser extent from Spain and Italy. The larger part of this group consists of foreign people (some of them ask for the Belgian nationality in the same time) and a marginal part consists of native Belgian people who have studied medicine in another country.

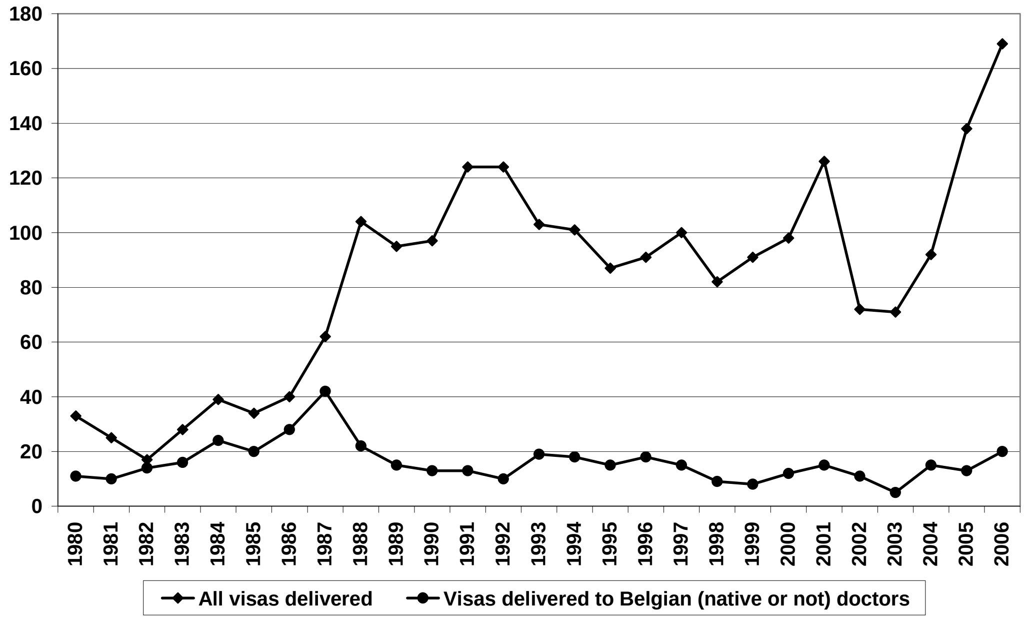
Analyzing visa delivered by decade underlines the rapid evolution of foreign doctors who ask for this Belgian visa and particularly since 1980 (Figure 14 and Figure 15).

Figure 14. Evolution of visas delivered in Belgium



Note. The last period only has 7 years unlike the other ones

Figure 15. Visas delivered in Belgium between 1980 and 2006 by year



Although migration is not a new phenomenon (in 1997, there were already 1 304 foreign doctors working in Belgium, with around 100 new incomers yearly), an increase is observed since 2004, with 138 and 169 new visas which were delivered in 2005 and 2006, respectively. This increase is certainly favoured by the application of the internal market for services (set out in the EC Treaty) guaranteeing to physicians to provide services anywhere in the EU as well as the mutual recognition of professional qualifications between Member States. The recent increase in migration in Belgium could also be partially explained by the demand for physicians in some specific sectors, such as hospitals.

Whatsoever, this international inflow makes any forecasting exercise of national medical supply quite difficult. It should also be noted that only crude data are available so far, and important parameters such as proportion of immigrants getting the practise licence for training reason (specialization) who will stay in Belgium, turnover rates or activity profiles, are poorly documented.

Among doctors asking for a visa in Belgium, foreigners requesting a visa before submitting a training plan (to obtain further qualifications in Belgium either as a general practitioner or as a specialist) are also increasing. In 2004, 38 training plans were introduced by foreign holders of medical diploma (7 in the Flemish Community and 31 in the French Community), i.e. 4.4% of all training plans submitted. This number increased to 41 in 2005 and to 78 in 2006 (40 in the Flemish Community and 38 in the French Community), i.e. 10.4% of all training plans submitted this year.[g]

There is also only limited information on emigration of Belgian MDs. Figures seem to be on the rise, but it is not even clear if the migrating MDs are Belgian or foreigners getting back to their native country. For instance, a growing emigration towards the Netherlands is recently observed but not really computed.[19] According to Van der Velden (2001), the foreigners' inflow to the Netherlands would concern 50 GPs and 40 SPs per year, mostly coming from Belgium.[20] Nevertheless, most of them are Dutch students who studied in Belgium and return to their own country to practise. The last years, some 180 physicians originating from France left Belgium.[19] We could hypothesize that most of them are native French students who return to their country after their whole training period.

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g Source: FPS Public Health. Note à la Commission de Planification – offre médicale. Nombres de plans de stage débutés en 2004, 2005 et 2006. Version du 24.07.07

2.2.6 Medical supply planning in Belgium

2.2.6.1 Medical training

Medical training is a seven-year university course, divided into two cycles: the first, lasting three years, covers basic scientific education (Bachelor's degree); the second cycle, lasting four years, is the Master's training and includes clinical studies and practical training in a hospital or a medical practice. After these seven years, students receive their physician's diploma. To be able to practise, a physician needs a licence granted by the Federal Ministry of Public Health. Further training is needed to obtain this licence. Students wishing to become specialists follow training from four to six years, depending on the specialty. Specialization is restricted to a limited number of candidates. To be eligible for specialization, students have to submit a training plan indicating the name of the supervisor with whom they want to specialize and the in-service department where they want to work, together with the agreement of the supervisor and the in-service department. The training plan has to be approved by the licensing commission for the specialty concerned. There are 30 recognized specialties. Those wishing to practise general medicine undergo two extra years of training and have also to submit a training plan.[8]

2.2.7 The numerus clausus

2.2.7.1 Numbers

Since 1996, the Practice of Medicine Act empowers the Federal Ministry of Public Health to limit the number of physicians that may apply for getting a licence to practise under the national health insurance system. On the advice of the Belgian Committee of Medical Supply Planning, a *numerus clausus* mechanism was proposed in 1997 (article 170 from Framework Law). Since 2004, quotas determined the number of new physicians allowed to submit a training plan and to further register with the National Institute for Sickness and Disability Insurance.

The federal government has computed the quotas in such way that the existing discrepancy in medical density between the North and the South of the country should gradually disappear. The restriction mechanism was applied immediately after the basic training and limited the number of trainees (GP or specialist) that can access the specialization (Table 16). The maximum number of medical graduates (already holding a diploma in medicine) accepted for further training leading to practising with licence was 700 for the year 2004, 650 for the year 2005 and 600 for the year 2006 (in comparison to approximately 1 200 licences in 1999). Furthermore, the inflow was to be shared between the Flemish Community (60%) and the French Community (40%), and between GP (43%) and specialist (57%) training.

Table 17. Number of physicians, by Community, having access, by year, to particular professional titles

Year	*Flemish Community*	*French Community*	*Belgium*
2004	420	280	700
2005	390	260	650
2006	360	240	600

Source: Royal Decree Augustus 29, 1997 (MB/BS 05.09.97)

Since 1997, a number of adaptations have occurred:

- Within the overall quotas fixed in 1997, it was scheduled to increase the proportion of GPs from 43% in 2004 to 50% in 2006 (Royal Decree November 7, 2000 applied on December 18, 2000) (see Table 17 and Table 18). However, this revision was cancelled in 2002 (Royal Decree May 30, 2002; MB/BS June 14, 2002).

Table 18. Number of physicians having access, by year to the title of "general practitioner", by Community

Year	Flemish Community	French Community	Belgium
2004	180	120	300
2005	180	120	300
2006	180	120	300

Source: Royal Decree November 7, 2000

Table 19. Number of physicians having access, by year to the title of "medical specialist", by Community

Year	Flemish Community	French Community	Belgium
2004	240	160	400
2005	210	140	350
2006	180	120	300

Source: Royal Decree November 7, 2000

- The overall quota was increased to 700 for the years 2004-2011 (420 for the Flemish Community and 280 for the French Community) (Royal Decree May 30, 2002; MB/BS June 14, 2002). It was revised again in 2006 and fixed at 833 (500 for the Flemish Community and 333 for the French Community) for the year 2012, and at 975 (585 for the Flemish Community and 390 for the French Community) for the year 2013 (Royal Decree of December 8, 2006).
- In 2002, minimum numbers of positions that should be fulfilled yearly in each specialization were defined in order to guarantee sufficient renewal of the stock (Royal Decree May 30, 2002; MB/BS June 14, 2002), and revised again in 2006 (Royal Decree of December 8, 2006)[h]. No minimum number was defined for GPs.
- Moreover, it was stated that candidates to some specific specialisations were not accounted in the overall quota ("out of quotas" and "immunized candidates") (Royal Decree May 30, 2002; MB/BS June 14, 2002). Those specialisations are:
  - Specialist in data management
  - Specialist in forensic medicine
  - Specialist in occupational medicine
  - Specialist in child psychiatry from 2004 to 2010 (20 applicants by year: 12 from the Flemish Community and 8 from the French Community)

Some modifications were introduced in 2006:

  - Child psychiatry: 20 applicants by year until 2012, i.e. 180 licences from 2004 to 2012 (108 for the Flemish Community and 72 for the French Community),
  - Research: 198 researcher doctors from 2004 to 2012 (119 for the Flemish Community and 79 for the French Community),
  - Acute medicine: 10 applicants per year from 2007 to 2012 (6 for the Flemish Community and 4 for the French Community),
  - Emergency medicine: 5 applicants per year from 2007 to 2012 (3 for the Flemish Community and 2 for the French Community).

- The Royal Decree of April 26, 2007 modifying the RD of May 30, 2002 (MB/BS May 16, 2007) stated that students holding a secondary level diploma from one country in the European Economic Area, which does

h This Decree also indicated modalities to replace one candidate by another (death, withdrawal).

not offer the complete course of medical studies, are not included in the quotas. This RD was specifically written up to address the inflow of students coming from Luxembourg. Having no complete training in medicine in their country, candidates come in Belgium to study and then return to their own country. Consequently, decision makers thought that it was not correct to include them in the quota.

2.2.7.2 *Selecting students*

The Federal Minister of Public Health fixes the number of practice licences available to trainees every year. However, the Community Ministers of Education bear the responsibility to adapt students' intake so as it fits the number of trainees who will be eventually allowed to further specialize as GPs or SPs. This regulation of students' intake was implemented differently in the 2 Communities. The Flemish Community introduced an entrance examination, while the French Community opted for a selection procedure after three years of study.

THE FLEMISH COMMUNITY

The Flemish Community has adopted an entrance examination (Decree of July 24, 1996; MB/BS September 19, 1996) which was organized for the first time in 1997[i]. Since Dutch is the official educational language, the entrance examination must completely be taken in Dutch. The knowledge of the Dutch language is actually a requisite for the admittance to the program (Ministerie van Onderwijs en Vorming, Agentschap Hoger Onderwijs en Volwassenenonderwijs, 2007). This exam allows only registering in a university in the Flemish Community.

The exam is organized on an inter-university basis by the Ministry and is commonly organised for medicine and dentistry. It is an exam and not a competition: everyone who passes the exam is eligible to register in university training, without any number restriction[j]. Each student can try to pass this exam more than once.

Globally, taking into account the 22 sessions organised since 1997, 19 283 candidates were registered of which 42.6% succeeded, i.e. 8 214 candidates.

The low success rate for this entrance exam does not seem to discourage candidates, who are more numerous year after year (Table 19).

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i This Decree was partially invalidated by the State Council for 1997 leading to an oversupply of qualified students in 2004. The first complete exam was really organised in 1998.

j The exam is split up into two parts:
"Knowledge and Insight in sciences" (Kennis en Inzicht Wetenschappen or KIW): testing actual knowledge of physics, biology, chemistry, and mathematics at the level of the third stage of general secondary education (Algemeen Secundair Onderwijs); 60 questions (15 for each part) are multiple choice items.
"Acquisition and Elaboration of Information" (Informatie Verwerven en Verwerken or IVV): comprehension tests (assessment of the ability to acquire and assimilate information through comprehension and restitution tests); this test is less theoretically based but seems rather like exercises based on data and graphics (without calculator). Moreover, a case study is presented to students and their ability to communicate and to search for the adequate information is evaluated. To pass the exam, at least a 10/20 score must be obtained for each part, and a minimum 22/40 score for the whole exam. Since 2004, negative points are attributed to false answers (-1/3 for questions having 4 propositions, -1/4 for questions having 5 propositions) to limit chance effect in selection. A commission composed of 10 to 15 members is under the presidency of the ambassador of Departement Onderwijs van de Vlaamse Gemeenschap. All members of this commission are teaching professors in universities.[21] The exam is organised twice a year, in July and in Augustus in Brussels; students have to pay 30 euros. For the year 2006, 25.2% of the 2 184 applicants succeeded in the July session; and 30.2% of the 1 529 candidates succeeded in the Augustus session. Thus, 1 012 applicants passed the exam with an overall success rate of 38.4%. Taking into account all exam sessions, 55.8% of male candidates succeeded to the exam in comparison with 50.7% of all female candidates.[21]

Table 20. Evolution of registered candidates and success rates between 1997 and 2007 in the Flemish Community

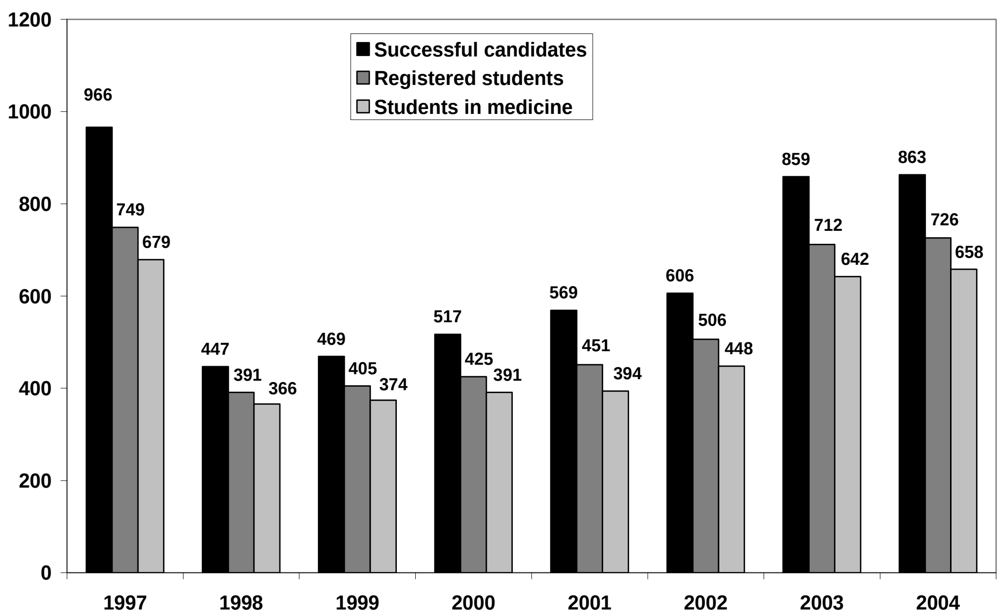
Year	Number of candidates registered to the entrance exam	Number of candidates who succeeded	%
1997	1 244	966	77.7
1998	914	447	48.9
1999	1 159	469	40.5
2000	1 352	517	38.2
2001	1 436	569	39.6
2002	1 499	606	40.4
2003	1 750	859	49.1
2004	1 963	863	44.0
2005	2 356	1 006	42.7
2006	2 636	1 012	38.4
2007*	2 974	900	30.3
Total	**19 283**	**8 214**	**42.6**

Source: [21]; *data published by Agentschap Hoger Onderwijs en Volwassenenonderwijs / Examencommissie toelatingsexamen arts en tandarts (Press communication September 4th 2007)

Students having succeeded receive an attestation and can register in any Flemish university. Nevertheless, that does not mean that all successful candidates will do so.

Figure 16 indicates that a mean of 82.4% of successful candidates will actually begin training in medicine or dentistry. Among them, 90% will opt for medicine; the remaining 10% choosing dentistry. The entrance exam seems to effectively act as a filter before the entrance at the university. After this difficult stage, the success rate during medical studies is quite high (over 80% since 1997 at the end of the first year).[21]

Figure 16. Evolution of the number of successful candidates and the number of all registered students (medicine and dentistry) from 1997 to 2004



Source: Yearly follow-up from Lievens and Buyse (UGent)[18]

The important number of successful candidates to the entrance exam associated to the high success rates could result in a number of trainees exceeding the quotas imposed by the national legislation. Student cohorts from 1997 to 2002 fit with the federal quotas of 420 Flemish physicians.

Nevertheless, since 2003, the number of students in cohorts exceeds the number of trainees who will get practice licence according to the quotas. In the academic year 2003/2004, 688 students were registered in the first year BA medicine (new students + students having to repeat their previous unsuccessful year) and 595 students were in the second year BA medicine. With success rates over 94%, the total number of students who could success their 7th year of medical training will be over the quota of 420.[21] For following years, the fit could be even more difficult to achieve as new students in 2006 are twice as numerous as in 2000.

Foreign students follow the same procedure as Belgian ones. Since 1997, 20.8% of all candidates come from the Netherlands, and 1.6% comes from other foreign countries. In 2007, 25.6% of all candidates came from the Netherlands. The success rates are somewhat different according to the origin of the students: 58.4% for Belgian candidates, 33.1% for Dutch candidates and only 21.8% for other foreign students.[21]

THE FRENCH COMMUNITY

The French Community adopted, in 1996 and 1997, a selection system at the end of the third year of training. The selection was based on the results of the first three years of university training (Decree of July 08, 1997). The selection tests were introduced for the first time in 1997-1998. In 2003, the Minister Françoise Dupuis suppressed the selection process by allowing all students to keep on training after the third university year (Decree of July 27, 2003). In 2006, the selection was re-initiated but, this time, at the end of the first year on the basis of exams results (Decree of June 26, 2005). Numbers of attestations giving access to 2nd year are spread between universities respecting historical sharing. The sharing will be reviewed every 5 years from 2010 onwards, according to numbers of first cycle students per university. Globally, 420 attestations were delivered in the French Community for the years 2005-2006: 110 (26.09%) for UCL (Université catholique de Louvain), 97 (23.06%) for ULB (Université Libre de Bruxelles), 96 (22.90%) for FUNDP

(Facultés Universitaires Notre-Dame de la Paix Namur), 90 (21.53%) for Ulg (Université de Liège) and, finally 27 (6.42%) for UMH (Université de Mons Hainaut). Although the quota was set at 333 for 2012, 420 students were admitted in the second year to compensate failures and withdrawals from the training and to allow immunized posts (overall 17 posts in data management, forensic medicine, occupational medicine, research…). Also, a limited number (5 per university) of students having a foreign valid first cycle diploma delivered by a foreign university, can access to the second cycle, i.e. outside the selection exam.

Students who are not admitted to the second year can use their training credits in other teaching orientations such as biomedical sciences, chemical sciences, pharmacy, bio-engineer, physiotherapy and rehabilitation. Nevertheless, unselected students can also make the choice of taking the exam another time, but they can not enjoy credits or reports of results. Students who did not pass the exam can take it again, but not more than once.

Students who begin medical training receive a copy of the Royal Decree May, 30 2002. Moreover, they are informed that only a limited number of students who will succeed their first year training can continue their medical training. The exam classifies students by results order[k]. The selection includes the most successful ones[l].

At the end of the seventh year, trainees are spread amongst the various specialisations (including GP). Attestations are delivered taking into account:

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k 80 points for academic results and 20 points for more global skills: students have to acquire ability to synthesize, compare and exchange information as well as to resolve complex situations which require interdisciplinary knowledge and ability.

l Students have to obtain a minimum score of 10/20 in each matter and a mean score of 60/100. Students are authorized to take 2 times the same exam (3 times for exams organized in January) in order to improve their score. Results of the last exam taken will be recorded. Credits are delivered in the same time and can further be used for any other training not submitted to restrictions by numerus clausus (not for dentistry for example).

- for 50%: academic results for all years in the second cycle;
- for 25%: results obtained in matters directly linked to the covered specialty;
- for 25%: evaluation of the student's abilities and motivations.

Between 2004 and 2006, the overall number of 7th year students was 8.7% higher than the fixed number of training positions for specialisation (including GP).[22] This excess will be more important from 2008 onwards due to the lack of regulation in 2003-2005.

2.2.7.3 *Fulfilling quotas*

After completion of the 7th study year, graduates receive an attestation allowing them to begin a specialisation. The total number of those attestations delivered by French and Flemish universities should not exceed the maximum number of attestations fixed for each Community and discipline by the Royal Decrees. However, although the overall quotas are respected nationwide, discrepancies can be observed between requirements as defined by legal quotas and actual fulfilled positions (Table 20). The quota of GPs was not fulfilled, with a difference of -25.5% in comparison to scheduled numbers. This difference was more important in the Flemish Community, and the recent trend observed indicates a worsening of this difference (86 training plans were submitted for the year 2006, whereas the maximum numbers were 180). An inverse trend is noticed in the French Community (120 training plans were submitted for the year 2006, i.e. maximum numbers were reached). As regards specialists, the overall difference is +19.5% and is more marked in the French Community.

Table 21. Differences between quotas and training plans by Community for GPs and SPs between 2004 and 2006

Number of training plans 2004-2006		Flemish Community	French Community	Belgium
GPs	Quotas	540	360	900
	Fulfilled	355	315	670
	Difference	-185 (-34.2%)	-45 (-12.5%)	-230 (-25.5%)
SPs	Quotas	720	480	1200
	Fulfilled	836	598	1434
	Difference	+116 (+16.1%)	+118 (+24.6%)	+234 (+19.5%)
Overall	Quotas	1260	840	2100
	Fulfilled	1191	913	2104
	Difference	-69 (-5.5%)	+73(+8.7%)	+4(+0.2%)

Source: FPS Public Health "Note à la Commission de Planification - Offre médicale: Number of training plans started in 2004-2006; 24/07/2007"

It is also noteworthy that some of the minimum numbers guaranteeing the renewal of the stock per speciality are not respected. In the Flemish Community, this is the case for psychiatry (64% of the minimum required), for geriatrics (16.7%), for clinical biology (62.5%), and in the French Community, for geriatrics (33.3%) and for clinical biology (88.9%).

2.2.7.4 *Management: actors and processes*

The practice of most health care professionals, including physicians, is regulated by the Practice of Health Care Professions Act (Royal Decree n°78, November 10, 1967).

In 1996, the Federal Government set up the Committee of Medical Supply Planning (CMSP). Number and identity of members are set by Royal Decree (RD July 31, 2004). Membership is for a 5 years period:

- 1 president
- 4 members proposed by the College of the Rectors of Universities from the Flemish Community
- 4 members proposed by the College of the Rectors of Universities from the French Community
- 6 members proposed by the Intermutualistic Agency (IMA/AMI)
- 4 general practitioners proposed by each of the representative professional organisations
- 4 medical specialists proposed by each of representative professional organisations
- 4 dentists proposed by each of representative professional organisations
- 4 physiotherapists proposed by each of representative professional organisations
- 4 nurses proposed by each of representative professional organisations
- 4 midwives proposed by each of representative professional organisations
- 4 professionals in logopaedics proposed by each of representative professional organisations
- 4 members proposed by the Ministry of Public Health
- 2 members proposed by the Ministry of Social Affairs
- 2 members proposed by the Flemish Community
- 2 members proposed by the French Community
- 2 members proposed by the German Community
- 1 member of Public Federal Service Public Health (as secretary)
- 2 members proposed by INAMI/RIZIV
- 4 members, experts in physiotherapy, proposed by the Ministry of Public Health
- 4 members, experts in nursing, proposed by the Ministry of Public Health
- 4 members, experts in midwifery, proposed by the Ministry of Public Health
- 4 members, especially experts in logopaedics, proposed by the Ministry of Public Health.

The original remit of this committee was to ascertain supply requirements as regards physicians and dentists and to take account of the evolving needs of medical care, the quality of care provision, and the demographic and sociological development of the professions concerned (Royal Decree published in MB/BS 30.04.1996). On the advice of this Committee, a *numerus clausus* mechanism was proposed in 1997 (article 170 from Framework Law). In 1997, the remit was extended to physiotherapists and, since 1999 it was enlarged to nurses, midwives and logopaedics. This committee is responsible for advising the Federal Ministry of Public Health on the annual number of trainees per community that are eligible for being granted a practise licence.

Every year, a report is issued on "the incidence of the quotas on the manpower" (this report is not mandatory). More recently (March 2006), a Central Data Management unit has been created in Directorate General 2 to act as a user interface between the FPS, Health professional planning unit and external users (M. Van Hoegaerden, 6 March 2006 Nota).

2.2.7.5 *Forecasting medical supply and requirement*

There have been a number of models to assess the future medical manpower, particularly since the implementation of the numerus clausus.[23,16,24,25] The overall methodology of these models is similar, i.e. they are "stock-and-flow" models. The projections are based on a base-year stock of physicians, and the size of this stock in the future is a function of future inflows and outflows. The models work either in "person equivalents", or in full time equivalents computed in hours or in relative amount of services in comparison to a reference category.

The supply forecasts are compared with the forecasts of future requirements for physicians, so as to determine the most appropriate quota of new medical graduates. However, the models differ by a number of aspects, such as the number and nature of the parameters included in the model[m], the data sources, the base-year, the medical population considered, the hypotheses retained for scenario making. As a result, outputs differ among models.[26]

Such discrepancies between models are common, and, in the absence of validity check, there is little scientific basis on which to claim that one projection is more credible than another (see chapter 4). Therefore, rather than comparing models, we focus on the model currently used by the "Unit for Planning of Health Professionals" (FPS Public Health), so as to assess its strengths and potential weaknesses. This model used to estimate the number of physicians who should be attributed a practice licence has been updated in 2007 and takes into account the following parameters:

1. Current stock		43 026 registered physicians < 74 y in 2004[n] 39 349 licensed GPs+SPs < 74 y in 2004
2. Annual Inflow	National	700[o] in 2004-2011 (+ 71 immunized[p]) 833 in 2012 (+ 71 immunized) 975 in 2013 (+ 71 immunized)
	International	78[q]
3. Demographics	Feminization	35% in 2004[r] 48% in 2024 59% in 2049
	Ageing	Ratio 25-49Y/50-74Y = 1.6 in 2004 = 0.9 in 2020 = 1.1 in 2040
4. Outflow	Mortality	mortality rate from population with a higher education degree, by 5 years range

m Parameters included in all models are: inflow of graduates; ageing of the medical professionals; retirement; level of activity; ageing of the Belgian population. Additional parameters inserted in some of the models are, for instance: immigration rate; retention rate; feminization of the medical profession; epidemiological or medical practice changes.

n Source: "Cadastre of Health Care Professions"

o In 2004-2006, 43 physicians per year received a practise licence, in addition of the official quota

p Specific specialisations not accounted in the overall quota

q Average of years 2000-2003

r Proportion of women in the overall inflow increases by 1 point % every 5 years

5. Productivity	Sex	30% reduction for female MDs[s]	
	Age	One GP produces[t]: 1FTE until age 54 0.9 FTE for age 55-59; 0.8 FTE for age 60-64; 0.6 FTE for age 65-69; 0.4 FTE for age 70-74; 0 FTE for age >74	One SP produces: 1FTE until age 54 0.95 FTE for age 55-59; 0.70 FTE for age 60-64; 0.23 FTE for age 65-69; 0.15 FTE for age 70-74; 0 FTE for age >74
	Work time reduction	1.5% reduction per five years	

Source: Model FPS Public Health, update January 2007

Such a model is useful to visualize likely trends in medical workforce supply, and to produce scenarios, particularly regarding the impact of various levels of inflow on the future workforce[u]. For instance, Table 21 and Table 22 present the evolution of the medical density in Belgium until the year 2050, respectively in head counts and in FTEs, on the basis of currently fixed quotas.

Table 22. Medical Density in head counts per 10 000 inhabitants through years 2045-2049

	Years	2004	05-09	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49
Registered doctors	**Belgium**	41.2	42.6	44.8	46.7	47.4	46.5	45.5	45.0	45.5	45.9
GP + SP	**Belgium**	37.7	39.1	41.1	43.0	43.7	43.0	42.2	41.9	42.4	42.8
GP + SP	**FL Com**	31.8	33.7	36.3	38.9	40.6	41.1	41.4	42.0	43.2	44.2
GP + SP	**FR Com**	46.4	47.0	48.1	48.9	48.1	45.7	43.3	41.7	41.3	40.9
GP	**FL Com**	12.5	13.2	14.2	15.4	16.1	16.0	15.9	16.3	17.0	17.7
GP	**FR Com**	16.8	17.2	17.8	18.4	18.0	16.8	15.5	15.4	15.6	15.8
SP	**FL Com**	19.3	20.6	22.1	23.5	24.5	25.1	25.6	25.7	26.2	26.5
SP	**FR Com**	29.6	29.8	30.3	30.5	30.1	28.9	27.7	26.4	25.6	25.1

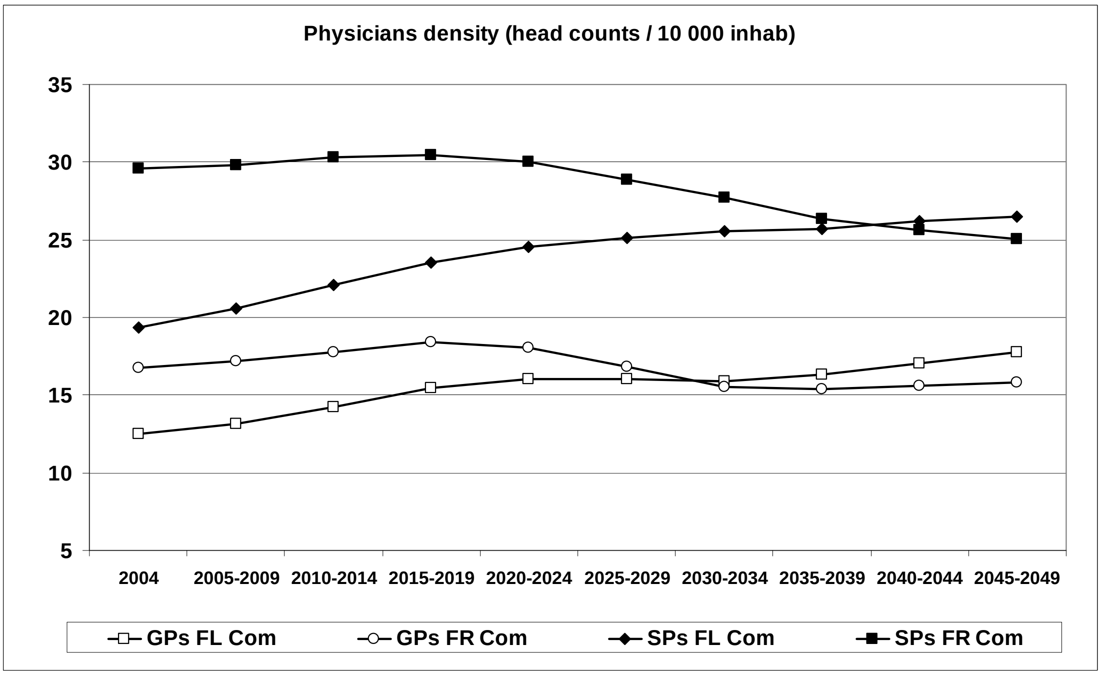
Source: Model FPS Public Health, update January 2007

s 35% for female GP; 25% for female SP

t The computation of productivity is based on actual activity volume from billing data (INAMI/RIZIV). The average number of medical services in each age category is divided by the average number of medical services from the more active age category. Although, activity levels of young physicians as registered by INAMI/RIZIV are low, 1 FTE is attributed to them.

u An alternative model of the "Unit for Planning of Health Professionals" allows additional scenarios by variation of the attrition rate of new graduates, and of the activity level of young professionals. Retention rate during the career is also accounted for (Deliège D, Artoisenet C, Modèles Médecins 2005; Groupe de travail interuniversitaire établi auprès du SPF, 2005, 23 p)

Figure 17. Medical Density in head counts per 10 000 inhabitants by professional title and community



Source: Model FPS Public Health, update January 2007

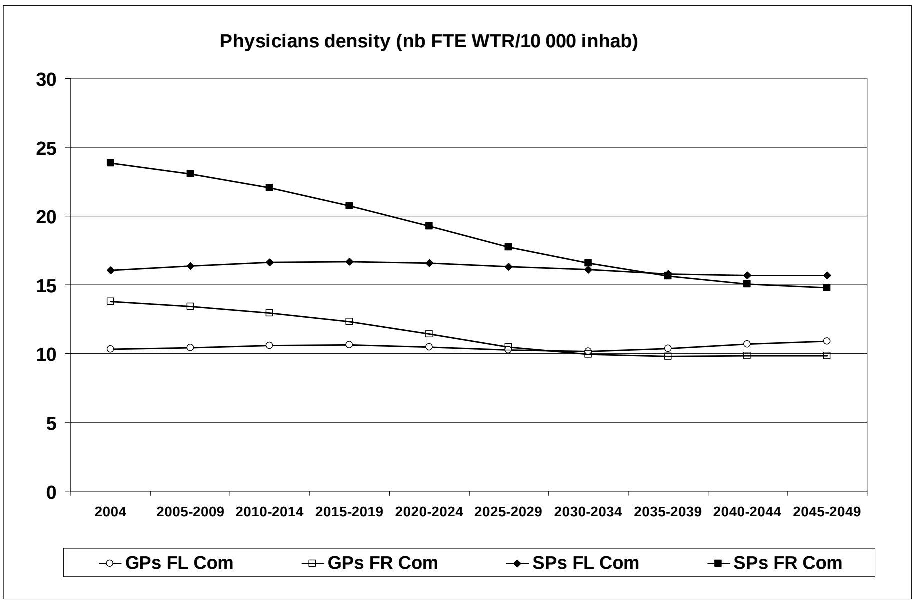
Table 23. Medical Density (FTE WRT[v] per 10 000 inhabitants) through years 2045-2049

		2004	05-09	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49
Registered Doctors	**Belgium**	33.2	32.8	32.2	31.0	29.6	28.3	27.6	27.2	27.1	27.0
GP + SP	**Belgium**	30.4	30.2	29.7	28.6	27.4	26.3	25.7	25.3	25.2	25.1
GP + SP	**FL Com**	26.0	26.4	26.6	26.4	26.0	25.7	25.6	25.7	25.8	26.0
GP + SP	**FR Com**	37.1	35.9	34.2	31.8	29.3	27.2	25.8	24.9	24.3	24.0
GP	**FL Com**	10.3	10.4	10.6	10.7	10.5	10.2	10.2	10.4	10.7	10.9
GP	**FR Com**	13.8	13.4	13.0	12.3	11.4	10.5	9.9	9.8	9.8	9.9
SP	**FL Com**	16.1	16.4	16.6	16.7	16.6	16.3	16.1	15.8	15.7	15.7
SP	**FR Com**	23.8	23.1	22.1	20.7	19.2	17.7	16.6	15.6	15.1	14.8

Source: Model FPS Public Health, update January 2007

[v] WTR: Work Time Reduction (-1.5% per 5 years)

Figure 18. Medical density in Full-Time Equivalent by professional title and Community



Source: Model FPS Public Health, update January 2007

Table 21, Table 22, Figure 17 and Figure 18 illustrate the expected evolution of the workforce in the coming years, given the current quotas, the current indicators of productivity by sex and age range, and the professional demographics: (1) the overall density of physicians (licensed GPs + SPs) will be balanced between the 2 Communities by 2030-34; (2) the overall density of physicians (licensed GPs + SPs) will still increase by 15.9% until year 2020, and then stabilize at the level of 43 per 10 000 inhabitants. However, given the profession ageing and feminization, and the secular working time reduction, it is expected that the overall medical density in FTE per 10 000 inhabitants will decrease by 9.9% by year 2025 and by 16.1% by year 2050. This decrease will be more important in the French Community (by 21% by year 2025).

While useful for making scenario's, the limitations of such model for making projections are acknowledged (for a complete overview of forecasting models, please see chapter 4).

1. It is a time series projection

In such a model, where the future is forecasted on the basis of past or current known events, any inaccuracy in input data will sum up through the years and result in potentially large imprecision of the estimates.

The likelihood of such inaccuracy in the above projections is not negligible:

a. Who counts as a physician needs to be carefully defined. Only a proportion of registered physicians are active, and an even smaller proportion is active in the curative sector (see paragraph 2.2). Besides registered physicians, the model presented above considers separately licensed GPs and SPs. For instance, 14 866 licensed GPs contribute to the stock at baseline in the model. However, only 11 626 are practising GPs (in 2005), as explained in paragraph 2.2. That makes a difference of 21.2% in GP headcount. To allow a clear picture of the actual workforce, the model should allow to distinguishing practising physicians from others.

b. The FTEs are computed in reference to the mean number of medical services in the more active age category. It is thus a relative coefficient. If the productivity decreases in all age ranges, the total FTEs will remain stable. Such changes may occur in a relatively short term. An example is the important decrease of home visits by GPs between

2002 and 2005 (leading to a global decrease of annual contacts). Hence, 1 FTE in 2002 does not translate anymore in the same level of productivity in 2005. Another approximation consists in attributing 1 FTE to all physicians under 55 years, although younger physicians have a lower level of activity (see Figure 8).

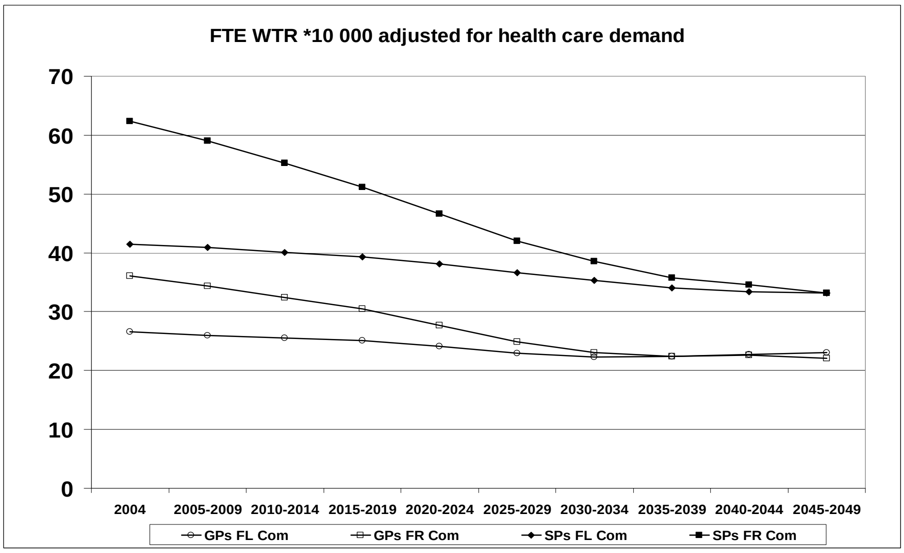
c. Some potentially important parameters are absent of the model. The attrition rate[w] of young professionals, for instance, is a factor likely to change over time and to influence the evolution of the workforce.[27,28] Changes in the skill-mix or revisions of the health care financing are other potential parameters.

d. Such inaccuracies or lacking data generate uncertainty. A last drawback of such model is that no confidence interval around the estimates can be computed. An alternative approach would be to perform a sensitivity analysis so as to detect factors that mostly contribute to the output variability and to characterizing the uncertainty associated with the model. For instance, in the forecasts proposed above, it can be shown that a difference of productivity between female and male MDs of 15%, instead of 30%, would result in a number of FTE in 2025 10% higher than the projections, while an inflow of foreign doctors twice as big as currently would result in a 1% increase of the total FTE.

2. It is a supply-based model

The current model essentially attempts to forecast requirements of physicians as a result of current trends observed in the workforce. Forecasts of demand for health care have been much less developed so far, so as a gap analysis is difficult to perform. In the model presented above, a normalized index of medical costs, based on 1997 data, is used to account for the effect of the population ageing on the demand for health care. The index is sex and age dependent. So it is possible to relate the total FTE to a weighted population (each individual has a different weight according to his/her age and sex) (Figure 19)[x].

Figure 19. Medical Density in FTE adjusted for health care demand, by Professional Title and Community



Source: Model FPS Public Health, update January 2007

w Attrition is accounted for in the alternative model of the "Unit for Planning of Health Professionals" (Deliège D, Artoisenet C, Modèles Médecins 2005; Groupe de travail interuniversitaire établi auprès du SPF, 2005, 23 p

x The alternative model considers trends in the rate of physician-patients contacts, according to population growth and ageing. Three scenarios of demand are considered: constant (same rate as population growth) ; increased (growth in line with GDP growth) ; average hypothesis (Deliège D, Artoisenet C, Modèles Médecins 2005; Groupe de travail interuniversitaire établi auprès du SPF, 2005, 23 p)

When taking into account the population ageing, and the resulting increase in health care expenditure, the decrease in FTE between 2004 and 2025 is obviously bigger (-13.6%).

However, to base the estimation of the demand for health care on such a synthetic index generates the same kind of difficulties pinpointed in point 1: lack of accuracy (the index agglomerates physician expenditure, technology and functioning costs; reference data are from 1997); potentially rapid evolution of the coefficient (change in health seeking behaviours or technology costs); missing parameters (technological innovations; emergent diseases; new disease management).

2.2.7.6 *Available data on medical workforce*

The existence of 4 datasets is noteworthy. The National Medical Council manages the first one. Medical trainees need to register to the National Medical Council (Order of Physicians) in the province where they will practise. Data from Provincial councils are collected in a national database. However, nationals of an EU Member State who are established as physicians in a Member State are entitled to provide medical services in Belgium without being registered on the list of the Order of Physicians in Belgium, although being subjected to the jurisdiction of the order for the activities led on Belgian territory.[8]

The second one is kept since 2003 by the Public Health Ministry (called "Cadastre of Health Care Professions"[y]). This register encompasses all holders of medical diploma, including foreigners, who need to obtain a visa on their diploma from the Public Health Ministry before getting a practice licence from INAMI/RIZIV. A specific objective of this register was the provision of information to the Committee of Medical Supply Planning.

It is noteworthy that these registers do not take into account the professional activity or inactivity of physicians in Belgium. Data about physicians who do not work as practising physicians or who emigrate are not updated in these registers.

A third base is built on reimbursement data. It is managed by the sickness funds[z]. In Belgium, the social insurance companies play an intermediary role in the National Sickness Insurance system. They reimburse patient fees in ambulatory care and intervene in the third-party payment system in hospital care. Consequently, they collect year by year medical bills for their members (all ambulatory care, hospital care and prescription drugs reimbursed in the social security scheme) and organise it in databases; to perform their duties, they also have at their disposal information about patients and medical practitioners (sex, age, geographical localisation, social status of the patient…). Each sickness fund manages its own database, but a national database can be created for ad hoc projects by the Intermutualistic Agency (AIM-IMA). This is done for instance for sending feedback on their clinical activity to practitioners, or can be done for specific research, as the current project. Social insurance companies send aggregated data (individual patients can not be identified for privacy reason) to the INAMI/RIZIV responsible for administrative follow-up.

The fourth one is managed by the CIPMP (University Centre for Medical and Paramedical Professions, UCL) and is updated through various information sources such as INAMI/RIZIV, the Public Health Ministry, Universities, Sickness funds, Provincial Commissions of The Order of Physicians, phone directories. This register lists all physicians entitled to practise on the Belgian territory.[29] This register is available on-line[aa].

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y https://portal.health.fgov.be/portal/page?_pageid=56,585303&_dad=portal&_schema=PORTAL

z Social insurance companies or mutualities

aa http://www.sesa.ucl.ac.be/cipmp/methodologie.htm

2.3 DISCUSSION

2.3.1 Medical supply

As regards medical supply in Belgium, our analysis brought up a number of issues.

First, the medical head counts available for health care are much lower than reported in international comparisons. There are much less active MDs than registered MDs, and among the active ones, only 4/5 to 2/3 is practising in the curative sector. Computations as ours are seldom available for other countries, but a similar shift is likely. Whatsoever, in the absence of such information, any international comparison is precluded and it is hard to know where Belgium stands in terms of physician density. It is also noteworthy that in a short time period (2002-2005), the practising physicians' density decreased significantly, particularly regarding GPs. This decrease is probably unrelated to the numerus clausus, as the first medical trainees submitted to quotas were graduated in 2004, but might result from an important professional attrition rate.[27,28] Although the causes, and thus the remedies, of such phenomenon are not well known so far, this aspect should be accounted for when forecasting medical supply.

Second, geographical variations in head counts (but also in productivity) are noticed. To counterbalance the geographical imbalances, an attraction policy has been recently implemented. Since 1st July 2006, a specific fund (Impulseo) is proposed to encourage general practitioners to settle down:

- in areas which have a low medical density, i.e. less than 9 GPs per 10 000 inhabitants **OR** in areas with less than 12 GPs for 10 000 inhabitants and less than 125 inhabitants / km²
- in areas qualified as "positive action areas" within the political framework for big cities (precariousness).

The Impulseo package includes:

- a premium of € 20 000
- € 15 000 for interest-free loan
- € 30 000 for additional loan

In 2007, 205 over the 589 official municipalities[bb] (35%) were recognized as target for Impulseo (Table 23). Given the recent launch, no evaluation is yet available.

Table 24. Proportion of municipalities for which the Impulseo package is proposed, by province (2006)

Province	Total number of municipalities	Proportion of municipalities for which the IMPULSEO package is delivered
Luxembourg	44	95.4%[cc]
Limburg	44	52.3%
Antwerp	70	37.1%
Namur	38	21.0%
West Flanders	64	18.7%
Flemish Brabant	65	18.7%
Walloon Brabant	27	14.8%
Liège	84	14.3%
East Flanders	65	9.2%
Hainaut	69	4.3%

Source: INAMI/RIZIV, 2007

bb One municipality is considered both as having a low medical supply and as a positive action area.

cc In the Province of Luxembourg where GP densities are among the highest, 95.4% of all municipalities were identified by INAMI/RIZIV as municipalities having an insufficient medical density. This Province has an area of 4 443 km², making it the largest Belgian province. At around a quarter of a million inhabitants, it is also the province with the smallest number of inhabitants making it the most sparsely populated region in a densely populated country.

A last noteworthy phenomenon is the increase of foreigners in medical specialization and practice. This is a likely consequence of EU internal market for services rules, and this phenomenon sped up in recent years. The situation generates questions concerning medical workforce supply planning. First, in 2006, 106 foreign MDs began a practice, contributing 12.1% of the inflow. For a consistent medical supply planning, those numbers need to be accounted for in the forecasts. However, little is known so far on the attrition rate of that category of MDs. Second, in such an open labour market, restricting numbers of national physicians can result in a paradoxical discrimination. Henceforth, medical supply planning should be replaced in a broader perspective where physicians, but also patients, can migrate and do it effectively.

2.3.2 Productivity

The productivity (i.e. the service output per provider) varies among providers and over time. We have shown that factors like sex, age, speciality and location of practice influence the activity level of the providers. That female and older practitioners tend on average, to produce less health services is noteworthy, as the medical profession in Belgium is ageing and undergoes a feminization. These two parameters are therefore important to forecast medical supply. However, it should be noted that productivity can evolve rapidly, as demonstrated by the sharp decrease in home visits by GPs between 2002 and 2005. Therefore, caution is needed when extrapolating observed cross sectional or 'point in time' differences to the future. A regular update of observed trends is advisable. Location of practice also influences productivity. Two explanations can be put forward. First, the health needs of the population, or its expectation in terms of health care utilization, may vary among regions. How this can be influenced by variations in medical density will be examined in chapter 3. Second, the parameter "location of practice" may capture characteristics of the wider health system. Indeed, the rate of service delivery by health professionals other than MDs or the structuring of the local health services may vary across regions and impact on productivity of MDs. Our research project was not set to capture such phenomenon. However, if they were further investigated and understood, also on a qualitative basis, invaluable lessons could be learned in relation to medical supply planning.

2.3.3 Medical supply planning

The Committee of Medical Supply Planning is responsible to guide medical workforce supply planning policy. Remarkably, it consists of a comprehensive panel of national stakeholders involved at various levels of medical supply (training, regulation, practice). However, although its legal mandate encompasses the provision of recommendations on all aspects of medical requirements, this committee has so far very much limited its role to advising on the number of trainees required annually. Therefore, the supply forecast appears disconnected from other policy initiatives shaping the medical workforce and practice. Such initiatives are the Impulseo fund (see above), quality check through feedbacks on the medical practice made by INAMI/RIZIV to practitioners, or the Passeport Diabète, which opens avenues for a new type of collaborative management of a chronic disease, involving different health professions. New legal regulations can also interact. For example since 2006, increased levels of medical and nursing staffing in hospital are necessary for paediatrics health care programmes to be agreed (Royal Decree 13/07/2006; MB/BS 16/08/2006). Other initiatives aim at influencing the demand for health care. Medical requirements can be affected as a result. Recent examples of such initiatives can consist in modifying the private out-of-pocket payment, for instance in case of home visit by GP rather than office consultation (see above) or when consulting a specialist or an emergency service without being referred by a GP. The Global Medical Record, which aims at coordinating the health information of one patient in the hands of one specific GP but also at developing a loyalty from the patient towards the referent GP, is another example[dd].

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dd The GMR contains patient medical and administrative data. Patients can choose which GP holds and manages their file. The GP charges a fee to his/her patient for the management of the GMR. This fee is reimbursed entirely by the patient's sickness fund. The patient with a GMR obtains a reduction of 30%

The computation of medical requirement per se has been essentially supply-based and relies on a time-series prediction. The uncertainties associated with the modeling process and with the outcome of the model itself are unknown. The forecasting could be improved by limiting measuring errors (i.e. input practising physicians and actual activity levels); updating regularly data collection (i.e. productivity by sex and age range); assessing and integrating important parameters (e.g. attrition and migration rate, speciality boundaries and skill-mix, technological advancements and epidemiology changes); evaluating the confidence in the model (see taxonomy of models and methods in chapter 4). The Ministry of Public Health intends to develop a more comprehensive model, which would be available on-line in order to allow policy-makers and researchers to make simulations. The Committee of Medical Supply Planning is also leading a reflection on options to assess supply requirements for the future.

Fortunately, lack of precision of the forecast can be compensated by a great flexibility of the system. The numerus clausus does not primarily limit the number of training positions, but the number of practising licences available to graduates.

This number can be revised every year, so as required numbers of physicians can be fulfilled immediately, provided that enough graduates are available, i.e. the number of graduates exceeds the quota previously fixed for that year. This has been the case so far. In 2011, 7 years after the implementation of the numerus clausus, there will be an excess of more or less 800 medical doctors (+/- 300 in the Flemish community and +/- 500 in the French community), comparing to quotas set for general practitioners and medical specialists. However, in the absence of adaptation of quotas, these medical doctors will have to opt for an “out-of-quota” speciality, to train as MDs in a foreign country, or to choose a professional activity not requiring an INAMI/RIZIV licence. The last modification of the Royal Decree 2002 introduces the opportunity for 468 applicants (281 in the Flemish community and 187 in the French community) during the period 2004-2012 to choose one of the following specialties financed by INAMI/RIZIV, but out of quotas: child psychiatry, acute medicine, emergency medicine, researchers involved in regulated specialties.

A last difficulty met in recent years is about fulfilling specific quotas. Although the global quotas were respected during the period 2004-2006 (+0.2%), 25.5% of the quotas were unfilled for GPs. The phenomenon is more important, and worsening, in the Flemish Community. The phenomenon is also noticed in other specialities. This emphasizes once again the importance of developing a comprehensive framework of medical supply planning. Defining quotas of professionals to fit the requirements can turn out to be a sterile exercise if professional boundaries and functions are not conceptualized, and strategies to attract and retain professionals not defined. It is also noteworthy that overall new specialists were beyond the quotas (+19.5%). This denotes again the flexibility of the current system. The excess numbers should be compensated by lower recruitments in the coming years, although the balancing mechanism is unclear.

Key messages

- **In 2005, there were 42 176 registered physicians in Belgium, for a global medical density of 41 per 10 000 inhabitants. Only a proportion of them are practising physicians, i.e. 53.3% of general practitioners (GPs) and 65.4% to 87.4% of specialists (SPs). The overall density of practising physicians is thus between 23.8 and 28.1 per 10 000 inhabitants. There are important variations of the medical density across the country, at the level of provinces and arrondissements.**
- **From 2002 to 2005, the number of practising GPs decreased by 7%, while the number of practising SPs remained stable. The decrease in GP density, observed in all provinces, might result from an important professional attrition.**

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on his/her out-of-pocket payments. This financial incentive was proposed to encourage patients to adhere to the principle of a unique GMR managed by one GP. In 2007, a maximum amount will be set for the costs which can be charged to the patient for copying his medical file.

- **Physician sex and age influence his/her productivity. As the medical profession is ageing (in 2005, the proportion of physicians older than 50 years was 47.7% and 46.2% of practising GPs and SPs, respectively) and feminizing (30.1% of the current medical workforce are women, while this proportion amounts to 59.5% in new graduates), this will have an impact on the overall manpower.**
- **The general environment of medical practice also impacts on productivity, such as practice location or change in the financing regulations. Productivity can evolve rapidly, as demonstrated by the sharp decrease in home visits by GPs between 2002 and 2005 without being compensated by an increase of other medical activities.**
- **Since 1997, a numerus clausus determines the number of new physicians allowed to work within the frame of the National Health Insurance. Quotas are revised every year under the auspices of the Belgian Committee of Medical Supply Planning, on the basis of projection scenarios and stakeholders consultation.**
- **The share of the global quotas is stratified by Community (60% for the Flemish Community, 40% for the French Community) and by professional title (43% for GPs, 57% for specialists). The restriction of student numbers in order to fit the quotas has been implemented differently in the Flemish Community (entrance exam) and in the French Community (selection after 1st year). Trainees are exceeding quotas in both Communities (+/- 300 in the Flemish Community and +/- 500 in the French Community foreseen for 2011).**
- **According to projections, current quotas (700 for years 2004-2011; 833 for year 2012; and 975 for year 2013) will allow to smooth progressively the difference in medical densities between the 2 Communities and to stabilize the overall workforce at the level currently encountered in the Flemish Community, used as a benchmark.**
- **The computation of medical requirements has been essentially supply-based and relies on a time-series projection. Important data for in-depth appraisal of the medical supply are not accounted. The uncertainties associated with the modelling process and with the outcome of the model itself are also unknown. In particular, how medical densities relate to health needs is blurred.**
- **Although the global quotas were respected during the period 2004-2006 (+0.2%), 25.5 % of the quotas were unfilled for GPs. The phenomenon is more important in the Flemish Community. It is also noteworthy that overall new specialists were beyond the quotas (+19.5%).**
- **The number of visas delivered to holders of a foreign diploma is increasing (169 in 2006). In 2006, 106 foreign MDs began a practice, contributing 12.1% of the inflow.**
- **There is no explicit general framework of the medical supply planning. The supply forecast appears disconnected from other policy initiatives shaping the medical workforce and practice and from other professional groups.**

3 WHY LIMITING NUMBERS?

3.1 INTRODUCTION

As shown in the previous chapters, the major concern of medical supply planning is to guarantee the availability of a sufficient health workforce to meet population health needs. Since population health needs can vary between geographical entities, medical supply planning should consider the geographical distribution of the health workforce. Oversupply and undersupply of physicians may end in unmet needs, lower quality, unnecessary services or increased costs.

The decision to introduce numerus clausus in Belgium was motivated by concerns about quality of care but most of all by an attempt to curb rising health costs. Regulating health services delivery by targeting the number of health care workers is based on the hypothesis that health care utilisation is associated with physician-to-population ratio. The underlying idea is that increased physician density lowers the income of the current stock of physicians, and may lead to increased delivery of health services per physician. This correlation between physician-to-population ratios and health care utilisation is often interpreted as evidence of inducement by physicians. Supplier induced demand (SID) is however a much debated issue in the health economics literature. Section 3.2 reviews the empirical literature on SID. In section 3.3 the relationship between physician density and health care utilisation in Belgium is analysed. Section 3.4 gives a summary and conclusion.

3.2 IMPACT OF PHYSICIANS DENSITY ON HEALTH CARE UTILISATION: A LITERATURE REVIEW

3.2.1 Introduction and Objectives

The 'Roemer Law' or 'Roemer effect' refers to the origins of the theory about the supplier induced demand. Shain and Roemer in 1959 and Roemer in 1961 found a positive correlation between the number of short-term general hospital beds per 1 000 populations and the number of hospital days per 1 000 populations. This correlation was interpreted as "a bed built is a bed filled". Applied to other medical services, Roemer's Law became the well-known 'supplier induced demand' (SID)[ee]. There are a number of concepts underlying SID.[30] However SID generally refers to the phenomenon of physicians deviating from their agency responsibilities to provide care for their self-interests rather than their patients' interest. McGuire adopts the following definition: 'Physician-induced demand exists when the physician influences a patient's demand for care against the physician's interpretation of the best interest of the patient' (page 504).[31] Whatever the reasons underlying SID, this will always lead to increased consumption of health care in a fee-for-service system. This aspect is of course of crucial importance for politics, as regards cost containment and effective allocation of resources, and has been one of the arguments for restricting the number of health care providers in many countries.

Many authors consider SID inevitable because of the inherent asymmetry of information between health providers and patients. However the concept of SID and the importance of the phenomenon are still much debated. For instance, Evans thinks that we have to allow shifts in the demand curve in response to supplier behaviour and that market clearing may take place directly through the information which suppliers pass to consumers as well as by adjustments in price.[32] There are also various ways of measuring SID, from ecological studies based on aggregated data to regression modeling based on extensive individual data.

[ee] To refer to SID, a lot of other expressions are used in the literature. An exhaustive list of these 'synonyms' has been used in our 'literature search strategy'; we found expressions like physician-created demand, physician-initiated demand or demand creation; each of them relates to a specific connotation.

This chapter aimed at reviewing evidence on the relation between the physician density and health care utilization. Although a relation is also plausible with prices of health services,[33] we overlooked that dimension in the present research frame because within the Belgian health care system prices are fixed (for general practitioners). A secondary objective of the literature review was to assess the relative magnitude of SID as compared to other determinants such as physician characteristics (sex, age) or patient characteristics (health, socioeconomic status).

3.2.2 Methods

A systematic literature review was performed. The applied search strategy is explained in Appendix B1.

The **inclusion** criteria were:

1. Original studies (i.e. no opinion or methodological papers) based on individual empirical data (consultations and visits of physicians), published between 1980 and today.
2. Studies based on individual data (because of the potential bias linked to aggregated data).
3. Studies addressing SID by physicians in ambulatory or hospital sectors (dentists and physiotherapists are not concerned).
4. Studies adjusting their analysis for the effect of at least one of the most common confounders: age, socioeconomic status and morbidity of the population or physician characteristics.
5. Studies using the medical care use (as number of acts or income of the practitioners) as dependent variable and the physician density as independent (exposure) variable.

The **exclusion** criteria were:

1. Studies with main focus on patient satisfaction.
2. Studies with main focus on effect of SID on fees (interpretation of SID as the ability of physicians to increase the charge when the competition increases).
3. Studies with main focus on the change of fees, co-payments (in the context of the present study, the key variables are the physician density, the reasons and the ways to limit it in Belgium) or personal financial interests of the practitioners (change in income taxation, importance of the revenue of the spouse, earning of hospital parts) on SID.
4. Studies based on aggregated data (empirical studies based on aggregated data have been criticized because of the lack of control variables like patients' health status or physicians' characteristics).

All selection criteria are presented in Table 24.

Table 25. Selection criteria in literature review

Selection criteria	***Inclusion criteria***	***Exclusion criteria***
Data	In a first step : individual data with personal characteristics of patients like age, sex, social status, health status In a second step (after complete reading): supplier induced demand based on the physician density as explanatory (independent) variable	Aggregated data without any control variables
Design	Empirical analysis	Purely theoretical analysis like game theory models
Focus	General practitioners and medical specialists in ambulatory and hospital sectors	Other types of practitioners (nurses, dentists, psychiatrists, …)

Our search yielded **145** peer-reviewed references, and **2** working papers. After a first reading of the abstracts, **89** were rejected because not fulfilling the first inclusion criteria and **6** were not available.[34,35] Therefore, **50** papers were retrieved.

After a first check, the rejection was due to the following reasons: insufficient data (3); papers about psychiatry (2); papers about medical planning (2); papers based on aggregated data (10); papers concerning effects of changes in co-payments (1); comments, opinion, editorials (12); papers concerning dental care (5); general considerations (22); no international languages (2); papers about physiotherapists (1); papers about long term care (2); papers about SID based on prices (3); paper about SID based on quality (1); pure theoretical papers (13); out of scope (1); not about health care (1); about drugs (1); about demander induced supply (1); general approaches in books (7) and unavailable references (6)[ff].

The **50** references focusing on SID and satisfying the first inclusion criteria were read thoroughly. Finally, **24** papers (22 peer-reviewed and 2 working papers) fulfilled the inclusion criteria. The methodological assessment of papers was based on a number of key questions that focus on those aspects having a significant influence on the validity of results reported and conclusions drawn. These key questions are summarized in Table 25.

ff Papers of the Taiwan Journal of Public health and thesis

Table 26. Key questions for the critical appraisal

1	Research question	• Well explained
2	Study design	• Appropriate to address the research question • Cross sectional or longitudinal • Representativeness of the sample
3	Data quality	• Source of data mentioned • Quality check reported
4	Analysis	• Methods clearly explained (management of outliers; modeling process) • Appropriate statistics: cluster or multilevel accounted for; confidence intervals reported • Validity of models: endogeneity tested in case of aggregated data; normality, heteroscedasticity and collinearity tested in case of regression modeling
5	Discussion	• Internal validity • External validity • Conclusions supported by findings

Results of the literature review about SID are presented in Table 26.

Table 27. Global results of the systematic review about SID

	n
1. Country:	
USA	9
(includes 1 about Florida and 1 about Michigan)	
Norway	6
Australia	2
France	2
Ireland	2
Belgium*	1
Switzerland	1
Germany*	1
2. Type of physicians	
General practitioners	12
GPs & SPs (distinguished)	3
Specialists	2
Physicians (ambulatory without other distinction)	4
Surgeons	2
GPs & SPs (not distinguished)	1

3. Dependent variable[gg]:	
Nb consultations per patient	7
Nb medical services per physician	8
% of patients with return visits	3
Physician initiated visits	5
Income per GP or per patient visited	7
Rate or likelihood of surgery	2
Intensity of care	4
4. Endogeneity of physician density tested where appropriate	14
5. Multilevel analysis applied where appropriate	1
6. Studies rated high on quality scale	3
7. Results considered as support of SID hypothesis	15

*Working papers [36, 37]

The critical appraisal was performed by 2 independent researchers. Results are presented in Appendix B3.

3.2.3 Results

All studies but one[38], were cross-sectional and all studies concerned fee-for-service payment systems. However, data collection, physician selection, dependent and independent variables, and statistical modeling varied substantially among studies (see Appendix B2). Most of the studies used billing data to measure health care consumption. However, a specific survey was organized in 4 studies[hh]: Australia[39], Ireland[40,41], Norway[42] and USA.[43,44,45] All these surveys were based on questioning patients, except one in which doctors themselves were surveyed.[39] The aim of these surveys was to know who initiated the visit.

Health care utilization was expressed mainly through 3 dimensions: physician volume of care, i.e. the number of contacts or services per physician (n=15); individual intensity of care, i.e. indicators of services utilization at the patient level, such as the annual number of visits or medical procedures, or the probability of getting a follow-up visit (n=12); population intensity of care, i.e. the proportion of the population undergoing specified medical procedures (n=5). The relationship between medical density and the dependent variable was also expressed in different units, i.e. mainly elasticities (n=16) or regression slope (n=12). In 4 studies, results were expressed as probabilities or Odds ratio of a follow-up visit.[39,41,40,42] The interpretation of results is easier when the variables are expressed in the logarithmic form[ii], while for regression slope coefficients, more calculation is needed to know if the slope is high enough to represent an inducement attitude (see section 3.3.3.1).

As regards physician volume, elasticities went from a low -1.00[46] to -0.06 for overall contacts per physician. Elasticities concerning surgery, laboratory tests and expenditures were all positive (from +0.14 to +0.52[45, 47,48]). Regression coefficients concerned various types of measures (total number of contacts, number of return visits, physician income). They are thus difficult to synthesize.

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gg Some studies analysed more than one dependent variable

hh Reported in 7 papers. A same survey can be reported more than once according to differences in analysis.

ii In this case, the regression coefficients represent the elasticity of the dependent variable with respect to the corresponding independent variable. An elasticity of -1.00 is interpreted as a decrease in health care consumption totally proportional to the increase in density.

It is however noteworthy that regression coefficients are either close to 0 (no decrease of physician volume when the medical density increases) or even positive, except in Norway (coefficient = -10.9, p-value<0.05)[49] and in a French paper (coefficient: -0.19, p-value<0.05).[50]

As regards intensity of care at the patient level, 10 over 12 studies reported a significant increase in relation to medical density. For instance, in an Irish study, the probability of getting a return visit was 0.91 in the area characterized by the highest medical density, whereas it was 0.08 in the lowest density areas.[41] The 4 studies looking at the consumption of health care at the population level also consistently showed an increase in relation to physician density.

Studies specifically addressing the question of physician-initiated visits all reported a significant positive association with medical density, except one study in Norway.[42] Scott et al. investigated if, for 4 simple health conditions, follow-up visits initiated by the physician varied according to medical density.[39] They reported only a significant association with medical density for one of the studied conditions, i.e. otitis media.

Overall, there was no increase in health care consumption related to medical density in 3 papers. The study by Sorensen et al. demonstrated an elasticity of -1.00 for physician volume.[46] The 2 other papers did not report an increase of care intensity related to medical density.[42,51] Most of the time, confidence intervals around the point estimate were not reported, which made it difficult to appraise the actual size of the phenomenon. When significant, the magnitude of the relationship varied greatly among studies, but also according to the outcome considered. For instance, in Norway, although a common data collection, 2 of the studies reported evidence of no or moderate SID,[52,46] while the third one showed an increase in utilization of laboratory tests and long consultations.[jj] [48] The geographical level of investigation might also be important to assess the existence of SID. In a study by Béjean for instance, the correlation was significant at the county level for the number of procedures per patient per GP, but not at the district level for the number of procedures per GP, implying that the interaction of the geographical unit considered with the unit of volume might be a determinant factor.[50] Another determining factor could be the medical specialty. As illustrated by Delattre: the size of the association was higher for specialists than for GPs when considering the number of patients or the number of contacts per physician, or the intensity of care per patient.[38] Similar findings were found by Stano et al.[53] A synthetic presentation of the results in function of the dependent variable and the signification of the regression coefficient is reported in Table 27.

jj Long consultations are better reimbursed in Norway.

Table 28. Summary of results in function of the dependent variable and the signification of the regression coefficient

Form of the presented results	*Physician volume (other outcomes than number of consultations are specified)*	*Intensity of care (visits per patient)*	*Population volume*
Elasticity	BEL (1): -0.305 [37] FR (1): -0.201 to -0.063 [38] NOR (2): -1.00 to -0.729 [52, 46] NOR (1): +0.14 (NS) (laboratory tests) and +0.20 (NS) (long consultations) [48] USA (2): +0.14 (expenditures) (PI) [45] and +0.17 (NS) to +0.52 (surgeons) [47] From -1.00 to +0.52	USA (1): +0.112 (PI) [45] USA (2): -0.19 to +0.319 (surgery) [53, 47] GER (1): +0.172 [36] FR (1): +0.088 to +0.239[38] From +0.112 to +0.56	AUS (1): +0.468[54] USA (1): +0.269[53] USA (1): +0.342 (caesareans) [55] USA (1): +0.06 (NS) to +0.56 (surgery) [47] From +0.269 to +0.56
Slope	IRL (1): +13.29 (PI) [40] NOR (1): -10.9 [49] USA (2): -0.00006 to +0.001 (PI [43]) [43, 56] USA (1): +0.1 (expenditures) (PI) [44] CHE (1): +35.6 to 375.2 for psychotherapists (cost per visit) [57] FR (1): -0.1866 [50] From -10.9 to +13.3	FR (1): +0.0081[50] NOR (1): +32.2 to +59.2 (income per person) [58] USA (1): -0.27 (NS) [51] CHE (1): +0.258[57] From + 0.0081 to +0.258	USA (1): +13.01 (elective surgery) [33]
Probability		IRL (1): From +0.08 to +0.91 (PI) [41]	
Odds ratio	AUS (1): From 0.991 to 1.014 (PI) [39]	IRL (1): 1.04 (PI) [40] NOR (1): 0.996 (NS) to 1.001 (NS)[kk] (PI) [42]	

* PI means Physician Initiated visit – COUNTRY (number of similar papers for this country) – we mention, if necessary, the range of results for each category of papers – NS : Non significant

A comprehensive table of results in Appendix B2 presents the covariates inserted in the models. Here again, the level of adjustment varied substantially across the studies. However, it is noteworthy that parameters other than medical density play a significant role on health care consumption. For instance, elasticities were also significant for parameters such as patient age, patient sex, patient health status, patient insurance coverage,[45] group practice,[48] population age,[46,48,53] population income,[53] percentage of population living in urban areas,[53] population education.[53] Also in the Australian study was the odds ratio of a return visit greater than

unity for all conditions considered when a diagnostic test had been ordered during the index visit.

The ordering of a test could be considered a proxy of disease severity or interpreted as a strategy to increase the number of return visits.[39] All other studies also reported results on covariates but in linear terms. This made a comparison with the effect of medical density impossible (see table in Appendix B2).

Details of all studies considered and their results are presented in Appendixes B4 to B6. The discussion of the literature review is integrated in section 3.4 to enable a comparison of these findings with the results from the empirical analysis of SID in the Belgian health care sector.

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kk The results are own computations to facilitate the comparisons. The OR are not significantly different from 1 (i.e. no association between density and physician initiated visits per patient).

3.3 PHYSICIANS DENSITY AND HEALTH CARE UTILISATION IN THE BELGIAN HEALTH CARE SECTOR

3.3.1 Introduction

Although decreasing, the physician-to-population ratio in Belgium remains high with large interregional differences (see section 2.2.3). In addition, just as in France [38], several other characteristics of the Belgian health care market could favour physician inducement. In short, Belgian physicians are dominantly paid fee-for-service, patients are fully insured by the compulsory health insurance (except for co-payments) and prices are fixed for GPs. In a fixed fee-for-service system, individual physicians can only offset a decrease in income due to an increase in the supply of physicians by generating more patient contacts or by attracting more patients.

In this section we examine the existence of SID in Belgium, operating in the form of a positive correlation between physician density and health care utilisation. However, this correlation should be interpreted carefully since it could either reflect an inducement or an availability effect due to lower opportunity costs in terms of waiting and travelling costs. Moreover, a potential problem with the physician density variable is that it may be endogenous.

Assessing the importance of the number of physicians as a significant driver of demand may contribute to the efficiency of policy measures aimed at curbing health care costs.

To explore the hypothesis of SID, billing data for all practising Belgian GPs and SPs for 2005 were analysed. Section 3.3.2 briefly describes the data and methods of analysis (with full details in appendix B.9). Section 3.3.3 contains the regression results for GPs and SPs.

3.3.2 Methods

To test the hypothesis that health care utilisation is correlated with physician density, volume and intensity of physicians' services were measured both for GPs and SPs. The nature of the utilisation data consisted of all types of contacts for GPs (mainly consultations and visits) and consultations for SPs (so no technical acts). The analyses were based on the practising physicians, i.e. with at least 1 contact a year among 50 individual patients.

For the volume of activity provided by each physician, total contacts, total consultations and total visits were investigated separately. In addition, intensity of care measures, i.e. the average number of contacts, consultations or visits delivered per patient by each physician, were calculated.

By construction, patients having seen different GPs in 2005 will be counted in each of these GP's patient population. To assess the impact of the non-uniqueness of patients, the effect of patients' characteristics was compared to that of unique patients meaning that each patient was "attributed" to one unique GP. These analyses are described in the "sensitivity analyses" section in Appendix B.9. The activity level on the unique patients, hereafter called "loyal" patients, was described and compared to the whole population in Appendix B.10 (Figure GP2).

As a correlation between physician density and volume or intensity of care may be the result of variations in population health needs or physician characteristics, potential confounding from these characteristics was controlled for in the analyses. For each physician, information about age, sex and home location was available. Patients' characteristics were also available at the level of the physician (demographics for GPs and SPs, socioeconomic and morbidity information for GPs only).

Appendix B.9 presents the data sources, data handling, outlier handling, the analysis of the functional form, the choice of the covariates, the method of taking into account the clustering of physicians per geographical entity and some sensitivity analyses on the model specification.

Because of the crucial importance in the results interpretation, the functional form of the regression model for the volume of care data is presented below (and not in appendix B9).

As detailed in Appendix B.9, strong heteroscedasticity problems in the linear form were found for the volume measures. To solve the problem of non-constant variance of the residuals, we log transformed the dependent variable. Since the choice between the semi-log or log-log specification could not be made on the basis of the statistical results, the interpretation of the coefficients was the decisive factor.

In a log-log specification, the estimated coefficient can be interpreted as an elasticity: a fixed percentage change in GP density results in a percentage change in e.g. total visits per GP. Abstracting from possible availability effects and endogeneity bias, a positive correlation between per GP consumption and GP density is indicative of an inducement effect. However, does a negative correlation necessarily denote absence of SID? As shown by Carlsen and Grytten (1998)[52] and Schaumans (2007)[37], the necessary condition for inducement is that the coefficient of GP density is estimated significantly larger than minus 1. This result is derived from the relation between **consumption per GP** and **consumption per capita**, both at the level of the municipality. The key idea is that supplier inducement will cause a positive correlation between GP density and per capita consumption. In the absence of changing physician (and patient) behaviour, a percentage increase in physician density of x, reduces the number of patients and hence consumption per GP by the same percentage. A necessary assumption is that the reduction in consumption is the same for all GPs in the municipality. Instead of assuming a proportional reduction in the workload of each GP in the municipality, alternative assumptions may be formulated (e.g. a larger decrease in workload for GPs with an existing workload above a cut-off point). Investigation of such alternatives is beyond the scope of this study.

In a log-log model the elasticity is constant. Regardless of the level of consumption, if GP density increases by 10%, then consumption per GP increases by x%, where x equals the estimated coefficient of GP density. To relax the assumption of constant elasticity, two alternatives can be investigated. First, the semi-log model allows a different 'elasticity' in each municipality. As with a log-log model, the necessary condition for inducement is that the elasticity of GP density with respect to consumption is estimated significantly larger than minus 1. For this condition to hold, the estimated coefficient of GP density in the semi-log model should be larger than - 1/GP density in each municipality. Instead, to simplify calculations the approach of Schaumans (2007)[37] was followed, dividing the municipalities into five equal-sized clusters according to GP density. Hence, five elasticities were estimated in a log-log specification.

The variables available for the analyses are described in Table 28.

Table 29. Variables available for the analyses

GP's individual characteristics	SP's individual characteristics	Unit
GP Age	SP Age	Years
GP Sex	SP Sex	Dummy variable
		1 (male)
		0 (female)
GP's activity variables	**SP's activity variables**	
Number of Patients per GP	Number of Patients per SP	Number of patients
Total contacts per GP		Number of contacts
Total consultations per GP	Total consultations per SP	Number of consultations
Total visits per GP		Number of visits
Average contacts per patient per GP		Mean number of contacts per patient
Average visits per patient per GP		Mean number of visits per patient
Average consultations per patient per GP	Average consultations per patient per SP	Mean number of consultations per patient
Patient's characteristics		
% of male patients per GP	% of male patients per SP	%
% of patients less than 21 years old per GP	% of patients less than 21 years old per SP	%
% of patients 21-40 years old per GP	% of patients 21-40 years old per SP	%
% of patients 41-60 years old per GP	% of patients 41-60 years old per SP	%
% of patients 61-80 years old per GP	% of patients 61-80 years old per SP	%
% of patients above 81 years old per GP	% of patients above 81 years old per SP	%
% of patients with preferential status per GP		%
% of patients entitled to lump sum B or C for home care per GP		%
% of patients entitled to lump sum for physiotherapy (E-pathology) per GP		%
% of patients entitled to lump sum for 6 hospital admissions per GP		%
% of patients entitled to increased child allowance or to an allowance for handicapped persons per GP		%
% of patients entitled to support from the public municipal welfare centres, the subsistence level income or income guarantee for the elderly per GP		%
Geographical characteristics		
Density GP/Municipality(INS)		Number of GP/10 000 inhabitants
Density GP/Arrondissement		Number of GP/10 000 inhabitants
	Density SP/Arrondissement	Number of SP/10 000 inhabitants

3.3.3 Results

3.3.3.1 Description of the practising GP activity data, practising GP characteristics and their patients

ACTIVITY DATA

Activity levels of the 11 626 practising GPs, amounting to 43 736 602 contacts in 2005, were briefly described in section 2.2.2.1. More details on activity levels are described in Appendix B.10 (Figure GP1), with the full details of distributions given in Appendix B.7. The average number of different patients per GP seen in 2005 amounted to 927, resulting in an average number of 3 762 contacts, of which 2 396 were consultations and 1 366 were visits. Visits represent 36.3% of the total amount of contacts: of these, 5.4% were visits to elderly in rest and nursing homes, and another 1.3% was performed during the evening, the night or the weekend. No analyses were performed on the different types of visits separately.

GPS' DEMOGRAPHIC CHARACTERISTICS

The review of the literature on SID revealed the importance of GP characteristics in explaining intensity and volume of care. Differences in the number of hours worked or practice setting (solo versus group practice) are likely to influence the level of activity. Since these differences are related to the age and sex of the GP, we expect an effect of both characteristics in the volume regressions. A priori there is no reason why these GP characteristics should influence the intensity of care, except when patient characteristics differ.

Demographic characteristics (age and sex) of practising GPs were already described in sections 2.2.4.1 and 2.2.4.2. Distributions are fully described in Appendix B.7.

Mean age of all practising GPs in 2005 was 49 years, and 28% were female. The percentage of female GP differs considerably across the age groups: in younger age groups (<40 years of age) the majority of GPs are female, whereas the reverse was the case for the older age groups (see table 11 in section 2.2.4.1). No interaction effects between age and sex were included, as the models of intensity of care showed no such effect. To keep consistency between all models, no interactions were included in the volume of care models.

PATIENTS' CHARACTERISTICS

To control for demand effects, patients' demographic, socioeconomic and morbidity characteristics were included. Appendix B.7 reports descriptive statistics of these variables.

3.3.3.2 Relation between practising GP activity and practising GP density

The density of practising GPs is already described in section 2.2.3, at the province level and at the arrondissement level. Globally amounting to 11 GPs per 10 000 inhabitants, the density varies from 9.8 to 14.4 GPs per 10 000 inhabitants between provinces.

To study the hypothesis that health care utilisation is associated with physician-to-population ratio, densities were also computed at the municipality level (details in Appendix B.7), showing a greater variation in densities: from 3 GPs/10 000 to 24 GPs/10 000 inhabitants.

RELATION BETWEEN ACTIVITY AND PRACTISING GP DENSITY AT MUNICIPALITY LEVEL

Figure GP3 from Appendix B.10 shows that all activity variables in terms of absolute activity levels (number of patients/GP, total contacts/GP, total visits/GP and total consultations/GP) decrease with increasing GP density. The decrease is much more pronounced for consultations than for visits.

With regard to the intensity of care variables, the pattern is different, with opposite trends: the average number of visits per patient increases with density, while the average number of consultations per patient decreases.

Based on these first results, the rest of this section focuses on the central question of this chapter, namely "is there evidence that health care utilisation is larger in areas with higher GP density?"

Intensity of care

Table 29 shows the results from the regression models for the average number of visits and the average number of consultations per patient and per GP. The results for the average number of contacts are given in Appendix B.10 (Table GP2). Coefficients in bold are significant at p<0.0001, coefficients in bold italic are significant at p<0.05.

Table 30. Results from regression models on average number of consultations per patient per GP and on average number of visits per patient per GP (at municipality and at arrondissement level)

Dependent variable	**Average Number of Consultations/patient**							**Average Number of Visits/patient**						
Geographical level	**Municipality (INS)**						**ARR**	**Municipality (INS)**						**ARR**
Model number **C for clustering** **L for Loyal patients**	**1**	**2**	**3**	**4**	**4-C**	**4-C-L**	**4-C**	**1**	**2**	**3**	**4**	**4-C**	**4-C-L**	**4-C**
R^2_{adj}	**0.01**	**0.09**	**0.20**	**0.24**	**0.24**	**0.22**	**0.25**	**0.00**	**0.14**	**0.34**	**0.42**	**0.42**	**0.47**	**0.42**
Variable	**Beta**	**Beta**	**Beta**	**Beta**	**Beta**	**Beta**	**Beta**	**Beta**	**Beta**	**Beta**	**Beta**	**Beta**	**Beta**	**Beta**
Density GP	**-0.05**	**-0.05**	**-0.04**	**-0.04**	**-0.04**	**-0.05**	**-0.11**	***0.01***	***0.02***	0.00	**0.02**	0.02	***0.03***	0.04
GP sex		**0.12**	**0.15**	**0.12**	**0.13**	**0.19**	**0.15**		**0.56**	**0.23**	**0.28**	**0.25**	**0.30**	**0.24**
GP age 40-49		**0.56**	**0.41**	**0.35**	**0.36**	**0.28**	**0.36**		**0.25**	**0.29**	**0.27**	**0.28**	***0.06***	**0.28**
GP age 50-59		**0.71**	**0.46**	**0.40**	**0.41**	**0.32**	**0.41**		**0.61**	**0.44**	**0.39**	**0.39**	0.07	**0.39**
GP age +60		**0.90**	**0.56**	**0.46**	**0.48**	**0.35**	**0.49**		**1.34**	**0.68**	**0.58**	**0.55**	-0.03	**0.56**
% of male patients per GP			***-0.01***	0.00	0.00	**-0.02**	-0.01			**0.02**	***0.01***	0.00	0.00	0.01
% of patients 21-40 years old per GP			**0.02**	**0.02**	**0.02**	**0.03**	***0.01***			**-0.02**	**-0.01**	0.00	0.00	0.00
% of patients 41-60 years old per GP			**0.04**	**0.04**	**0.04**	**0.06**	**0.05**			0.00	0.01	0.01	0.01	0.01
% of patients 61-80 years old per GP			**0.04**	**0.05**	**0.04**	**0.05**	**0.04**			-0.01	0.00	0.01	***0.01***	0.01
% of patients above 80 years old per GP			**-0.06**	**-0.04**	**-0.04**	**-0.04**	**-0.04**			**0.15**	**0.11**	**0.12**	**0.15**	**0.12**
% of patients with preferential status per GP				**-0.01**	-0.01	0.00	0.00				**0.04**	**0.03**	**0.04**	**0.03**
% of patients entitled to lump sum B or C for home care per GP				***-0.05***	***-0.07***	***-0.05***	**-0.09**				***-0.05***	-0.04	-0.01	-0.02
% of patients entitled to lump sum for physiotherapy (E-pathology) per GP				***-0.04***	-0.02	0.00	-0.01				0.00	-0.01	0.03	-0.02
% of patients entitled to lump sum for 6 hospital admissions per GP				**-0.12**	**-0.11**	**-0.06**	**-0.11**				**-0.13**	**-0.13**	0.02	**-0.13**
% of patients entitled to increased child allowance or to an allowance for handicapped persons per GP				0.01	0.00	***-0.02***	0.00				**0.10**	**0.09**	**0.13**	**0.09**
% of patients entitled to support from the public municipal welfare centres, the subsistence level income or income guarantee for the elderly per GP				0.01	0.01	0.00	0.01				**-0.08**	**-0.07**	**-0.06**	**-0.07**

Bold : p-value< 0.0001; ***Bold italic***: p-value < 0.05

We first discuss the results for the average number of visits (see Table 29) in detail. For the average number of consultations (also in Table 29) only striking or opposite results are mentioned. Model 1, including only GP density, shows a statistically significant but moderate effect of GP density on average visits. Adding GP characteristics (Model 2) hardly alters the effect of GP density. Male GPs had 0.6 visits more per patient and the average number of visits per patient per GP increased with age (see also Figure GP9 in Appendix B.10). This result should not necessarily be attributed to part time working of the female GPs, nor to the working time according to the age of the GP. To put it differently: Why should a female GP provide fewer visits per patient? Why should an older GP perform more visits per patient? Part of the answer could be attributed to a cohort effect.

To control for variations in demand across municipalities, patient characteristics were included (Models 3 and 4). As a result, the significant effect of density on average visit disappeared, and the effect of GP characteristics diminished especially for the male and older GPs, showing that GP characteristics relate to their patients' characteristics. An increase of 1% of male patients raised the average number of visits per patient by 0.02. An increase of 1 percent of patients between 21 and 40 years of age at the expense of the youngest age group resulted in 0.02 less visits per patient. Similarly, an increase of 1 percent of patients older than 80 years of age at the expense of the youngest age group resulted in 0.15 more visits per patient. Remember that visits include nursing home visits. Inclusion of patient socioeconomic and morbidity characteristics (Model 4) did not change the effect of GP characteristics or patients' demographic variables much. However, the effect of density became statistically significant. An increase in the percentage of patients with preferential status had a positive significant effect, but this effect was very moderate. The effect of patients entitled to support from the public municipal welfare centers, the subsistence level income or income guarantee for the elderly per GP was negative. Since most patients entitled to income support were also eligible for preferential status, the negative coefficient should be compared to the coefficient of preferential status and reads as follows: patients with preferential treatment had more visits per patient than patients without preferential treatment, but within the group of patients with preferential treatment, those entitled to income support had a lower average. The negative effect may be the result of underconsumption or other consumption behavior, e.g. emergency care. The coefficient of handicapped patients can be interpreted in the same way. Patients entitled to a lump sum because of 6 hospital admissions had a lower average. Since they spent a lot of time in hospital, the negative coefficient seems acceptable. For patients entitled to a lump sum B or C for home care, the average number of visits per patient was lower. This result is somewhat surprising. A possible explanation is the relatively high correlation of this characteristic with being handicapped and with patient age. The effect of patients entitled to a lump sum for severe physiotherapy was not significant.

When accounting for clustering (Model 4-C), the density effect and some patient characteristics (sex, some age categories and lump sum B or C for home care) became non significant.

Results on loyal patients (accounted for clustering) showed a statistically significant effect of GP density (Table 29, Model 4-C-L). The effect of the GP age disappeared, while the patient's age became significant for all age groups. The effect of socioeconomic and morbidity characteristics of patients was rather stable between Models 4-C and 4-C-L, except for the lump sum for 6 hospital admissions.

Table 29 shows the same models for the average number of consultations. The most striking result was the negative and stable coefficient of GP density. To take account of possible interactions between visits and consultations, a simultaneous equation model deserves to be explored and is a possible avenue for future analyses. The effect of GP characteristics was also stable after controlling for patients' characteristics. While the effect of patient sex was not stable across the models, the age pattern of patients was. Patients above the age of 80 had fewer consultations per patient than the youngest age group. The effect of the proportion of handicapped patients and of patients entitled to income support was not statistically significant.

The effect on "loyal" patients is consistent with these results (Table 29, Model 4-C-L).

Volume of care

Table 30 shows the results from the regression models for the total number of visits and consultations per GP respectively. The results for the total number of contacts are given in Appendix B.10 (Table GP3). Coefficients in bold are significant at p<0.0001, coefficients in bold italic are significant at p<0.05. All models are in log-log specifications for GP density and semi-log for the GP and patient characteristics. The structure of the models is the same as for the intensity of care measures. 95%CI are presented for the density effect, and allow testing the hypothesis (at 5% level) that the density is significantly different from minus 1.

Table 31. Results from regression models on total number of consultations per GP and on total number of visits per GP (municipality and arrondissement levels)

Dependent variable	**Log Total consultations per GP**							**Log Total visits per GP**						
Geographical level of analysis	**Municipality (INS)**						**ARR**	**Municipality (INS)**						**ARR**
Model number C for clustering L for Loyal patients	**1**	**2**	**3**	**4**	**4-C**	**4-C-L**	**4-C**	**1**	**2**	**3**	**4**	**4-C**	**4-C-L**	**4-C**
R^2_{adj}	0.06	0.12	0.22	0.28	0.28	0.22	0.29	0.02	0.09	0.18	0.26	0.26	0.28	0.26
Variable	Beta	Beta	Beta	Beta	Beta	Beta	Beta	Beta	Beta	Beta	Beta	Beta	Beta	Beta
Log density GP	**-1.09**	**-1.04**	**-0.86**	**-0.80**	**-0.78**	**-0.96**	**-1.54**	**-1.28**	**-1.18**	**-1.08**	**-0.80**	**-0.69**	**-0.74**	***-1.01***
Lower limit of 95%CI	(-1.17,	(-1.12,	(-0.93,	(-0.87,	(-0.88,	(-1.08,	(-1.86,	(-1.43,	(-1.32,	(-1.22,	(-0.94,	(-0.93,	(-0.98,	(-1.96,
Upper limit of 95%CI	-1.01)	0.97)	-0.79)	-0.73)	-0.68)	-0.84)	1.23)	-1.13)	-1.03)	-0.94)	-0.67)	-0.44)	-0.50)	-0.06)
GP sex		**0.35**	**0.36**	**0.32**	**0.32**	**0.51**	**0.33**		**1.01**	**0.54**	**0.50**	**0.47**	**0.65**	**0.45**
GP age 40-49		**0.23**	**0.19**	**0.15**	**0.15**	**0.27**	**0.15**		**0.33**	**0.40**	**0.29**	**0.31**	***0.21***	***0.31***
GP age 50-59		**0.12**	**0.15**	**0.11**	**0.12**	***0.10***	***0.13***		**0.41**	**0.39**	**0.22**	***0.24***	***-0.14***	***0.24***
GP age +60		**-0.47**	**-0.25**	**-0.33**	**-0.32**	**-0.56**	**-0.31**		0.08	***-0.25***	**-0.57**	**-0.58**	**-1.39**	**-0.58**
% of male patients per GP			**0.01**	**0.02**	**0.01**	**-0.02**	**0.01**			**0.05**	**0.05**	**0.05**	0.00	**0.05**
% of patients 21-40 years old per GP			**-0.01**	***-0.01***	-0.01	0.00	-0.01			**-0.06**	**-0.04**	**-0.03**	-0.01	***-0.03***
% of patients 41-60 years old per GP			0.00	0.00	0.00	0.03	0.00			**-0.02**	**-0.02**	-0.02	***0.02***	-0.01
% of patients 61-80 years old per GP			0.00	*0.01*	0.00	0.02	0.00			**-0.02**	-0.01	0.00	**0.04**	0.00
% of patients above 80 y. per GP			-0.08	-0.06	-0.05	***-0.03***	**-0.05**			**0.05**	**0.07**	**0.09**	**0.08**	**0.09**
% of patients with preferential status per GP				**-0.02**	***-0.01***	0.01	-0.01				**0.02**	***0.02***	**0.04**	***0.02***
% of patients entitled to lump sum B or C for home care per GP				**-0.02**	**-0.03**	**0.02**	***-0.05***				0.04	0.04	***0.11***	**0.04**
% of patients entitled to lump sum for physiotherapy (E-pathology) per GP				-0.07	-0.06	**-0.02**	***-0.06***				***-0.06***	-0.05	0.00	-0.06
% of patients entitled to lump sum for 6 hospital admissions per GP				-0.11	-0.11	-0.11	**-0.11**				**-0.40**	**-0.41**	**-0.12**	**-0.41**
% of patients entitled to increased child allowance or to an allowance for handicapped persons per GP				**0.01**	**0.00**	*-0.03*	-0.01				**0.03**	0.01	0.01	0.01
% of patients entitled to support from the public municipal welfare centres, the subsistence level income or income guarantee for the elderly per GP				*-0.02*	**-0.01**	-0.05	***-0.02***				**-0.12**	**-0.09**	**-0.12**	**-0.10**
Bold : p-value< 0.0001**;** ***Bold italic***: p-value < 0.05														

The result in model 1 (Table 30) implies that a 10% increase in GP density leads to a more than proportional (12.8%) decrease in the total number of visits per GP. Controlling for GP characteristics (Model 2) and variations in demand (Models 3 and 4) reduces the elasticity to -0.80. When accounting for clustering (Model 4-C), the elasticity further reduces to -0.69. The confidence limits show that the elasticities are larger than minus 1 and hence reveal SID behaviour. Male GPs perform more home visits (see also Figure GP5 in Appendix B.10) whereas older GPs (>60) perform less visits than their younger colleagues (<40). Male patients have more visits, but the effect is very moderate. Most age effects are not stable across the models, except for the positive effect of the oldest group and the negative effect of patients between 21-40 years old, both compared to the youngest age group. As for patient socioeconomic and morbidity characteristics, patients with preferential status and handicapped have more visits (although the effect of handicapped disappears when controlling for clustering), patients with 6 hospital admissions and receiving income support have more visits. Results for loyal patients (accounted for clustering) change the picture rather drastically (comparison of Model 4-C with Model 4-C-L). The effect of GP density is rather stable, but the negative effect of older GPs increases to a considerable extent. Patient age effects are significant now, with older loyal patients having more visits than their younger counterparts. The effects of loyal patient socioeconomic and morbidity characteristics is comparable with that of Model 4-C.

Most GP and patient demographic characteristics show the same results for the total number of consultations (Table 30). However, GPs with more patients above 80 years old have fewer consultations than GP with young patients. GPs with patients entitled to preferential status, a lump sum for physiotherapy and 6 hospital admissions have fewer consultations. For loyal patients, the effect of GP density increases by almost 2 percentage points. As with the total number of visits, all elasticities except for Model 4-C-L are larger than minus 1 and hence reveal SID behaviour

In summarizing the effect of GP density in all Models 4 after controlling for clustering, it may be concluded that for the intensity of care only weak evidence for inducement was found for visits. For the volume measures, the findings are consistent with the inducement hypothesis. Further analysis is needed to disentangle inducement from availability effects (see sensitivity analysis in this section).

RELATION BETWEEN ACTIVITY AND GP DENSITY AT ARRONDISSEMENT LEVEL: IMPLICATIONS OF BORDER CROSSING

In the above analysis at the municipality level, border crossing was neglected. It was assumed that all patients of a GP live in the same municipality as their GP. The data show that border crossing is non-negligible: 10% of all GPs have 90% of their patients living in another municipality, 15% of all GPs have 30% of their patients living in another municipality and 21% have 20% of their patients living in another municipality (table not shown). Border crossing means that the municipality level overestimates or underestimates the market of a GP and that the population living in a municipality is not an adequate measure to test GP behaviour. Consequently, the estimated coefficients of the models with GP density at the municipality level may be biased.

In an attempt to remove the effects of border crossing, Model 4-C was also estimated with GP density measured at the level of the arrondissement (see also in Figure GP12 in Appendix B10 for the large heterogeneity of municipalities' densities within arrondissements). This higher level of aggregation is probably too coarse to test for SID. An administrative level in between that of the municipality and the arrondissement or a geographical area representing the relevant market of the GP, would be more appropriate.

Figure GP11 in Appendix B.10 depicts the relation between GP density and GP activity, with GP density measured at the arrondissement level. GP density per arrondissement was presented in Figure 2, section 2.2.3 (geographical distribution).

The sign of the effects at the arrondissement level are in line with those at the municipality level (decrease of number of patients, decrease of total contacts, larger decrease of consultations, decrease of average contacts and consultations, increase of average visits), but they are larger in absolute value.

The results with GP density at the arrondissement level are presented in Table 29 (intensity measures) and Table 30 (volume of care measures). The results are corrected for clustering (Model 4-C). We limit the discussion to the coefficient of GP density. As for the intensity measures, the results confirm those with GP density measured at the municipality level, namely no evidence for SID. For the volume measures, the coefficient of GP density indicates that the inducement hypothesis is rejected.

SENSITIVITY ANALYSIS: IS BRUSSELS A SPECIAL CASE?

From all practising GPs, 11% live in Brussels, 53% in Flanders and 36% in Wallonia. The level of activity is very different between the 3 regions (see table GP5 Appendix B.10). GPs in Brussels have the lowest level of activity (already described in section 2.2.3 about geographical distribution).

The exclusion of Brussels did not change the results presented above, neither for volume nor for intensity of care measures (data not shown).

SENSITIVITY ANALYSIS: AVAILABILITY OR INDUCEMENT EFFECT?

In order to discriminate between an inducement and an availability effect, we divided the municipalities into five equal-sized clusters, according to GP density. QT1 represents the cluster of municipalities with the lowest GP density, QT5 the cluster with the highest GP density.

The key idea is that a positive relation between GP density and health care utilisation is only indicative of supplier inducement in municipalities with high GP density. In low GP density areas an increase in the physician-to-population ratio is likely to lower the cost of access to health care or to lead to a decrease of demand rationing.

Descriptive statistics for the five clusters are given in Appendix B.7 and Table 31. The average number of patients per GP and most volume measures decrease with increasing GP density. As for the intensity of care measures, the average number of consultations per patient decreases with decreasing GP density. The average number of visits increases up and including the third quintile. The percentage of male GPs amounts to about 75% in the first three quintiles and reduces to about 70% in the last two quintiles. Patients' demographic characteristics show a decrease in the proportion of male patients from the first to the last quintile and a smaller percentage of patients above the age of 80.

Table 32. Summary statistics for activity variable, GPs and patients demographics, per quintile (based on GP density)

	GP density (/10 000 inhabs)				
	Low density	**Medium Low**	**Medium**	**Medium High**	**High density**
	QT1	**QT2**	**QT3**	**QT4**	**QT5**
GP density limits	From 3.01	From 8.885	From 10.231	From 11.602	From 13.77
	To 8.88	To 10.23	To 11.601	To 13.37	To 24.45
N municipalities	117(19.93%)	118(20.10%)	117(19.93%)	117(19.93%)	118(20.10%)
SUPPLY Mean (SD in appendix)					
N GPs (total)	1246	2666	2904	2120	2690
N GPs per municipality	10.65	22.59	24.82	18.12	22.80
Density municipality	7.45	9.54	10.84	12.43	15.81
ACTIVITY VARIABLES : Mean (SDs in appendix)					
Number of Patients per GP	1142.40	1035.48	964.05	860.94	733.91
Total contacts per GP	4649.48	4274.66	3986.00	3499.41	2807.81
Total consultations per GP	3200.07	2769.31	2479.67	2180.87	1731.20
Total visits per GP	1389.30	1453.98	1454.28	1270.58	1036.56
Average contacts per patient per GP	4.17	4.29	4.29	4.19	4.00
Average consultations per patient per GP	2.84	2.70	2.60	2.55	2.42
Average visits per patient per GP	1.26	1.52	1.62	1.57	1.52
Proportion of visits (%)	0.27	0.31	0.34	0.33	0.32
CONTROL VARIABLES – GP LEVEL					
GP age	48.7	48.8	49.3	49	49
GP sex (%male)	74.1%	73.93%	75.17%	70.09%	68.17%
CONTROL VARIABLES – PATIENT LEVEL MEAN % (SD in appendix)					
% of male patients per GP	45.41	44.53	44.07	43.65	42.25
% of patients 0-20 years old per GP	21.55	20.31	20.06	20.97	20.25
% of patients 21-40 years old per GP	24.97	25.08	24.95	24.33	25.09
% of patients 41-60 years old per GP	26.81	26.37	26.63	26.93	26.55
% of patients 61-80 years old per GP	21.22	21.83	21.85	21.35	21.22
% of patients above 81 years old per GP	5.44	6.41	6.52	6.42	6.90

[NB: the full table is shown in appendix B.7]

Table 33. Elasticities within quintiles and results from Model 5-C

	Model 5- C estimation of elasticity within quintiles (municipalities)			
	Log total consultations per GP		Log total visits per GP	
Quintile	**Beta**	**95%CI**	**Beta**	**95%CI**
QT 1	-0.29	(-0.62, 0.04)	0.04	(-0.92, 1.01)
QT 2	-0.57	(-1.78, 0.65)	-1.01	(-3.62, 1.61)
QT 3	-0.70	(-1.96, 0.56)	-2.82	(-5.56, -0.01)
QT 4	-0.82	(-2.30, 0.65)	-1.99	(-5.11, 1.13)
QT 5	-0.92	(-1.29, 0.54)	-0.98	(-1.89, -0.07)

The effect of GP density within the 5 quintiles is also adjusted for the GPs' and patient's characteristics from Model 4 (effects not shown).

Relaxing the assumption of constant elasticity removes the inducement effect on the number of visits. The positive effect of density in the municipalities with the 20 percent smallest GP density can be interpreted as an availability effect. The pattern for consultations largely confirms the results of constant elasticity. Again, there is evidence of an availability effect in the first quintile of municipalities.

The municipalities in the first quintile meet the first criterion of the Impulseo fund, i.e. less than 9 GPs for 10 000 inhabitants. Although the Impulseo fund aims at the redistribution of GPs across the country in order to increase accessibility, it was decided not to perform separate analyses on the Impulseo municipalities, since density is not the only criterion (see section 2.3.1).

Sensitivity analysis: substitution between GPs' and SPs' activities

Since patients in Belgium have free choice of physician and can directly access specialists, possible substitution between GPs and SPs was investigated. Both the models with density based on all selected SPs (see section 3.3.3.3) and models with density based only on the number of paediatricians, dermatologists and gynaecologists gave the same results. Including SP density did not change the results of tables 29 and 30 concerning the effect of GP density. SP density had a negative statistically significant effect on the total number of consultations and visits of GPs, whereas the effect on the intensity of care measures was only significantly negative for the average number of consultations (data not shown).

3.3.3.3 Description of the practising SP activity data, practising SP characteristics and their patients

ACTIVITY DATA

The activity data of the practising SPs is limited to the consultations (including advices). Data on technical acts was not available. Activity levels by specialty were already described in section 2.2.2.2 (table 8). For this analysis, we selected 18 specialties on the 28 existing, and we grouped them in 8 clusters, since the total number of specialists in some specialties was too small.

The 8 groups of specialists are (with the number of practicing specialists): dermatologists (593), Eye-Nose-Throat (498), gynaecologists (1 118), Internal Medicine en Neurology (3 102), ophthalmologists (836), pediatricians (975), psychiatry and neuropsychiatry (1 486), and all surgeons (2 314)[ll].

[ll] These numbers are slightly lower than numbers of practising SPs presented in Table 8, as the filter used to define practising SPs was applied on aggregated data in Table 8, and on individual data in all analyses presented in chapter 3.

Differences in activity levels between the different groups of specialists are striking (summary statistics are presented in Table 33, with more details in Appendix B.8). In terms of global volume of consultations, the lowest providers (below 2 000 consultations a year) are the psychiatrists (1 244 consultations), the internal medicine & neurology specialists (1 434 consultations) and the pediatricians (1 958 consultations). While this makes perfectly sense for the psychiatrists (who also have the lowest number of patients and the highest number of consultations per patient) and the pediatricians (who also have a relatively low number of patients and a relatively high number of consultations per patient), for the internal medicine and neurology specialists this picture of their activity is probably underestimated (as technical acts are not counted in the volume of activity, and may be an important part of it). At the other end of the spectrum of the volume of consultations are the dermatologists (3 271 consultations) and the ophthalmologists (3 237 consultations). These two specialties have a comparable number of patients, and hence a comparable level of number of consultations per patient (1.8 for dermatologists, 1.5 for ophthalmologists). The three remaining groups of specialists (Eye-nose-throat specialists, the gynaecologists and the surgeons (all)) have a volume of consultations which lies between these two extremes.

SPs' AND PATIENTS' DEMOGRAPHIC CHARACTERISTICS

Demographics characteristics (age and sex) of practising SPs were already described in sections 2.2.4.1 and 2.2.4.2. Distributions are fully described in appendix B.8. Patient's sex and age are also described in Appendix B.8 per group of specialists.

3.3.3.4 Relation between practising SP activity and practising SP density

Density of SPs was described in section 2.2.3 (Geographical distribution) and is detailed in Appendix B.8, with the geographical distribution of SPs per arrondissement, per group of specialists.

RELATION BETWEEN ACTIVITY AND SP DENSITY AT ARRONDISSEMENT LEVEL

Figures SP1 in Appendix B.10 show that all activity variables in terms of absolute activity levels (number of patients/SP and total consultations/SP) decrease with increasing SP density. With regard to the intensity of care variables, the pattern is different, with a much more flat trend.

Volume of care

Results from regression model 3-C (with adjustment for physician and patient demographic characteristics, and taking into account the clustering of the data) are presented in Table 33. Results from Model 1, 2, 3 (without clustering) and 5 (with the impact of GP density on SP activity level) are presented in Appendix B.10 (Table SP1).

THE EFFECT OF SP CHARACTERISTICS ON TOTAL SP CONSULTATIONS

The effect of SP sex and age is consistent through the different specialties analyzed. For all specialties, male SPs have a higher number of consultations than female SPs. This effect is highly statistically significant and stable for all specialties, except for the gynaecologists, where that effect becomes not statistically significant after adjustment for patients' characteristics.

After adjustment for patients' characteristics, specialists older than 60 years have the lowest level of contacts, for all specialties analyzed. They are followed by specialists below 40 years old (see also Figure 10 to 13 in section 2.2.4.2). The SPs with the highest level of consultations are those between 40 and 49 years old (except for dermatologists, E.N.T specialists and ophthalmologists).

THE EFFECT OF SP DENSITY (AT ARRONDISSEMENT LEVEL) ON TOTAL SP CONSULTATIONS

For all specialties analyzed, the elasticity of SP density on total SP consultations is comprised between minus 1 and zero, and is always statistically different from minus one (as shown by the 95%CI around the density). This effect is very stable when SP or patients' characteristics are accounted for in the model, with the exception of surgery specialists, where the inclusion of SP and patients' characteristics decreases the magnitude of the effect. The effect is also very stable when we account for the clustering within arrondissements for the internal medicine and neurology specialists, paediatricians and psychiatrists. For the gynaecologists and surgeons, the effect of clustering decreases the magnitude of the density effect (see appendix B.10 Table SP1 for the full details).

To account for the fact that the total number of consultations by SPs may be affected by the density of GPs living in the same arrondissement, sensitivity analyses were performed to investigate the robustness of the results. There is no statistically significant evidence of a substitution effect between GP practices and SP practices for all the specialities, except for the surgeons, where the elasticity is -6.7% (so an increase in 10% GP density decreases by 6.7% total consultations of surgeons).

Sensitivity analyses were also performed excluding the SPs from the Brussels arrondissement, and results were consistent with those described above (data not shown).

Intensity of care

The results of the impact of the SP density on the SP intensity of care (number of consultations per patient) are presented in Appendix B10, Table SP1.

For 5 types of specialists (dermatologists, E.N.T, internal medicine, ophthalmologists and surgery), the intensity of care was not correlated with the density of the SPs, after adjustment for SP and patients' demographics characteristics.

For the gynaecologists and paediatricians, the intensity of care decreased as the density of specialists increased.

Only for the psychiatrists the intensity of care did increase with the density of psychiatrists.

Table 34. Summary Statistics on SP Activity levels and Results from Model 3-C (volume of consultations)

Variable	**Derm.**	**Gyn.**	**E.N.T**	**IM and N**	**Ophtalmo**	**Paed.**	**Psych.**	**Surg. All**
Total N SP	593	1118	498	3102	836	975	1486	2314
Summary Statistics	mean	mean	mean	mean	mean	mean	mean	mean
Number of patients/SP	1861.51	1429.58	1497.54	807.79	2146.44	823.22	363.43	1098.80
Total consultations/SP	3271.93	2892.97	2582.86	1433.89	3236.74	1958.83	1244.40	2132.36
Avg consult/Pat/SP	1.80	2.02	1.76	1.90	1.52	2.40	4.84	1.96
Results from Model 3-C : Dependent variable is Log of Consultations								
R^2_{adj}	0.22	0.22	0.27	0.14	0.24	0.08	0.12	0.13
Log Density SP/District (ARR) (Lower limit of 95%CI, Upper limit of 95%CI)	***-0.19*** (-0.38, 0.00)	-0.17 (-0.36, 0.03)	***-0.26*** (-0.42, -0.11)	***-0.15*** (-0.29, -0.01)	**-0.24** (-0.34, 0.14)	***-0.35*** (-0.50, -0.21)	**-0.16** (-0.21, -0.10)	-0.12 (-0.29, 0.05)
SP Sex	***0.24***	0.04	**0.40**	**0.28**	**0.22**	***0.25***	**0.34**	**0.34**
SP age 40-49	***0.14***	***0.17***	***0.20***	**0.20**	0.08	***0.22***	**0.28**	**0.31**
SP age 50-59	0.11	***0.13***	0.03	**0.21**	0.02	0.04	**0.26**	**0.27**
SP age +60	**-0.76**	**-0.49**	**-0.47**	**-0.28**	**-0.67**	***-0.35***	-0.01	**-0.21**
% of male patients per SP	0.01	-	0.01	**-0.01**	**-0.02**	-0.01	***-0.01***	**0.01**
% of patients 21-40 years old per SP	-0.01	***0.03***	0.02	***-0.01***	-0.01	-	*0.01*	*0.00*
% of patients 41-60 years old per SP	-0.02	***0.03***	-0.01	***-0.01***	0.02	-	0.00	***-0.01***
% of patients 61-80 years old per SP	-0.02	0.01	-0.01	0.00	0.00	-	***-0.01***	**-0.02**
% of patients above 80 per SP	0.05	0.11	-0.03	**-0.04**	***-0.03***	-	***0.03***	0.01
Bold : p-value< 0.0001; ***Bold italic*:** p-value < 0.05								

3.4 DISCUSSION

The systematic review of the literature and the analyses for Belgium have shown that health economists (amongst others) have a hard time finding evidence of SID. Although a large number of papers have been devoted to the problem of SID, the search for evidence about the relationship between physician density and health care utilisation did not give a conclusive answer. The divergent settings, methods and quality of available data do not facilitate a comparison of the existence and magnitude of SID across papers.

Supplier induced demand is usually interpreted as a means for the physicians to compensate for an income loss when the density of competitors increases. However, SID is a generic term which encompasses a variety of concepts[mm] as can be concluded from the framework by Labelle et al. in Figure 20.

Figure 20. Conceptual framework for SID

		EFFECTIVENESS OF SERVICES "Did the service contribute positively to the patient's health status?"		
		YES	NO	
			Neutral	Detrimental
EFFECTIVENESS OF AGENCY "Would the patient have demanded the service if he/she had the same information as the physician?"	YES	I	III a	III b
	NO	II	IV a	IV b

The first cell of the matrix characterises a perfect action of the physician: the service would have been demanded by the patient if he had been fully informed and it contributes positively to the health status of the patient. Obviously, the care remains a physician-initiated (or induced) service but the inducement is justified and should not be considered as a failure in the physician-patient relationship or as an over-consumption. According to Labelle et al., cell II presents an interesting dilemma because the care is health-improving but would not be chosen by the fully informed patient. We are here confronted with issues of ideological or philosophical considerations about the autonomy of the patient versus a paternalistic attitude of the physician. The services of cell II should be performed because the physician values health differently than patients, and feels professionally obligated to perform all the services known as health-improving. The cells IIIa and IIIb correspond to the results of ignorance of the physician and the patient.

The theoretical framework of Labelle et al. demonstrates that a common understanding of SID could help in assessing its importance and in interpreting and comparing results. The systematic review revealed a number of issues making it hard to test SID empirically. First, although 21 out of 24 selected papers have shown that there is a positive association between physician density and utilisation of medical services, it is not clear whether this relationship reflects supplier inducement which is a supply response or improved availability which is a patient demand response. A possible way to separately identify both effects is to relax the assumption of a constant effect of physician density irrespective of the level of density.

mm Phelps cites, in his book '*Health Economics*' on page 237, Joe Newhouse, editor of the *Journal of Health Economics,* who once said that he had considered to rename this journal the *Journal of Induced Demand* because he received so many articles submitted for publication on this topic [59]

To that end municipalities can be divided into equal-sized clusters, according to physician density. Adopting this approach, evidence was found in favour of an availability effect in low density areas (Carlsen and Grytten, 1998)[52] and Schaumans (2007)[37] and an inducement effect in high density areas (Schaumans, 2007). This interpretation is coherent with the intuition but the regression coefficients are sometimes insufficiently significant to conclude definitely about the existence of an availability effect. There are however elements in support of the SID hypothesis. First, four studies were designed to assess if the next follow up visit had been initiated by the physician. All reported an increase in return visits with increasing medical density. By contrast, Scott demonstrated that it was only the case for one of the 4 health conditions considered, and that the prescription of a diagnosis test during the index visit was a much more important determinant.[39] Second, Iversen et al. measured the perception of 'patient shortage' by the physicians and related it to activity levels. Patient shortage was defined as the difference between the desired and the actual number of patients for a given physician. The 'rationed' physicians had about 15% more income per listed patient than their non-rationed colleagues.[58] In a paper focusing only on the effect of patient shortage but overlooking the effect of the physician density, the same author found that a GP who experienced a small shortage of patients was expected to have 9% higher income from fees per patient than the non-rationed GPs. In case of severe shortage this difference increased to 17% and 29% for providing laboratory tests.[60]

A second issue concerns the problem of reversed causation. The number of physicians in a geographical area is potentially endogenous since physicians may be attracted by certain locations due to the level of demand. To correct for endogeneity bias in a cross-section analysis, two-stage least squares may help, but these models are as good as the quality of the instrumental variables. Instrumental variables regression avoids bias provided that good instruments are available. A lack of sufficient correlation of the instruments with physician density will reduce the efficiency of the estimates. Hence, the reasons for locating in specific areas unrelated to demand should be instrumented. Common instruments in the SID literature are population density or size and per capita income of the relevant geographical area. In the empirical analysis for Belgium, no test for potential endogeneity of physician density was performed. This decision was motivated by the lack of adequate location variables, such as family life (see section 5.3.4 for factors influencing the practice location). Moreover, with individual physician information, correction for endogeneity is less required.

A third issue is the quality and availability of the data, often acting as a limiting factor on the interpretation of the results. First, critics about the modelling of SID relate to the lack of observed key variables and the possible correlation of these with physician density. The inducement effect is biased if such key variables are omitted. On the other hand, independent variables not correlated with the physician density should also be included to assess objective determinants of the consumption of care. Insurance status, health status (represented by the number of disability days, a chronic illness, consumption of drugs or hospitalization) and patients' demographic characteristics as age and sex are all variables used in the reviewed papers. Next, studies on SID have been performed both on aggregate and individual physician or individual patient data. A positive relationship between physician density and per capita utilisation has often been interpreted as evidence of SID. Yet analyses on aggregate data do not allow discriminating between availability and inducement effects. Analyses of individual GP data do, but they show less decisive results. Finally, the current practice of examining the existence of SID based on utilisation data make direct inferences about physician behaviour very difficult, e.g. they do not allow to differentiate between patient initiated and physician initiated contacts. Surveys with interviews of patients and/or physicians to identify who induced the follow up visit could offer an alternative. However, interpretation of such studies should be treated cautiously. Follow up visits might be considered as 'good practice' by physicians, but affordable only if the workload is manageable, which is more likely in areas with higher physician density.

Before summarizing the results of the analysis of SID in the Belgian health care sector, we briefly address some limitations and strengths of the addressed approach.

As for the limitations, the measure of physician density is based on existing administrative levels. While the municipality level undoubtedly neglects the effect of border crossing, the level at the arrondissement is probably too coarse to test for SID. No data exists on the geographical level representing the relevant market of the GP or SP. Second, the measure of physician density is based on the place of residence of the physician. For GPs, in most cases, their place of residence is the same as their practice area. For SPs however, this may be a less realistic assumption. Although an analysis at the level of the arrondissement reduces the consequences of this assumption, it does not solve the problem that e.g. many specialists with residence in Walloon Brabant work in Brussels. Third, the activity measures for SPs solely contain consultations. Data on technical acts were not available. Since large price differences exist between different types of technical acts, lacking data on technical acts not only underestimates the volume of activity of the physician, but also income differences. Hence, the results on SID should be interpreted cautiously. Fourth, while rich data is available on GPs' patient characteristics, only age and sex were included as control variables in the models for the SPs. Given the evidence of pro-rich inequity in the distribution of specialist visits in Belgium, the omission of socioeconomic characteristics may lead to biased results. In addition, no adjustment for the number of hospital beds per arrondissement was made. Finally, no information on physicians entering or leaving the market was available.

In spite of the above data limitations, the richness of the database allows to take into account many of the weaknesses identified in the literature review. First, GPs' patient characteristics include a whole range of demographic, socioeconomic and morbidity information. The step by step building up of the models, revealed their importance. Second, as for the health care consumption, volume as well as intensity of care measures were available. Third, possible substitution effects between GPs and SPs could be analysed. Fourth, the effect of the characteristics of loyal patients and of all patients per GP could be compared. Fifth, two measures of GP density were compared to capture the effect of border crossing. Finally, all results are based on the total population of Belgian practising GPs and SPs.

In line with the findings of the systematic review, the results of the empirical analysis of SID in the Belgian ambulatory market are balanced. The GP results with density measured in the municipality provide only weak evidence in favour of the inducement hypothesis. High levels of GP density generate a slight increase in the average number of visits per patient, but the effect is too depending upon the model specification. For the volume measures, the findings are consistent with the inducement hypothesis. Relaxing the assumption of constant elasticity removes the inducement effect on the number of visits. The positive effect of density in the municipalities with the 20 percent smallest GP density can be interpreted as an availability effect. The pattern for consultations largely confirms the results of constant elasticity. Again, there is evidence of an availability effect in the first quintile of municipalities.

Moving to the level of the arrondissement to take account of border crossing, the inducement effects for the volume measures disappear. Other sensitivity analyses such as omitting Brussels or including SP density to take account of substitution effects hardly change the effect of GP density. The evidence in favor for SID is far more conclusive for SPs. While intensity of care is only positively correlated with SP density for psychiatrists, the findings for the number of consultations per SP support the notion of SID for all specialties.

Since the major concern of medical supply planning is to guarantee the availability and geographical distribution of a sufficient health workforce to meet population health needs, addressing the existence and magnitude of SID in the Belgian context seemed appropriate. It should be stressed however that an empirical analysis of SID is one possible instrument to document oversupply or undersupply of physicians. Even if evidence in favour of physician inducement is found, targeting the number of physicians is only one measure to control health care costs. An alternative is providing physicians with financial incentives to alter their behaviour. Moreover, merely counting physician heads does not take quality nor appropriateness of care into account.

Key messages

- **The literature review did not yield a conclusive answer about supplier induced demand due to divergent settings, methods and quality of available data. Nevertheless, when SID is evidenced, it is of weak magnitude and cannot be extrapolated to other specialties, regions or countries.**
- **Data including the whole population of Belgian physicians in 2005 was analysed. The results of that empirical analysis are also balanced.**
- **Results on GP density measured in the municipality provide only weak evidence in favour of the inducement hypothesis. High levels of GP density generate a slight increase in the average number of visits per patient, but the effect is too depending upon the model specification. For the volume measures, the findings are consistent with the inducement hypothesis. Moving to the level of the arrondissement to take account of border crossing, the inducement effects for the volume measures disappear.**
- **The evidence supporting SID is far more conclusive for SPs. While intensity of care is only positively correlated with SP density for psychiatrists, the findings for the number of consultations per SP support the notion of SID for all specialties.**

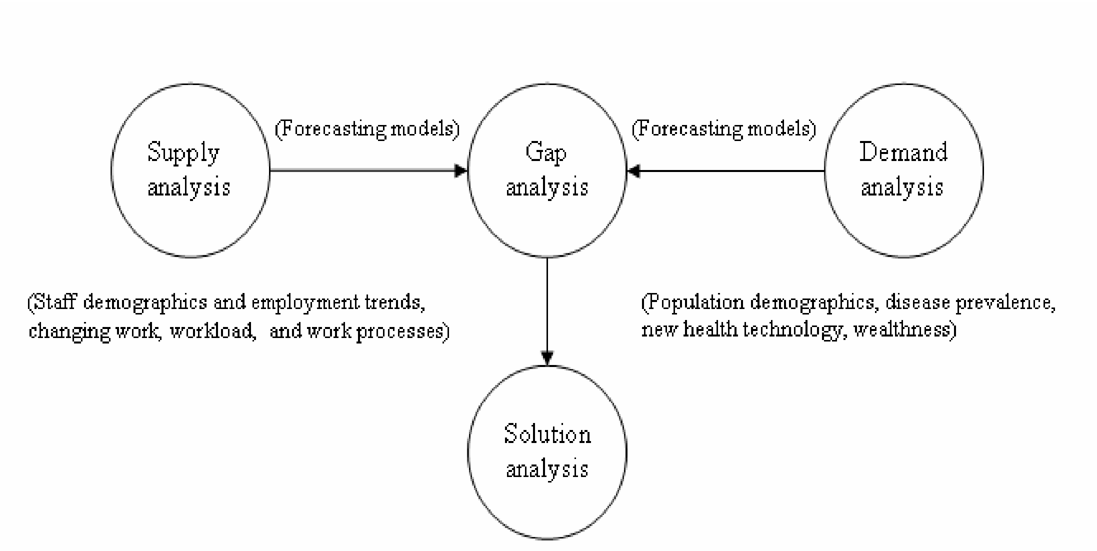
4 WHAT ARE THE RIGHT NUMBERS?

4.1 INTRODUCTION

Regulating physician numbers is considered an important task within the wider frame of HRH planning for reasons presented in the introduction section.

Theoretically, forecasting physician numbers is essentially a two-stage process (Figure 21). First, current supply is estimated, and the adequacy of current supply (compared to current requirement) of a workforce group should be assessed. Second, a forecast of physician requirements in future years is made (usually based on analysis trend of professional demography and demand for health care), and the optimal workforce size to match those requirements is estimated.

Figure 21. Main steps of health workforce planning



The following steps can be individualized[61]:

1. Describe the current workforce (size, characteristics, distribution and service provision) and training program.
2. Estimate workforce inputs and outputs from retirements, death, migration, immigration and the training program.
3. Assess the adequacy of the supply and distribution of the current workforce drawing on any international and national benchmarks, the views of the profession and other key stakeholders.
4. Project workforce supply requirements for the next 10 years using a range of needs based and demand based indicators.
5. Assess the likely impact of new technologies on productivity and future demand for services.
6. Assess the likelihood of the community deciding to use other providers to provide some of the services currently provided by the respective workforce.
7. Project levels of workforce supply required to meet projected workforce requirements (i.e. to achieve a balanced workforce).
8. Recommend adjustments to training program inputs to achieve a balanced workforce within the 10 year planning timeframe and to draw attention to any other pertinent issues raised as a result of the review.

9. At least every five years revisit each workforce and review again. This process may need to be brought forward should the monitoring process indicate unforeseen changes or problems in implementing the recommendations.

The gap analysis allows foreseeing likely over- and under-supply of health workforce.

We avoid here ideological terms such as "shortage" or "plethora", and refer to the descriptive, more neutral, terms of over-supply and under-supply. Zurn et al. refer to the terms of imbalances.[62] Those authors also pinpoint the importance of defining precisely the population segment under scrutiny (according to population characteristics, speciality, institution type and location) when reporting on under- or over-supplies.

4.2 OBJECTIVES OF THE CHAPTER

A *numerus clausus* (NC) limiting the number of practise licenses, and in turn the intake of medical trainees, was decided in Belgium in 1997, as previously in many other developed countries, and made effective in 2004. It is thus paramount to compute the right numbers of health professionals required, and there is already considerable public debate about "looming shortages". Moreover, means and methods for that sort of computation are numerous, and there is no unique gold standard.

Therefore the objectives of this chapter are:

1. To review available forecasting models for health manpower
2. To assess the efficiency of such models

The general objective is to present an overview of methods and issues in forecasting medical workforce, rather than reporting on all country- or speciality-specific models published.

4.3 LITERATURE SEARCH STRATEGY

A literature review was undertaken in Medline-Ovid, Embase, and ERIC. The detailed search strategy can be found in appendix C1.

References of retrieved articles were scrutinized, and corresponding relevant papers also retrieved. When necessary, authors have been contacted for additional information.

Grey literature was searched electronically through Google, Google Scholars, and the database of important institutions involved in Medical supply planning, such as research centres, health ministries or specific associations, with the following search terms: health AND (workforce OR manpower OR physicians OR human resources) AND (forecast OR planning OR models)

The search was restricted to documents published in French, Dutch, English or Spanish, during the years 1997-2007. Documents reporting on Medical supply planning in developing countries were excluded.

After a first screen, we included in the review only documents reporting on forecasting methods actually implemented and providing details of the modelling process. However, the content of documents not fulfilling this unique inclusion criterion was used to put the discussion in perspective, where appropriate.

Our search yielded 281 references. Content of retrieved documents was scrutinized for details on forecasting models used. 42 documents were retained on the basis of that inclusion criteria and thoroughly read. Paper by Shipman[63] reporting on the use of a supply model for general paediatrician in the USA was excluded because the model was unavailable (URL had changed). Two extraction grids were used. The first one included details of the forecast models reported. The other one focused on measures of models validity.

4.4 RESULTS

4.4.1 Planning models' typology

4.4.1.1 Type of models

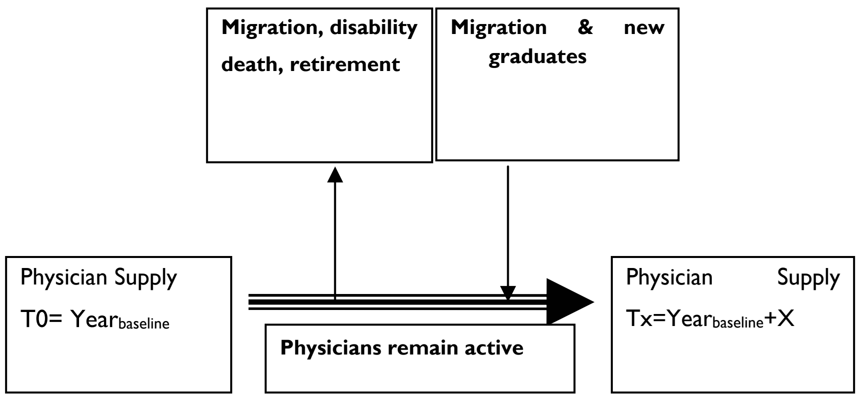
Four main approaches for physician resource planning were identified.[64] Table 34 synthesizes the typology, as well as examples by country. Concrete examples of models in various countries, with parameters included, scenarios used, and predictions, are provided in appendix C2.

A. The **supply projection approach** (also called the **trend model**), relies on physician-per-population ratios and takes into account health-care services currently delivered by the total pool of practising physicians. A physician-per-population ratio is set based on judgements about the existing level and quality of care. This ratio is then used to determine needs for physician training or immigration based on projected requirements. This approach assumes that future requirements for physicians will need to match the quantity of services currently provided on a per capita basis. This approach is thus based on 3 assumptions[5]:

1. the current level, mix, and distribution of providers in the population are adequate
2. the age and sex specific productivity of providers remain constant in the future
3. the size and demographic profile of the providers population changes over time in ways predicted by currently observed trends

Possible changes in demographic features and the delivery system are sometimes factored into the projections. Some caution should be paid to terminology. In such models, needs are defined as the necessary in-flow of human resources to keep or to reach, in some identified future point in time, an arbitrary pre-defined level of service offer. Thus, the computation of requirements is not computed on the basis of population health needs. The overview in Figure 22 shows how simple the conceptual model is. However, such models can gain complexity. First, the supply-based model often integrates parameters of demand (see point 4.4.1.1.B). Second, the model is not necessarily based on simple headcount of providers but also can integrate parameters more or less refined of professional productivity. The model can also serve for scenario making, i.e. changes in the skill-mix. In such instance, the model is called by some authors **substitution model**, for instance by Persaud et al.[65, 66] **The service targets approach** is similar to personnel-to-population ratio. Requirements are defined on the basis of pre-sets health service targets, e.g. staffing required for expansion of facilities.[62]

Figure 22. Overview of the Physician Supply Model

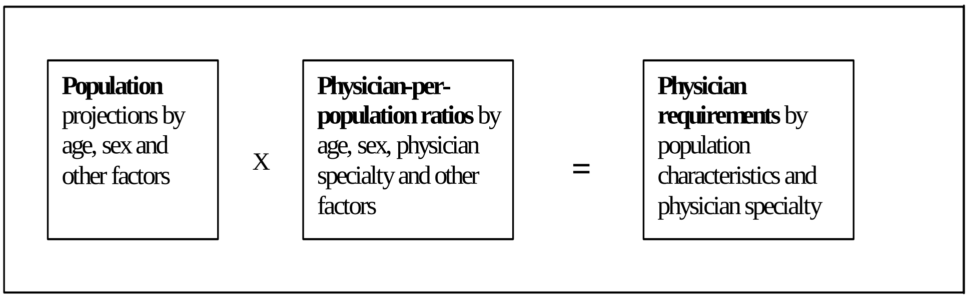


B. The **demand-based approach** (also called the **requirement model** or **the utilization-based approach**) examines the quantity of health-care services *demanded* by the population (Figure 23). *Demand* refers here to amounts of the various types of health services that the population of a given area will seek and has the means to purchase at the prevailing prices within a given time period. Physician requirements are estimated based on the number and type of projected services and on the physician-per-population ratios in the reference population (population at baseline or benchmarking). This information can be derived from analysis of billing data[67] or from other sources. Generally, the population characteristics used are limited to age and sex (demographic models), although other characteristics could/should be incorporated, such as existing market conditions, institutional arrangements, access barriers, and individual preferences.[68] Most often also, this approach assumes that physicians are required for all health services that are demanded,[69] but the approach can be modified to reflect potential changes to the delivery system.

The approach is based on 3 assumptions:[5]

1. the current demand for health care is appropriate and appropriately met by current level, mix, and distribution of providers
2. the age and sex specific resource requirements remain constant in the future
3. the size and demographic profile of the population changes over time in ways predicted by currently observed trends

Figure 23. Overview of the Physician Demand Model



Demand can be estimated through 3 methods[70]:

1. Service utilisation method: data on current service utilisation serve as a proxy of satisfied demand. Further, it is assumed that analysis of past trends in service utilisation allows estimation of the likely future changes in utilisation patterns. This approach is the most commonly used.
2. Manpower/population ratio method: a theoretical relationship (ratio) is established between the population (segmented into different age categories) and the requirement for health service professionals. Future predictions are based on estimated service need per unit of population and forecast population scenarios. An example of such an approach is given by Morgan et al. who assessed the adequacy of the oncologist workforce in Australia by using the reference ratio of 7 oncologists per million population. This reference ratio was derived from international benchmarking and expert evaluation.[71]
3. Economic demand method: an assessment is made of the current and future social, political and economic circumstances, and how consumers of services, service providers and employers will behave as a result of those circumstances. This approach has been used by Cooper in his provocative paper, where he suggested that economic projections could serve as a gauge for projecting the future utilization of physician services.[72]

As for the supply-based model, models can get quite complex given the level of precision and prediction flexibility targeted. The Physician Requirements Model of the Health Resources and Services Administration, in the USA, provides a nice illustration of this (see Figure 24).

Figure 24. The Health Services and Resources Administration (HSRA) Physician Requirement Model [73,74]

The HSRA Physician Requirement Model divides the world of patient care into 3 domains:

1. Population: the model accommodates 108 population combinations of gender, race, age, and insurance status
2. Physician specialty: the model includes 18 medical specialties
3. Care setting: the model accounts for 5 settings (physician office; emergency room or outpatient; short term hospital stays; operating room; long-term care/nursing home visits)

The projection process involves 3 basic steps:

1. To assess the per capita utilization rates experienced in the reference population by each population segment (i) with respect to various combinations of physician specialty (j) and care setting (k). For each population segment, utilization rate (R) in the base year (Y) is computed by reporting the volume of services administered (V) to the number of persons (P) in that population segment during that reference year (y).

$$R_Y(i,j,k)= V_Y(i,j,k)/P_Y(i)$$

2. To project future year utilization. For each combination of population segment, specialty and setting, the projected number of units of service required in future years. P(i), the number of persons in population segment I, varies as the population grows and undergoes demographic changes. Also for each population segments (P), the utilization rate (R) can be modified to reflect anticipated changes in the health care delivery system or in the utilization patterns of selected groups.

$$V(i,j,k)=P(i) \times R(i,j,k)$$

3. To convert the future year utilization to number of full-time equivalent physicians to express all services, regardless of setting, in the number of minutes required to perform them (physician productivity) = M (j). M can be modified to reflect technological or other changes, e.g. to inflate M(j) to reflect the average percentage of time devoted by physicians of that specialty to indirect patient care.

C. The needs-based approach (also called the **epidemiological approach**) involves defining and predicting health-care deficits along with appropriate health-care services. *Needs* refers here to the number of workers or amount of services necessary to provide an optimum standard of service and to keep the population healthy. This planning method combines information on the health status of the population with disease prevalence, demographics and appropriate standards of care both present and future. The information is essentially provided by professionals. This approach has been utilized in the USA in the early 80s, by the Graduate Medical Education National Advisory Committee (GMENAC). Their model used epidemiologic evidence for each specialty, modified by professional opinion on the need and appropriateness of care for various conditions to estimate physician need (Delphi technique).[75] The following points are considered:

1. incidence rates of specific conditions
2. percentage of persons with that specific condition who should see a physician
3. rate of commonly performed procedures
4. percentage of procedures that should be performed by a specialist
5. associated inpatient and office visits per procedure

6. productivity estimates-profile of weekly workload.

This approach relies on 3 assumptions:[5]

1. all health care needs can and should be met
2. cost effective methods of addressing needs can be identified and implemented
3. health care resources are utilized in accordance with relative levels of needs

This approach has also been used by other authors[76,77] and is currently used in Latvia (Personal communication, K. Klavina, Ministry of Health, Latvia).

An important limiting factor of the needs-based approach is the availability of extensive epidemiological data. This limitation has led some authors to use an alternative approach based on utilization data, by making the assumption that, at least in universal health care system, utilization of services could be a valid approximation of the need for services. A neat example of this approach is given by Persaud for ophthalmologists in Ontario.[65,66] The author used the physician billing claims to measure utilization of services, and then modified those data for unmet needs and excess utilization to ensure that they are representative of need. The modification was based on the use of a Standardized Utilization Ratio, the health insurance utilization data being adjusted at provincial level for income, education level and Standardized Mortality Ratio.

The needs-based approach is also more useable when predicting numbers in a specific care speciality, because incidence of the diseases managed within that care speciality can be approximated with more accuracy. An example is the radiologists forecast in Australia. One radiation oncologists is expected to treat 250 new patients per year. The number of radiation oncologists required is thus determined by calculating the number of patients with newly diagnosed cancer during that year and dividing the assumed 50% treatment rate by 250.[71]

Table 35. Overview of forecasting strategies[nn]

Forecast strategy	Concepts	Strengths	Difficulties	Countries
1. Supply model	To predict the number of physicians required to maintain the current level of services given the likely changes in the profession (ageing, feminization, etc…)	Good accuracy to predict physicians number at 10-15 years if good quality data are available	Perpetuates current physician/population ratio assumed to be adequate Errors in prediction in case of incomplete model (substitution rates, mobility patterns …) Productivity of providers may vary Evolution of demand not always considered	USA78,79,63,80, 81 Australiaoo82-84 Nova Scotia, Canada85 France86,87,88,89
2. Demand model	To predict the number of physicians required to match the current level of services given the likely changes in the demand (mainly according to future population age and sex; GDP growth is sometimes considered)	Relatively easy. Billing data can be used to assess age and sex specific rates of utilization	Perpetuates current utilization of services (SID, inappropriate services not addressed) Assumes that MDs are the main actors and that any care is useful Demand for non curative services (prevention, research) and future trends not considered Demand for health care may evolve	USA72,73,90,79 Canada67,65, 66 The Netherlands91
3. Needs-based model	To predict the number of physicians required to provide appropriate health care to the future population	- Normative, avoid the perpetuation of existing inequities and inefficiencies - Unmet needs included in the estimation process	Requires detailed knowledge of the efficacy of individual medical services for specific conditions No account of technological developments and changes in the organization of health services The assumption that health care resources will be utilized in accordance with relative levels of need is not necessarily verified Ignores the question of the efficiency in the allocation of resources between different sectors of the society Requires huge amount of data	USA75,90,92 Ontario, Canada93,65,66 Australia71
4. Benchmarking	To define to a current best estimate of a reasonable physician workforce observed in a reference health system.	- Realistic	Only valid if communities and health plans are comparable, i.e. adjusted for key demographic, health and health system parameters The extrapolation methodology is often not sufficiently documented. Criteria to select reference not always transparent	USA94,95,78,90,96 Australia71

nn Belgian models are described in chapter 2.

oo Stochastic simulation

D. Benchmarking is based on identifying regions or countries that are similar in their demographic and health profiles, including overall mortality, but are markedly different in their costs and deployment of health care resources. Municipalities and health plans that achieve low levels of deployment of clinically active physicians without a measured loss of patient welfare due to a shortage of physicians are considered benchmarks. Those benchmarks are then used as a current best estimate of a reasonable physician workforce active in patient care for planning.[95] Benchmarking is thus based on real-life examples and expresses the question of the needed medical manpower in term of efficiency: could a similar level of health be attained with less human resources? Benchmarks can be neighbouring countries or regions within a country, or point estimates from a need-based approach. For instance, Lurie et al. used 4 benchmarks to estimate the number of future generalists "needed" in the USA: COGMA's upper and lower estimates of desirable generalist supplies, and two regions that had a relatively low and high supply of generalists.[78] Most of the forecasting in the USA during the 80s and the 90s, whatsoever the planning model (supply-, demand- or mixed model), was indeed based on benchmarking. The comparison reference was the staffing pattern in HMOs with adjustments to extrapolate to the general population.[97, 90] Rizza et al. listed the underlying assumptions of such an approach:[96]

1. No care is provided to members of the population by providers outside of the HMO, and the providers in the HMO provide care only to members of the HMO;
2. the HMO is itself in equilibrium and has the adequate number and mix of providers for the HMO population;
3. the providers in the HMO have a similar activity pattern (specialized versus general care) and devote a similar amount of time to other professional activities as do other providers outside the HMO;
4. the population in the HMO is representative, in terms of its health care needs and the quality of care received, of the more general population.

In benchmarking, the extrapolation methodology is crucial. To draw relevant lessons from a reference models to a specific situation, adjustments are necessary for population demography, population health, patient's insurance, physician's productivity, health system organization. Obviously, those adjustments will be possible only if appropriate information is available.

E. Mixed models and scenarios

Our models typology has been set up to ease understanding. However, in reality, supply projections are often based on mixed methodologies. For instance, in the Netherlands, epidemiological projections were considered along with demographic projections to estimate the evolution of health services demand.[91] The most common mix encountered in literature associates supply-based and requirement-based parameters, which allows performing gap analysis for future years and taking action to make medical supply match the requirements. Again, the supply-to-health care utilization ratio at baseline is assumed appropriate and serves as a reference for any gap analysis in future.[79,94] Modelling also allows generating scenarios, i.e. to assume variations in important parameters. The physician forecasts in California provide a neat example of the utilization of such scenarios (Table 35)[98] as well as an example of a forecast matrix based on different model types with various scenarios.[94]

Table 36. Projected Growth in Demand for Physicians per 100 000 Population in California, 2002-2015[98]

	Constant insurance environment	Expanded insurance environment	
Demand	**% Growth**	**% Growth**	**Scenario description**
Scenario 1	2.2%	11.9%	Baseline (Demand scenario 1)
Scenario 2	11.9%	22.5%	Economic expansion (Demand scenario 2)
Scenario 3	10.3%	18.3%	Age-specific physician utilization rate changes (demand scenario 3)
Scenario 4	- 2.5%	6.7%	Unnecessary/marginally beneficial services eliminated (Demand scenario 4)
Scenario 5	6.7%	16.8%	Economic expansion + Unnecessary/marginally beneficial services eliminated (Demand scenario 5)
Scenario 6	5.1%	12.8%	Age-specific physician utilization rate changes + Unnecessary/marginally beneficial services eliminated (Demand scenario 6)

The **Effective Demand-based approach** is another example of mixed model. In this approach, the epidemiological principles of the needs-based approach are complemented by economic considerations, i.e. fiscal resources constraints are integrated in the model.[99] Under this approach, the starting point is to estimate the future size of the economy for which health providers as well as all other commodities are to be funded. This is then used for estimating the proportion of total resources that might be allocated to health care. This approach can be in turn incorporated in a methodological mix. For instance, O'Brien-Pallas has built a dynamic system-based framework which considers: 1) population characteristics related to health levels and risks (needs-based factors); 2) service utilization patterns, provider deployment patterns (utilization-based); 3) the economic, social, contextual, and political factors that can influence health spending (effective demand-based).[100] The **Effective Infrastructure approach** is also based on needs assessment but complemented by infrastructure consideration. The reasoning is that there is little point in having a workforce greater than the physical capacity of the health system to gainfully employ or use that workforce.[101]

Another mixed approach was utilized by Rizza et al.[96] for endocrinologists in the USA, in which the endocrinologist to population ratio computation is based on a Markov-population model including elasticities derived from benchmarking. [pp]

4.4.1.2 *Modelling strategies*

Issues relating to human resources are complex in essence, and such complexity will be only partially captured in **static models,** based on a **deterministic approach,** such as the majority of models reviewed in section 4.4.1.1. Even when personnel to population ratios, population based rates, and utilization-based rates were used as the basis of computerized simulations, these models lacked the capacity to examine the dynamic relationships among inputs/outcomes. There are alternatives to such bounded approach.

pp in the form: $P_t = P_{t\_1}(1+\Sigma \varepsilon_x(\Delta X_{t\_1,t}/X_{t\_1}))$ where Pt is the endocrinologist to population ratio at period t ; $(\Delta X_{t\_1,t}/X_{t\_1})$ is the change in demand factor X between period t-1 and t as a proportion of the initial period's rate; and ε_x is elasticity, i.e. the behavioural parameter relating the proportionate change in factor X to a proportionate change in demand for endocrinologists as measured by the endocrinologist to population ratio.

First**, regression modelling** could be a more appropriate approach. Theoretically, regression models can be fit for health workforce projections. Such models allow to adjust for the effect of various parameters and to estimate the importance of each of those parameters on the supply and requirements for health care professionals. It would also be possible to compute confidence intervals around the required numbers. However, such models have been seldom used so far. It was done in the USA by Angus et al.[79] and by Lipscomb et al.[102], in Australia[103], and in Ontario by Persaud et al.[66, 65] The difficulty to obtain accurate data on determinants of services utilization and provision is an obvious difficulty.

Regression models can also serve as a basis for indirect standardisation, as this was the case for general practice workforce modelling in Australia.[103] However, in that case, the regression models aimed at identifying workforce imbalances at the national level and were not used for forecasting purposes. A slightly different methodology was used in the USA by Lipscomb et al. who determined physician requirements through empirically based models. Two sets of models were fitted: 1) production functions model, with patient workload dependent on physicians, other providers, and non personnel factors, estimated for various patient care areas in a medical centre; 2) inverse production functions, with physician staffing levels dependent on workload and other factors, estimated for various speciality grouping. Those models were then used to yield estimates of future staffing requirements conditional on future workload, but also to compare current physician staffing in a given setting with system wide norms, i.e. detect under- and over-supply.[102]

Murphy also underlines the importance of multilevel modelling when comparing HRH among or between communities.[104] That technique acknowledges both the ecological fallacy (i.e. transferring results from aggregates to individuals) and the atomistic fallacy (i.e. researching exclusively at the individual level, thus failing to account for the context in which the individual action occurs).

Second, uncertainty in health projections needs to be assessed. The two commonly-used approaches are **deterministic sensitivity analysis** and **stochastic simulation**. In sensitivity analysis, the input value of one variable is changed while the input values of other variables are held constant. A sensitive variable is detected if a change in its value results in a considerable change in the outcome. A range of projections can then be produced by varying the input value of the sensitive variables.[105] In stochastic simulation, the value of input variables is randomly assigned according to its probability distribution and the outcome of the projection will also be a random variable. This process is repeated until a large number of projections have been made.

The mean and the variance of the projection's outputs can then be estimated, and the uncertainty of the projections can be quantified by calculating a confidence interval within which the true value is located. Song and Rathwell[105] who developed a simulation model to estimate the demand for hospital beds and physicians in China between 1990 and 2010, compared the two approaches. Their simulation model consisted of three sub models: population projections, estimation of demand for medical services, and productivity of health resources. They produced three estimates, including the low and high limits, and the most likely value for each variable. Their findings indicated that the stochastic simulation method uses information more efficiently and produces more reasonable average estimates and a more meaningful range of projections than deterministic sensitivity analysis. They also mentioned that stochastic projection can be combined with deterministic sensitivity analysis in a projection. The stochastic projection can be used for factors that can not be controlled by policy-makers, such as population changes, while selected controllable factors may be conveniently tested by deterministic sensitivity analysis. More recently, Joyce et al.[84], Anderson et al.[90] and Lipscomb et al.[102] have begun testing models for planning resource requirements in health. In theory, simulation is much more flexible, in that it can model the evolution of a real-world system over time based on mathematical or logical relations between objects and probability distributions. Simulations can be used to analyze 'what if' scenarios, a capability essential for use in health system planning. However, the importance of continuously updating estimates cannot be overstated.

While they are easier to apply than analytical methods and require fewer simplifying assumptions, simulations can be costly to implement because of their detailed data requirements.

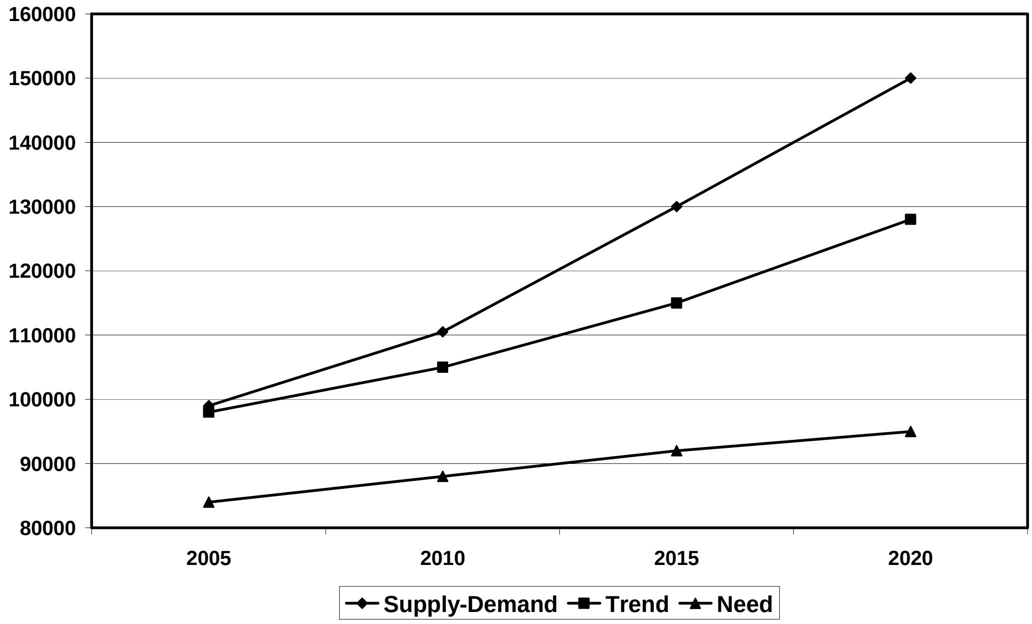
4.4.2 Validity of models

Validity is defined in the present framework as the capacity of a model to predict the adequate health workforce at some identified future point in time. What is adequate health workforce relies upon the assumptions underlying the planning process and is not at stake here. We propose 3 ways for exploring models validity. The first one is to compare how a set of models applied in a same situation and a same time-period produce matching predictions. The second one addresses internal validity. The last one confronts predictions and actual figures.

4.4.3 Variability between models

Different models used for prediction of health human resource requirements will produce different estimates. Figure 25 for workforce forecasts of family physicians in the USA to year 2020 provides a nice illustration of this statement. Another example of such discrepancy is given by Anderson et al. who forecasted the requirement of oto-laryngologists in the USA following three methods: benchmarking against managed care; demand-utilization modelling; and adjusted needs assessment modelling.[90] The best estimates for year 1994 went from 6 611 oto-laryngologists with the adjusted needs approach to 8 860 with the demand-based approach. In 1994, the actual number of oto-laryngologists was 7 006. Thus, according to the approach, a diagnosis of over- or under-supply could be drawn. Anderson et al. considered the managed care approach the most appealing because it reflected the work force staffing ratios of managed care organizations that operate efficiently in the marketplace. However, each of the approach presents its own limitation. In each of the models, it was possible to show a shortage or surplus of physicians by altering one or more key assumptions. Persaud et al. also tested the predictions yielded by a range of models.[65, 66] Their prediction of requested ophthalmologists in Ontario for year 2005 went from 489 FTE (physician/population ratio based on expert recommendation) to 526±16 FTE (substitution model), 559±17 FTE (utilization-based model) and 585±16 FTE (needs-based model). Besides discrepancies, it is noteworthy that the 3 last models yielded quite close predictions. Interestingly, Politzer et al. reviewed five projections methods made for generalist and specialist care requirements in the USA and reached the same conclusion that different models yielded different figures. But they took advantage of these differences to conduct a type of meta-analysis and to derive from it requirement bands, instead of one unique requirement figure.[106] This approach is indeed also a way of accounting for projection uncertainty.

Figure 25. Family Physician Workforce Forecasts, 2005 to 2020, USA (available at http://www.graham-center.org/onepager39.xml)



The results of projections differ because the models are based on different assumptions. The supply model assumes that existing trends, policies, and training positions will be maintained, thus expecting and accounting for no future changes in market factors. The ratio approach is simple and inexpensive, but its utility is limited as the implicit assumption is that changes in other variables are irrelevant. The demand model assumes that physician numbers can increase in response to an expected rate of economic growth. The need model assumes that the number of physicians should match the calculated number required to provide adequate medical services to the future population. The 2 first types of models are based on extrapolation, while the third one is based on expert scenarios. The 2 first types of models aim at predicting a likely future given the current parameters, although some changes can be factored in the models, the third one relies on a normative approach, as it poses the question: which health care professional or group of professionals can provide the necessary services most cost effectively and efficiently? According to Lomas (cited by Persaud[65]), the needs-based model predicts physician requirements that are usually exceeding those generated by other models. This statement was not verified however in the case of the COGME predictions[75] or in the present example. The models also differ in limitations, implications for population health outcomes, and resource costs (http://www.graham-center.org/onepager39.xml). It should be noted however that planners often base their predictions on mixed models, i.e. models integrating supply parameters and demand parameters.

4.4.3.1 *Variability within models*

Whatever the modelling approach is, estimates for requirements will not be exact numbers but instead, a range of numbers, as several authors suggest it.[5,105,90] Supply-, demand-, and needs-based models are Markov-population models, also called "stock and flow models". Some countries have used alternatively or synchronically the 3 types of models, such as Canada, the USA, or Australia. A Markov-population model can furnish a projection for the workforce supply in some future year, provided that the error present in the projection is small and quantifiable, i.e. the inflow and outflow parameters are known with certainty. However, planners and politics need to acknowledge the following limitations:

1. Small uncertainties in inflow and outflow parameters will add up through projection years, and might result in great inaccuracy.

2. Trends are considered to keep on developing infinitely, without considering plausible limits. However, such modelling can feed scenario approach, where the effect of various assumptions for future health workforce is assessed.
3. Another drawback of such models is that calculation of statistical confidence intervals is impossible. However, there have been attempts to apply those models in a more probabilistic sense.[102,90,84]

Although appealing because of its simplicity, benchmarking also presents a number of drawbacks. A similar medical density can provide very different levels of care according to care accessibility, provider productivity, task sharing or prevailing health care delivery model (e.g. the role of a family practitioner can vary very much across countries). Accurate information on those parameters is seldom available when forecasting health manpower. Finally, determinants of population health itself, such as environmental health hazards or lifestyles, can impact on the results. For those reasons, it is recommended to use regional benchmarks that are comparable in demographic characteristics and have a similar health system.[95]

Three set of factors will influence the model validity: parameter uncertainty in the reference population, i.e. data quality at baseline; the plausibility of scenarios, i.e. the likelihood of the underlying assumptions as regards projections; and the goodness of fit of the model, i.e. comprehensiveness and adjustment for confounding and/or interacting factors.

1. Data quality is one of the key challenges. Easily accessible clinical, administrative and provider databases are often lacking to conduct complex modelling activities. The imprecision of parameter estimates is striking. Even the number of physicians in activity can be difficult to assess, with important variations between databases. This is the case in France, (Prof Berland, Director of the ONDPS, personal communication), in Canada[107] and in Belgium as well (see chapter 2 on the Belgian situation). Moreover, the forecast usually focus on headcounts, with loose translation into effective workforce. The Australian case illustrates perfectly the importance of good quality data: although based on refined modelling strategies, predictions were however rapidly invalid because data on actual retirement rates was of relatively poor quality. Another example of loose evidence base is the sex difference of productivity. It is generally estimated that women produce 20% less medical services than their male counterparts, and that estimate feeds a lot of models.[108] However, this estimate is not universally applicable and rapidly evolving, even within a specific country.

2. Likelihood of the underlying assumption.

Forecast models rely on a number of underlying assumptions. For example, Anderson et al. used 3 types of models to forecast oto-laryngologist requirements. In each of the models, it was possible to show a shortage or surplus of physicians by altering one or more key assumptions.[90] Another example comes from Canada. In 1998, an under-supply of physician has been predicted over the next 25 years based on an estimated 31% reduction of the physician to population ratio.[109] However, if age and sex specific needs were to be reduced by 1% per year and average productivity of physicians increased by 1% per year, the physician-population ratio would increase by 27%.[93]

Therefore, a sensitivity analysis of the models is paramount. This is however rarely the case in models published so far.

Table 36 presents means of assessing model validity.

Table 37. Means of assessing model validity

1. Stochastic simulation, e.g. Monte Carlo simulation analyses based on bootstrap sampling	102, 105, 84
2. Deterministic sensitivity analysis	105
3. Residuals plot approach	103
4. Split-sample analysis	
5. Re-estimating the dependent variables with subsequent years of data	84
6. Clinical plausibility assessed by a panel	102

3. Goodness of fit of the model

In the models reviewed above, adjustment for confounding and/or interacting factors is generally minimal (i.e. for the supply side: profession ageing and/or feminisation; for the demand side: population ageing and/or population growth and/or GDP increase). Macro-econometric and micro-econometric models of the health care system can be used to draw a more comprehensive view of the health manpower planning. However, such models require considerable amount of data.[110]

Some authors have recommended accounting for inaccuracy in estimates through a stochastic approach. However, such approach is quite new in this field of activity, and concrete examples of the benefit of such approach are rare.

4.4.3.2 Retrospective analysis

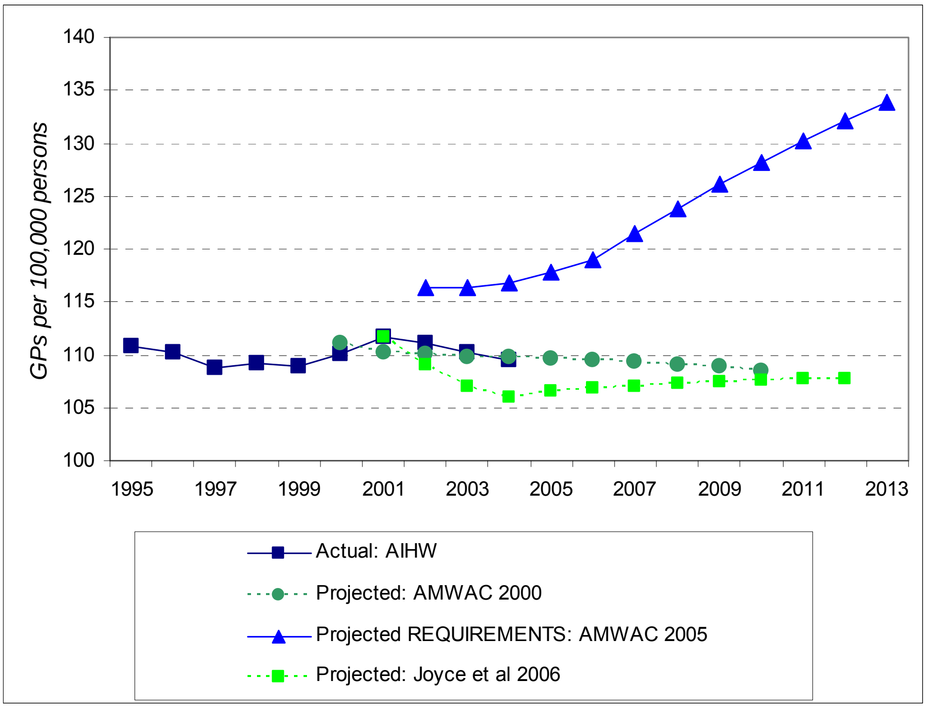
Validity of models, i.e. the goodness of their predictions, can be addressed by analysing how successful were past projections in either predicting or modifying the future. However, there have been few empirical applications and evaluations of the conceptual frameworks developed in the last 20 years. Such evaluation is also made difficult by the use of mixed models. Supply requirements are forecasted so as to meet predicted demand (target supply/demand ratio). But on the one hand, there are not direct means to assess if the target was effectively realized.[84] On the other hand, even in case of correct forecast, the perception of what is an adequate supply/demand ratio can have evolved, as illustrated by the USA case study (see appendix C 3). It is nevertheless possible to test at least the validity of predicted supply headcounts. For various countries, we got the HRH statistics for recent years and compared them against the predictions previously made by HRH planners. Results are presented in Table 38.

Table 38. Predicted and actual physicians headcounts in selected countries

Author	Country	Work force	Models and analysis	Year	Predict	Actual	Source of data	Time lag	Error
Persaud [65, 66]	Ontario, Canada	Ophthalmologists	Multiple regression	2005	418±10	387	Ontario Physician Human Resource Data Centre (https://www.ophrdc.org/Public/Report.aspx?owner=pio)	10	-5.4%
Joyce [84]	Australia	All MDs	Stochastic modelling	2001	54 294	56207	Australian Institute of Health and Welfare (http://www.aihw.gov.au/search.cfm/criteria/Medical%20labour%20force)	2	3.5%
				2001	55 000	59004		3	7.3%
Doan [89]	France	All MDs	Deterministic	1982	180 691	164667	National Medical Council	6	9.7%
				1985	193 160	184156	National Medical Council	9	4.7%
				1988	197 406	189802	National Medical Council	9	4.0%
				1992	185 260	184516	National Medical Council	2	0.4%
					192 779	196968	National Medical Council	7	-2.0%
					195 714	211425	National Medical Council	12	-7.4%

There is a margin of error in all of the predicted physician headcounts, and the error size increases with the time lag between prediction and assessment. For instance, in Australia, workforce projections have been computed with baseline year 2001 to 2012, on the basis of a supply-based approach.[84] For the first time, stochastic modelling, which uses random numbers and probability distribution, was used. Details of the modelling are given in appendix C2. The validity of the modelling has been investigated by comparing the projections with the actual workforce numbers in the early part of the projection period (2002-2003). For 2002, there was a close similarity between the predictions and the actual data. But for 2003, the projections were already 3.5% lower than the actual numbers (Figure 26). The authors concluded that “the model might be a conservative estimate of growth, and any potential shortages might be less than we predict”. The reason invoked for such discrepancy is an estimate of retirement rates higher than the actual rates (Joyce, personal communication). The example from France demonstrates also very well that the estimates become increasingly unstable the farther one projects into the future.

Figure 26. General practice workforce in Australia: Actual and projected 1995-2013. Courtesy of Catherine Joyce



4.5 DISCUSSION

4.5.1 Importance of the gap analysis

One major weakness of the models reviewed is the lack of gap analysis in the reference year. Most of the forecast make the assumption of adequate health workforce at baseline. The objective of the projection exercise is therefore to compute the future workforce required to maintain the current equilibrium by taking into account evolving supply and demand trends. However, to assess the adequacy of the workforce and determine whether there is currently a shortage or excess supply is core to manpower planning. Examples of such baseline gap analysis are few. Rizza et al. made an attempt to apprehend the level of balance between supply and demand at baseline.[96] The authors estimated "current" demand with 3 indicators: the increase of office visits to endocrinologists in previous years coinciding with a decrease in overall sub-specialization rate; the waiting time for initial visit relatively greater for endocrinologists than for other specialties; and an HMO "benchmark" indicating that 12.2% more endocrinologists would be necessary to provide the US population with health care services equivalent to those provided in the reference HMO. Also noteworthy, the authors looked at the effect of varying the estimate of the baseline gap between supply and demand on predictions. Morgan et al. accounted for the deficit in radiation oncologists at baseline to compute projected requirements. The specialist deficit was measured by reference to a needs-based estimate. In Australia in 1997 a deficit of 20% in the number of radiation oncologists was reported.[71]

Some indicators can be helpful to perform gap analysis[101,62,111] (Table 38).

Table 39. Indicators of undersupply and oversupply proposed by the AMWAC (adapted from Gavel[101])

Indicators of undersupply	*Indicators of oversupply*
Doctor provision well below the national average	Growth of the workforce well in excess of population growth
Under-servicing and unmet need; unacceptably long waiting times; dissatisfied consumers with access	
Over worked practitioners; high levels of dissatisfaction with the stresses of overwork and inability to meet population need;	Declining average patient numbers; declining average practitioner incomes; insufficient work/variety of work to maintain skills
Vacancies, unfilled public positions; employment of temporary-resident doctors to fill unmet need; substitution of services by alternative providers	Underemployment, wasted resources

To base a gap analysis on such indicators assumes that they are valid and available. In reality, these indicators present all some shortcomings and are seldom regularly monitored. Moreover, it remains necessary to determine at what level an indicator suggests workforce surplus or shortage, e.g. when a waiting time becomes unacceptable.

Zurn et al. proposed the following typology[62]:

1. Employment indicators:

- Vacancies. Vacancy-rate is easy to measure but one major limitation is that there is no single level of vacancies considered to reflect shortages, although an increase over time indicates a tight labor market. Moreover, this indicator does not capture private practitioners, and budget constraints or unadvertised vacancies may "hide" a shortage problem.
- Growth of the workforce. A growth of the workforce well above population growth could indicate that a shortage is being remedied. However, the main difficulty associated with it consists of determining whether health workforce growth responds to an initial shortage or to other factors.
- Occupational unemployment rate. An unemployment rate higher than the national rate would indicate a surplus. However, equating health workforce unemployment with oversupply is not necessarily always warranted. For instance, inactivity rate among physicians may reflect complex realities such as attrition for difficult working conditions or alternative working patterns.
- Turnover rate. Level of turnover might be influenced by elements not related to imbalances.

2. Activity indicators. Overtime reflects to a certain extent, the volume of activity of health care personnel, and is therefore quite sensitive to any changes in the workload. It might also be caused by bad management or an inappropriate skill mix.

3. Monetary indicators. Although the real wage rate approach is appealing by its simplicity, one of its main limitations is that the existence of an imbalance does not necessarily gives rise to a wage change as a result of regulations, budget constraints and monopsony power. On the other hand, wages could increase in consequence of productivity gain or union bargaining power, and not due to an imbalance. Another monetary indicator is the rate of return, which is relatively complex to estimate.

4. Normative population-based indicators. Although it is easy to estimate, there is no one unique gold standard for doctor/population ratios. The adequacy of the ratio must be considered in the view of the health system organization and funding, skill-mix, practice pattern, morbidity indicators.

Zurn et al.[62] concluded that relying on a single indicator is insufficient to capture the complexity of the imbalance issue. It is suggested that a range of indicators should be considered, to allow for a more accurate measurement of imbalances, and to differentiate between short and long term indicators. In addition, further efforts should be devoted to improve and facilitate the collection of data.

4.5.2 Limitations and expectations regarding planning models

Approaches to estimating medical supply requirements are plagued with methodological and conceptual limitations (see Table 39).

Table 40. Methodological and conceptual issues in planning models

Units	- Headcounts do not reflect variation in effective workforce - FTE measured in working hours can translate in variable effective workforce - FTE defined in reference to the most active physician categories makes the assumption that this activity level is relevant
Data quality	- Routine data are useful but provide generally limited information - Various data source coexist with inconsistencies - Qualitative data for in-depth understanding of trends is often lacking
Categories of HRH	- Computation of HRH requirements by specialities obviates professional interactions and skill-mix, and is thus unrealistic - Assessing skill-mix requirements is a complex task and documentation is often lacking
Supply parameters	- Information other than age, sex, and services volume, is unavailable - Level and mode of activity are sensitive to the environment and rapidly evolving
Demand parameters	- Assessing impact of new technologies, emerging pathologies, demography changes requires a bunch of data and expertise - Level and mode of health care utilization are sensitive to the environment and rapidly evolving
Modelling	- Deterministic models are likely to provide inaccuracy without providing means to evaluate it - Regression modelling with stochastic simulation can be innovative in the HRH field but background is lacking - Regular updating of data is paramount but resources-consuming

The focus to date has very much been on the impact of demographics change on individual health professions, i.e. mainly the effect of an ageing population on the service requirements, and the effect of an ageing workforce on the capacity to meet requirements.[93]

As a result, many countries, such as the United Kingdom, Canada, the United States, France, or Australia, are balancing from predictions of surplus to warnings of shortage with a perplexing frequency. The USA example is detailed in appendix C3. There is no accepted approach to forecasting physician requirements.[112] This is a disappointing statement regarding current utility of planning models.

However, a responsive planning for the future medical workforce remains necessary, as rapid changes are taking place in supply of medical practitioners and the requirement for their services. Finding this balance requires continuous monitoring, careful choices given the realities of our country, and the use of research evidence to ensure that population health needs are addressed effectively and efficiently.[5] Flexibility, relevance, and validity in planning require both ready access to timely information that is accurate and use of appropriate conceptual and analytic techniques. Australia has been for years at the forefront of developing medical workforce planning approaches. However, it has been only recently acknowledged that the Australian workforce planning so far had not taken into account the full range of dynamic variables that are involved, nor accounted for their inherent uncertainty and complex interactions.[113] Subsequently, Joyce et al. proposed a more effective approach to medical workforce planning, based on 3 key features:

1. An effective monitoring of all key factors affecting supply and demand, i.e. an effective systematic collection of good-quality data to monitor trends over time.
2. A system-level perspective, integrating medical workforce planning with workforce planning for other health professionals, and with workforce development, service planning and financial planning for the health care system. This broader approach has also been advocated by other authors.[99,100]

3. A dynamic approach, i.e. to undertake workforce planning in a planned cyclic fashion, with stochastic models to account for the uncertainty inherent to health systems.

Although this may seem a tautology, forecasting specialists are needed to provide valid forecasts. That most of the published studies on workforce projections in specific specialities are produced by members of the speciality under consideration may cast some doubt on the validity of the approach and interpretations. Probably the most striking example is given in Shipman et al.[63] As the authors had observed that the projected expansion was much bigger for the general paediatrician workforce than for the paediatric population, they concluded that '*to maintain practice volumes comparable to today, paediatricians of the future may need to provide expanded services to the children currently under their care, expand their patient population to include young adults, and/or compete for a greater share of children currently cared for by non paediatricians*".

Good quality and updated data are necessary on:

- Current medical practice and likely trends: productivity, skill-mix, part-timing, working time; analysed by age range, sex, practise location, and speciality
- Qualitative appraisal of actual functioning of health professionals: levels and sources of dissatisfaction; intent to retire early or migrate; difficulties met and improvements foreseen
- Current health care utilization and likely trends: population ageing, emerging morbidities, new health technologies, new legal regulations

4.5.3 Political aspect of health workforce planning

There is no unambiguous "right" number and mix of health professionals.[114,112] Instead, health provider requirements will be determined by broader societal decisions about the level of commitment of resources to health care, organization of the delivery and funding of health care programmes, and level and mix of health care services. The value of projections lies not in their ability to get the numbers exactly right but in their utility in identifying the current and emerging trends to which policy-makers need to respond. The requirements for providers are endogenously determined through the political or social choices that underlie the health care system. Only where the social and political choices about the access to and delivery of care are explicit, can scientific methods be used systematically to derive requirements for health care providers in a particular population.[93]

Key messages

- **Four main approaches for forecasting physician numbers were identified: the supply projection approach (trend model); the demand-based (requirement model or utilization-based approach); the needs-based (epidemiological approach), defining and predicting health-care deficits; the benchmarking defining a current best estimate of a reasonable physician workforce observed in a reference health system.**
- **Those different approaches can be combined, and modulated so as to account for changes in market conditions, institutional arrangements, access barriers, resources availability or individual preferences.**
- **There is no accepted approach to forecasting physician requirements. All approaches rely on assumptions that influence model outputs.**
- **Models may be useful to make scenarios but should be used with caution to forecast numbers. Three sets of factors will influence the model validity: parameters uncertainty in the reference population; the plausibility of scenarios; and the goodness of fit of the model**
- **Uncertainty of the projections could be appraised through deterministic sensitivity analysis or stochastic simulation.**
- **There is a need to improve data collection to better appraise dynamics in the medical profession.**

5 CROSS-NATIONAL COMPARISONS OF HEALTH SYSTEMS AND PHYSICIAN SUPPLY

5.1 INTRODUCTION

As regards physician supply, and more largely, health systems, countries share similarities. For instance, Federal states have to develop coordination mechanisms between their entities, and welfare states with a Bismarckian-type of compulsory national health insurance have implemented similar policy innovations in recent years. Despite these similarities, differences are great between countries in terms of HRH policies. This can concern the definition of human resources (professional and non-professionals), the production of healthcare workers, their training, their remuneration, the scope of professionals' practice, the distinction of professional roles endorsed by professional categories, as well as the evaluation of population's health needs to be met, and the willingness to meet all of these demands. The methods used to evaluate and forecast human resources in health are also somewhat different.

Comparing similarities and challenges and contrasting policies implemented and results might deepen our understanding and open new avenues. Many countries have become increasingly interested in the lessons they might learn from one another's experiences. This interest leads international organizations such as the Organization for Economic Cooperation and Development (OECD), the World Health Organization (WHO) or the World Bank to gather and disseminate updated information on the availability of health resources and on health status measures.[115] This interest for cross-national comparisons goes along market globalization which increasingly affects health care systems. In fact, trans-national mechanisms, such as European laws and international mobility of health workers, make cross-national analyses even more relevant.

5.2 PURPOSE AND METHODOLOGY

The purpose of this chapter is to present the results of a cross-national review on health care systems and physician supply and to identify implications and lessons for Belgium.

Six country overviews were included in the cross-national comparison, the first one being Belgium (presented in chapter 2). The selection of other countries focused on the Western European countries (France, Austria, Germany and The Netherlands) in order to offer a potential interesting lesson for Belgium. The countries were chosen to represent diversity in funding structures, systems of provision, payment mechanisms and their approach to central planning. Germany and Austria are federalized European countries like Belgium and adopt a Bismarckian health insurance scheme. France and the Netherlands, two neighbouring countries, share a similar health insurance scheme. Australia was included because it presents one of the more advanced examples of workforce planning methodology and process although focused exclusively on physicians at this point. Based on a strategic framework, the Australian Medical Workforce Advisory Committee carried out a number of studies for physicians overall and by discipline.[116]

All these countries are able to organize the complete medical training in their own universities and offer the opportunity for specialists to pursue their specialization. In all of these countries, except the Netherlands, physicians are paid on a fee-for-service basis. Finally, all these countries face a substantial increase of health care expenditure over time and try to contain it by undertaking reform of their health care systems or introducing regulations to control physicians supply or medical services utilization. Nevertheless, these countries present significant differences. For example, in the Netherlands, general practitioners are effective gatekeepers who limit access to specialists and hospitals.

Moreover, GPs are funded through a fixed contribution per enrolled patient and per consultation and are not paid on a 'fee for service' basis.

Some of the study countries have created a national research organization which produces studies on different themes related to health care provision and health care management and generates policy-relevant knowledge and expertise for policy-makers (KCE in Belgium, Observatoire National des Professions de Santé – ONDPS – in France, Nederlands instituut voor onderzoek van de gezondheidszorg – NIVEL – in the Netherlands, Österreichisches Bundesinstitut für Gesundheitswesen – ÖBIG – in Austria, Australian Medical Workforce Advisory Committee – AMWAC – replaced by The Health Workforce Principal Committee since 2006 in Australia).

Data collection was based on a literature review, including grey literature such as reports from international or national institutions, and on consulting stakeholders in the included countries.

The literature review was not systematic, but designed to identify and learn from the experiences of selected countries with respect to the description of health system, human resources in health, physicians demand and supply, regulation and physicians' role in the health care system (gate-keeping function, tasks delegation…). The following electronic databases were searched for relevant articles, databases and monographs published since 1990: Medline (OVID), Pubmed, EMBASE, Social Science Citation Index and ECONLIT. Individual journals in this field were searched and additional studies were collected from the bibliographies of articles retrieved.

Key words were utilized such as "health care system" OR "health care expenditure" OR "physician supply" OR "health manpower-physicians" OR "physician manpower" OR "medical workforce", "physician density" OR "physician distribution" OR "physician shortage" OR "physician training" OR "numerus clausus in medicine", combined with the name of the country.

For each country, we downloaded the more recent report published by the European Observatory on Health systems and Policies entitled "Health system review". 'Grey literature' was also accessed through Google and Google Scholars with same key words, as well as through a variety of government, academic and professional association websites and contacts. National correspondents and a number of experts in this area of research were also contacted in an effort to access official or unpublished documents produced by governments, research centres, professional associations (e.g. Medical Chambers), universities, unpublished studies and conference papers.

The search was restricted to documents published in French, Dutch, English and German, during the years 1990-2007.

Data collected through this extensive review were extracted in an analysis matrix, and a case study was written up for each country. Case studies were then submitted to native experts for revision:

Austria: Alexander Thomasser is deputy head of the department for organizational and personnel development of the LKH Villach and project manager for international healthcare projects of the region of Carinthia. His main foci lie on the local interregional harmonization of education and training for health professionals and on process management in patient care.

Australia: Dr Catherine Joyce, Senior Research Fellow in the Department of General Practice, Monash University, and Senior Lecturer in the Department of Epidemiology & Preventive Medicine, Monash University. Her main area of research is the health workforce, and her previous studies include a longitudinal survey of Monash University medical graduates, and a simulation modelling study of Australia's future medical workforce.

France: Mr François Guillaumat-Tailliet is deputy head of the *Bureau des Professions de Santé* (BPS) in *Direction de la Recherche, des Etudes, de l'Evaluation et des Statistiques* (DREES, Ministry of Health, Paris). He is specialized in statistics and economy (*Institut National de Statistique et des Etudes Economiques,* INSEE). He began his career as macro-economist before being involved in economical and social studies at national and regional levels.

Germany: Pr Dr Reinhardt Busse is professor and department head for health care management at Technische Universität Berlin. Besides being one the Observatory's Associate Head of Research Policy and Head of the Berlin hub, he is a member of several scientific advisory boards and a regular consultant for WHO, the EU Commission, OECD and other international organizations within Europe and beyond. His research focuses on both the methods and the contents of comparative health system analysis, health services research including cost-effectiveness analyses, health targets, and health technology assessments (HTA).

The Netherlands: Wienke Boerma is Senior Researcher and consultant at the Netherlands Institute of Health Services Research (NIVEL) in Utrecht, Netherlands. His research focuses on Health systems comparison, Primary care development and evaluation and Primary care consultancy. He is co-editor for the book "Primary Care in the Driver's Seat? Organizational reform in European primary care" published in 2006.

All these experts have carefully read the description of their respective country, updated data and legal decrees, added interesting references (documents produced by governments, research centres or professional associations which were not found by our search strategy).

5.3 RESULTS

In order to facilitate comparisons between countries, main findings are reported in Table 40. For more detailed information, the complete case studies can be found in Appendix D.

Table 41. Cross-national comparisons of health systems and physician supply

	Belgium	France	The Netherlands	Austria	Germany	Australia
Health system						
Public / private mix in services delivery	Health care is publicly funded and mainly privately provided	Combination of public and private care, including private for-profit hospitals	Health services are mostly private and organized around self-employed doctors as well as hospitals and clinics which are mainly private not-for-profit organizations	Most physicians work in private practice, under contract with the health insurance agencies	Ambulatory health care is mainly delivered by contracted GPs and SPs in private practice. Acute inpatient care is delivered by a mix of public (53%) and private providers	The majority of doctors in Australia are engaged in private practice
Doctors type of payment	Most physicians (GPs and SPs) are paid on a fee-for-service basis. The patient pays the fee to the physician and is reimbursed by sickness fund. Scales of fees are fixed by agreement between the insuring bodies and doctors' organisations or, failing this, laid down officially. If no contract exists or for non-approved doctors, fees are fixed freely by doctors.	Self-employed professionals are paid directly by patients at the time of the provision of the service; the statutory health insurance system reimburses the patient at a later stage, only partially. Scales of fees are fixed by agreement.	GPs are funded through a mix of the previous system, i.e. a fixed contribution of € 54 per enrolled patient and € 9 per consultation. Since 2005, specialist services are reimbursed by the Diagnosis Treatment Combinations system.	Fees are laid down in the overall contracts between the Regional Chambers of MDs and the insurance funds which conclude contracts with a proportion of private physicians (43% in 2005). Fees of non-contracted doctors are higher and reimbursed up to a level of 80% of the fee which a contracted physician would charge for the same service.	A fixed amount or based on the criteria of either individual services provided, or of a flat-rate per head, or a combination of these or further methods of calculation. The remuneration package is distributed among the contract doctors on the basis of a payment distribution scale.	Patients can be billed directly for a medical service and claim 85% of the schedule fee back from the Health Insurance, or doctors could bill the Health Insurance directly and accept 85% of the fee as full payment. Medicare pays a rebate: 100% of the schedule fee for GP services, 85% of the schedule fee for out-of-hospital services, and 75% of the schedule fee for in-hospital medical services.

	Belgium	France	The Netherlands	Austria	Germany	Australia
Health insurance type and coverage	The Belgian health system is based on the principles of equal access and freedom of choice, with a Bismarckian-type of compulsory national health insurance that covers 99% of the population.	Compulsory social insurance scheme with affiliation based firstly on professional criteria and secondly on residency. Beneficiaries are all persons with gainfully employment or with a permanent regular residence in France.	Since 2006, a standard package was introduced. All Dutch residents are obliged to take out health insurance, paying a nominal premium, irrespective of income, age or health status. They can choose with which insurer they want to take out health insurance, and are free to change.	The Austrian health system is shaped by statutory health insurance (SHI) that covers 95% of the population on a mandatory basis and 2% on a voluntary basis.	Statutory health insurance: sickness funds collect the contributions of the statutory insurance for health care and negotiate contracts with the health care providers. Almost every insured person can choose a sickness fund freely, while funds are obliged to accept any applicant.	Medicare, the tax-funded national health insurance scheme, offers patients subsidized access to their doctor of choice for out-of-hospital care, free public hospital care and subsidized pharmaceuticals.
Health expenditure	10.3% of GDP (2005)	11.1% of GDP (2005)	9.2% of GDP (2004)	10.2% of GDP (2005)	10.7% of GDP (2005)	9.7% of GDP (2004)
Annual number of consultations per capita	Mean number of contacts: 5.63 per person (2005). No waiting lists.	Mean number of contacts: 4.7 per person (2004).	Mean number of contacts: 6.7 per person (2005). 139 000 patients were waiting for treatment in hospitals (2004): 68% can be treated within 4 to 5 weeks and 20% cannot be treated due to capacity problems in hospitals.	Number of contacts: 6.8 per person (2002). No waiting time for SPs.		Number of contacts: 5.85 per person (2003) The median waiting time for all elective surgery procedures was 32 days, 5 days longer than in 2000–01. Waiting times for some elective surgery procedures continued to exceed one year.

	Belgium	France	The Netherlands	Austria	Germany	Australia
Human resources						
Registered physicians	42 176 physicians (2005) • 21 804 GPs • 20 372 SPs	-	25 921 physicians entitled to practise (2004) • 9 844 GPs • 16 077 SPs	38 730 physicians (2004) • 11 600 GPs • 20 900 SPs • 6 153 doctors completing residencies	407 000 physicians (2006)	65 499 physicians (2004)
Active physicians	38 204 physicians (90.6%) • 18 332 GPs • 19 872 SPs	207 277 physicians (2006)	-	-	311 300 physicians	58 211 physicians
Practising physicians	24 954 physicians (59.2%) • 11 626 GPs • 13 328 to 17 799 SPs	192 007 physicians • 93 315 GPs • 98 691 SPs	19 929 physicians • 8 209 GPs • 11 720 SPs	30 300 physicians • 12 899 GPs • 18 001 SPs	284 500 physicians • 75 600 GPs • 208 900 SPs	53 968 physicians • 28 225 primary care and non-hospital practitioners • 19 050 SPs • 6 692 SPs in training
Physicians not involved in curative activities	30.2% to 40.8% of registered physicians 22.0% to 34.7% of active physicians	7.4% of active physicians	23.1% of registered physicians	14.3% of registered physicians	30.1% of registered physicians 8.6% of active physicians	17.6% of registered physicians 7.3% of active physicians
Ratios SPs / GPs	Ratio: 1.1	Ratio: 1.1	Ratio: 1.43	Ratio: 1.46	Ratio: 2.8	Ratio: 0.86

	Belgium	France	The Netherlands	Austria	Germany	Australia
% of female GPs *% of female SPs*	27.7% in 2005 32.2% in 2005 (≥ 50% in dermatology, psychiatry, paediatrics, radiotherapy, ophthalmology)	39.9% in 2006 38.5% in 2006	34% in 2006 22% of SPs in 2001 (≥40% in genetics, geriatrics and paediatrics; <5% in urology, thoracic surgery and orthopaedics).	39.8% of all practising physicians in 2004	39.5% in 2006 34.7% in 2006 (15% in surgery; 50% in gynaecology and paediatrics)	36.5% in 2004 20.3% in 2004 (5.9% in surgery)
Activity levels	In 2005, 2.7% of GPs had a low activity level (< 1 250 contacts a year) 34.2% of GPs had a high activity level (> 4 500 contacts a year) male GPs totalized more or less 2 times more contacts/year than female GPs	In 2001, GPs worked 51 hours a week Activity of female GPs represented > 70% of mean activity of male GPs (full-time female GPs work 10 hours less than FT male GPs)	In 2006, 47% of all GPs worked part-time • 1 male GP = 0.91 FTE; • 1 female GP = 0.63 FTE In 2001, 26% of all SPs worked part-time • 1 male SP = 0.96 FTE; • 1 female SP = 0.80 FTE.	Men work minimum 10 hours weekly more than women (at each age)		Medical practitioners worked 39.4 hours per week (2004) 17% of male / 60% of female GPs work <40 hours 10% of male / 31% of female SPs work <40 hours GPs had 136 contacts a week (22% report ≥ 200 and 22% report 150- 199 contacts a week) SPs had an average of 80 patient contacts per week.

	Belgium	France	The Netherlands	Austria	Germany	Australia
Ageing of medical workforce	In 2005, • mean age of GPs: women was 42 years, men was 51 years; 47.7% > 50 years old • mean age of SPs: women was 44.4 years, men was 50.6 years; 46.2% > 50 years old • no mandatory age of retirement • female GPs retired earlier than male GPs	In 2006, mean age of female doctors was 46.2 years while mean age of male doctors was 49.7 years. 44.7% of male physicians were in 30-50 years range, 60.5% of female physicians modal age of retirement: between 65 and 66 years old.	In 2006, • mean age of GPs: women was 43 years, men was 49.6 years; • 20% of all male GPs aged 50 years had already left practice. For women this was 33%. • 60% of all men and 80% of all women had already ceased working as a GP at the age of 60 years	no mandatory age of retirement but > 60 years old, only 20% of women are at work	In 2006, • mean age of GPs: 51 years • mean age of SPs: 40.9 years • 15.6% of SHI-doctors > 59 years old • 15.9% of doctors < 35 years old • mandatory age of retirement fixed at 68 years old	In 2004, • mean age of GPs: women is 44.6 years, men is 51.4 years;
Migrations	• 2 568 migrant workers work in Belgian health care • The number of visas delivered to foreign physicians or trainees increases	• Non European doctors :1.7% of all registered doctors • European doctors: 1% of all registered doctors	• The inflow from other countries concerns 50 GPs and 40 SPs per year	• 3.3% of practising physicians are foreign physicians • Few emigrants	• 19 153 migrant workers work in German health care • The number of foreign physicians increase by 5% per year • 155 290 German doctors worked abroad in 2006	• 3 995 migrant workers work in Australian health care =25% of the medical workforce • 3 000 Australian registered MDs are currently working overseas=4.5% of the medical workforce

	Belgium	France	The Netherlands	Austria	Germany	Australia
National density of practising physicians	36.4 active MDs per 10 000 inh (23.7 per 10 000 having a regular practice > 50 patients)	31 per 10 000 inhabitants (27.4 per 10 000 having a regular practice)	12.2 per 10 000 inhabitants	35 per 10 000 inhabitants	37 per 10 000 inhabitants	27 per 10 000 inhabitants
Highest / lowest densities	Imbalances between provinces: 9.8 GPs vs 14.4 GPs per 10 000 inh 8.4 vs 24.0 SPs per 10 000 inh	Wide disparity between regions Density of medical capacity varies in ratio from 1 to 1.5 for general practitioners and from 1 to 2.2 for specialists	Few regional differences	Imbalances between Länder, between rural and urban areas (// population) Vienna (70 per 10 000 inh) Rural regions (32 per 10 000 inh)	Imbalances between Länder, between rural and urban areas (// population) Hamburg (48 per 10 000 inh) Brandenburg (29 per 10 000 inh)	Imbalances between states, between rural, and urban areas FTE rate for all MDS varies per 10 000 population from 21.7 in Queensland to 38.3 in Australian Capital Territory.
Unemployment / Unfilled vacancies	Qualitative studies indicate unfilled vacancies in hospitals. In 2005, 138 vacancy posts were declared in Belgian hospitals.	In 2005, 600 training posts in general practice remained unfilled	-	Because universities produce too many graduates, candidates for postgraduate medical education must reckon with a years long waiting period. During this time, graduates are put on waiting lists for general practice training regardless of their individual specialty preference.	Unemployment was high among doctors until 1995. In 2006, 4 616 physicians were unemployed (1.5% of active physicians). Every second hospital in western Germany has vacancies; in eastern Germany, 4/5 of all advertising positions in hospitals remain unfilled.	-

	Belgium	France	The Netherlands	Austria	Germany	Australia
Regulation policies: controlling supply						
Medical training	Since 1997, the Belgian Government caped the number of physicians allowed to submit a training plan to specialize as GP or SP. A strict limitation will be pursued until 2011. A relaxing is planned the following years. Quotas are fixed by Community (Flemish / French) and by category of physicians (SPs and GPs). A numerus clausus is differently applied in medical faculties from the 2 Communities. In addition, numbers of graduates have been fixed for certain groups of specialties.	France applied a numerus clausus since 1971. An exam limits access to the second year of training. The numerus clausus has been reduced progressively since 1980 to bottom out at 3 500 students in 1993. Since then, the numerus clausus has increased as a consequence of a projected shortage of physicians in 2010-2015: the intake of students has been raised from 3 850 in 1998 to 4 100, 4 700 and 5 200 in 2002–2003-2004 and is raised to 7 100 in 2007.	Three types of *numerus fixus* exist: *national quota* (limiting number of training places available in the whole country), *labour market-related quota* (limiting the supply of graduates from a particular programme when it exceeds the need of the labour market) and *institutional quota* (limiting the number of applicants when it exceeds the expected enrolment). Over these last years, the number of places in medical training institutes was revised in order to raise the intake of physicians.	Free and not limited by any restrictions. Since 2006, entrance exams, according to new Bologna Regime Bachelor's degree programmes. In 2000, ÖBIG recommended to reduce the training places by 48%. No measure was taken in this direction and there are no intentions to introduce a numerus clausus in any subject field.	Candidates to medical training are submitted to a procedure of selection. Access to German universities is usually limited to people with an A-level equivalent (12 or 13 years of school) plus completing a special Medical School-entry test. Admittance is according to academic records in conjunction with the test result, waiting times and special quotas (for example, foreigners or the disabled). In 2002, it was decided to reduce the number of students by 10%.	Medical school intake is controlled by the Government through the funding of university places. In 1973, an increase in medical school intake was applied including two new medical schools. By then, a surplus of GPs leads the Government to impose a cap on medical school places. The number of undergraduate medical school entrants has increased in the late 1990s combined with the opening of 5 new medical schools since 2000. A further seven programs are planned by 2008.

	Belgium	France	The Netherlands	Austria	Germany	Australia
Limitations to install (or to practice) / Incentives to install in specific areas	Since July 1st 2006, a specific fund (Impulseo) is proposed to encourage GPs to install in areas where more GPs are required.	A national demographic plan was introduced in January 2006, including the development of incentives to encourage doctors to practice in medically deprived areas, improvements in working conditions (financing innovations in ambulatory care to set up multi-speciality group practices) and actions to increase the supply of doctors in medically deprived areas. Projects are currently discussed to introduce coercive measures to resolve the regional disparities in medical density.	-	Austria has adopted a regulatory policy that imposes conditions on the choice of practice location. Physicians are not able to get a contract with a regional health insurance fund if the threshold number of physicians is reached in a region. A post for a GP with contracts is created for approximately 2 000 patients in the catchment's area.	Regional restrictions for setting up a medical practice with health insurance. New practices may not be opened in areas where supply exceeds 110% of the average required number for a given specialty. The geographical distribution of doctors has become more even, although the existing oversupply in specific areas, like large cities, was not resolved since it contains no instrument for closing practices or preventing others from taking over the practices and SHI registrations of retiring doctors.	The government adopted several strategies to increase the supply of doctors in rural and remote areas including additional places and financial incentives for GP registrar training in dedicated Rural Pathways, financial incentives for students to remain in rural medical practice, recruitment initiatives to assist employers to obtain permanently or on a temporary basis, limitations of immigrant workers to districts of workforce shortage if they wish to access a Medicare provider number.

	Belgium	France	The Netherlands	Austria	Germany	Australia
Forecasts						
	The Committee for Medical Supply Planning gives advices and formulates proposals to the federal Ministry of public health on the annual number of candidates per community that are eligible for obtaining practising licence. On the advice of this Committee, a *numerus clausus* mechanism was proposed in 1997.	In 2003, the Ministry of Health created a National Observatory of Health Professions. Its responsibilities are to collect, analyse and communicate information relating to all categories of health care professionals. Each 5 years, DREES makes a forecast for all practising physicians for 20-30 years. In 2004, results of such forecast until 2025 were published by region but also by specialty and mode of practice. In 2008, new forecast will be published by the year 2030.	The Capacity Organization provides physicians workforce advice on an annual basis regarding the number of doctors to be trained. The Capacity Body uses research institutes like the Netherlands Institute for Health Services Research (NIVEL), to examine both supply and demand within the health system. The first report in March 2001 recommended to increase the number of medical students, increase the number of training positions for GPs and additional funding has been set aside for training SPs.	Österreichisches Bundesinstitut für Gesundheitswesen (ÖBIG), a research organization, generates policy-relevant knowledge and expertise for policy-makers. It produces studies on different themes related to health care provision and health care management. The agency is actively planning health care provision and allocation in Austria.	-	The Australian Medical Workforce Advisory Committee (AMWAC) oversaw a medical workforce research program. AMWAC has been replaced in 2006 by a new national workforce planning structure, The Health Workforce Principal Committee (HWPC). This new structure provides a forum for reaching agreement on key national level health workforce issues requiring government collaborative action and provides advice on health workforce issues to the Australian Health Ministers' Advisory Council (AHMAC).

	Belgium	France	The Netherlands	Austria	Germany	Australia
Regulation policies: controlling demand						
	The patient share of the cost for medical services is 25%, but may be higher depending upon the type of treatment (30% for consultations with a GP, 35% for visits by a GP, and 40% for consultations with medical specialists), or lower (special coverage for some policyholders: 10% for routine care and 15% for consultations with medical specialists).	The portion of the costs of treatment not reimbursed by the health insurance system has steadily increased, by means of progressive increments, the introduction of a daily charge in hospitals and authorizations for Sector 2 doctors and for certain services to exceed standard charges.	-	For each accounting period (3 months), the patient can choose between a health voucher for GPs or a health voucher for SPs. During this period, the patient may only change from one contract doctor to another. If non-contracted doctors are consulted, 80% of the fees, which the health insurance funds would pay for the same service by a contracted doctor, are reimbursed. The fees for contracted doctors are mostly considerably lower than those of private doctors.	No financial participation in the case of treatment by contracted doctors.	Out-of-pocket expenditures have been rising both in real terms and as a percentage of sources of health expenditures by 4.2% per year. The rise in out-of-pocket expenditure reflects a strategy to utilize co-payments as a demand-side cost containment strategy.

	Belgium	France	The Netherlands	Austria	Germany	Australia
Gate-keeping						
Choice of doctors	Free choice of doctor. Patients have free choice of the first physician to contact, can change physician at any time, and get a second opinion or even consult several physicians at a time.	Free choice of doctor. Since 2005, each patient is invited to choose a primary care doctor, with whom he/she signs a contract. The preferred doctor scheme is not compulsory but is based on incentives directed at patients.	Free choice of doctor by registering with a doctor who has entered into contract with a health insurance fund.	Free choice among contracted sickness insurance fund doctors.	Free choice of doctors under contract *(Vertragsärzte)*.	Individuals are free to choose which GP they wish to consult, restricted only by availability. Patients may consult more than one GP, since there is no requirement to enrol with only one practice.
Access to specialists	Free choice for patients and free access to doctors. Patients who consult a specialist after being referred by a GP benefit from a higher rebate than patients who consult a specialist without referral. Moreover, patients who consult the GP holding their own GMR obtain a reduction of 30% on their out-of-pocket payments.	Free access to certain specialities or in case of urgency or of displacement. In the preferred doctor scheme, patients who consult a specialist after being referred by a GP benefit from a higher rebate than patients who consult a specialist without referral.	Patients do not have free access to specialists.	Free choice among contracted specialists.	In general, referral required by the general practitioner. Patients have to pay a practice fee of € 10 euros each time they visit their doctor for the first time within each yearly quarter. They do not have to pay if they are referred by another doctor. Patients have to pay an additional fee if they do not consult their GP first.	Patients need to obtain a referral from a GP before consulting a specialist physician or surgeon. Recognized specialists can claim a higher rebate when the patient is referred by a medical practitioner.

	Belgium	France	The Netherlands	Austria	Germany	Australia
Access to hospitals	Free choice among approved hospitals.	Free choice among public and private (approved) hospitals.	Patients do not have free access to but can choose among hospitals approved by the Minister of Health.	Free choice of licensed hospitals. With the exception of emergencies, only patients who have a transferral by a self-employed doctor are entitled to hospital care. To some extent, contracted physicians have a "gatekeeper" function, as they can control patient flows by referrals.	Free choice among public hospitals, if no additional costs arise.	Patients may exert a choice over the referral made by their general practitioner to a specialist or to a hospital. They can also choose the private hospital they wish to attend, assuming they are prepared to pay.

5.3.1 Head counts and manpower

Figures used for regional and international comparisons always rely on densities (physicians-to-population ratio) based on numbers of physicians registered or entitled to practise in a country. These numbers are in some cases very high because of the computation of all registered physicians whatever their status, their professional activity (professionally active or inactive) and the scope of their activity.

However, not all registered physicians contribute the same way to manpower.

First, they are not all active in the medical profession or practise medicine. According to countries, the proportions of registered physicians not involved in curative activities vary between 14.3% (Austria) and 30.2% to 40.8% (Belgium). This proportion goes uphill in all countries, probably in relation to the emergence of new job opportunities outside the curative field.

Second, among doctors practising in curative sector, activity levels vary a lot in terms of number of patients followed, number of contacts per patient or number of hours worked per week. For example, in Belgium, data obtained from INAMI/RIZIV indicated that 2.7% of all practising GPs had a very low activity level (< 1 250 contacts a year). While in France, a GP has on average 1 400 patients, in the Netherlands, each GP has a patient list of more or less 2 300 patients.

To express the manpower in FTE should allow a better appraisal of its actual size. However, there is no unique, harmonized, method to do so. Two main options are available to translate head counts into FTE. The first one is based on actual working time in the curative sector. This information is collected in the Netherlands through the means of survey. Still, this approach presents drawbacks for comparisons (within or between countries) as a given working time can result in different levels of clinical productivity depending on factors such as the health system organisation, professional profiles or mean length of contacts with patients. Whatsoever, although the distribution of hours worked by male practitioners remained skewed towards long working weeks, a slight reduction of working hours is observed among physicians, either due to personal preferences related to the societal trend towards more leisure time or due to external regulations. One example of such regulations is the implementation of the European Union Working-Time Directives (93/104/EC and 2000/34/EC) concerning workers and doctors in training. These regulations, mandatory in all European countries, specifically impact on working hours provided by physicians in hospitals. It is however unknown how deep will be the impact on manpower, as effectiveness may also be modified. Indeed, strategies to adapt are numerous: hiring additional staff, possibly from foreign countries; adapting professional profiles, so as to transfer part of the tasks to other professional categories; increasing the effectiveness of the health organization.

The second method to evaluate manpower relates to numbers of services provided. The mean number of services provided by individuals in the most active professional category (by sex or age) serves as the golden standard of activity, and FTE are computed by reference to that number. In Belgium, for instance, the mean annual contacts for male physicians aged 45-49, has been used as a reference and individuals in that category count for 1 FTE.[117] An alternative method has also been used, which attributes 1 FTE per physician until age 55-59 years, and incremental smaller fractions for upper age categories (see Belgian model in section 2.2.7.5.). This second approach based on levels of clinical activity has its own limitations. The main one is to consider that the current level of activity of the most active physicians' category is adequate without any further consideration of clinical or societal appropriateness.

Coming back to medical density, important variations in the number of practising physicians[qq] per 10 000 inhabitants are observed, from a low 12.2 per 10 000 inhabitants in the Netherlands to 37 per 10 000 inhabitants in Germany. However, one must keep an eye on the whole health system when comparing medical densities across countries.

qq Defined as providing at least 1 medical service per year

For instance, the relatively low medical density in the Netherlands goes along with organisational specificities. Most Dutch GPs worked in group practices and health centres (58% of GPs worked in group practices in 2001). A change in the level of activity of GPs was also observed over time helping GPs to answer to the increasing demand of care. The most striking changes are the shift from home visits (decreasing from 17% to 9% of all contacts between 1987 and 2001) to less time demanding office hours' consultations. The average working week remained about 50 hours for a full-time working GP. Task delegation increased by professionalisation of practice assistants, the introduction of practice nurses and out-of-hours triage systems.[118] More work is done by telephone.[119] Physician assistants receive clinical guidelines edited by the Dutch College of General Practitioners and ensure a triage in consultations by telephone. They answer themselves to a series of common medical complaints such as coughing, fever, sinus problems, diarrhoea and low back pain but also for other reasons (e.g. requests test results, specialist and hospitals results, to repeat prescriptions, for administrative matters). This transfer of medical tasks to practice assistants significantly reduces the GP's workload[120,121] and, in large practices, allows providing a wider scope of disease management services.[121]

However, the Dutch system has its drawbacks. GP's work satisfaction decreased whereas their burnout increased.[118] Medical practitioners have conducted a lot of strikes since 2001 to protest against the deleterious effect of the numerus clausus on the medical workforce (leading policymakers to react by increasing the medical school intake) and to denounce the heavy and increasing workload. In this country, GPs take care of 2 300 patients on average. The GP's patient list includes in some cases more than 2 700 patients.[120,121] Concerning access to specialists, Dutch government recognized the problem of long waiting lists for some specialities. In March 2000, around 150 000 patients were waiting for treatment in general hospitals, with more than 92 000 of them waiting for longer than a month. By October 2001, this number – excluding psychiatry and paediatrics – had increased to 185 000. The specialities of orthopaedics (35 000), general surgery (35 000), ophthalmology (34 000) and plastic surgery (24 000) had the largest waiting lists; plastic surgery had the longest waiting time: 12 weeks for diagnosis and 23 weeks for treatment (both figures about twice as high as the average). To counter this problem, the government implemented a policy of providing extra funding where waiting lists were cleared.[122]

5.3.2 Demography and manpower

Level of clinical activity varies by sex and age category. Therefore, changes in medical demography will impact on the manpower.

The proportion of female doctors has risen from the last two decades in all countries and is likely to keep on rising as the proportion of female medical students' increases (the general sex ratio is around 1 in most medical faculties) and upper age categories, predominantly constituted of males, retire. The flow-on effects of this change are particularly obvious in specialties like paediatrics, gynaecology, dermatology whereas female are less likely to choose physically demanding surgeries like orthopaedics or thoracic surgery. As women currently provide, on average, less medical services, are more often part-timer, and retire earlier, it is commonly assumed that the so-called feminization of the medical profession might result in manpower decrease in the coming decades.[59,123] However, any inference about future medical supply based on cross-sectional analysis should be done with caution. First, the feminization process, which concerns also other liberal professions (lawyer, solicitor, pharmacist, architect …) in the European Union, is a quite recent phenomenon and current levels of activity may be due to a cohort effect, i.e. not applicable to new students. In France, for instance, while female GPs worked less than male GPs, this gap is reducing. In the nineties, the activity of female GPs was 60% of that of male GPs. Ten years later, the mean activity of female GPs represented more than 70% of mean activity of male GPs.[124] Second, changes in the working environment might modify work profiles. Female MDs also tend to leave the profession earlier and to have more professional breaks than their male counterparts. To improve that aspect, France has recently entitled female doctors to benefit from the same maternity leave period as other employed women.

This is expected to facilitate a better balance between family and professional life, and is essential given the increasing number of female doctors.[125] The evaluation of this initiative has not yet been reported. However, the Commission for medical demography (2005) indicated that information about the plan was poorly diffused among potential beneficiaries; consequently, the impact of such measure could be non significant.

Ageing is another source of debate regarding future medical supply. The generation of doctors who were born during the 'baby boom' following World War II, will be coming up to retirement during the next decade or two ('papy boom'). Meanwhile, the cohort size of new trainees has been decreasing in many countries.[123] The proportion of active doctors aged over 55 years has increased sharply and represents currently more than one-third of professionals in some specialties. For women and men, weekly work hours rise for physicians from 35-39 years old, to reach a ceiling at 45-49 years old, and fall in most countries from 50-54 years onwards as physicians approach retirement age. This observation suggests that the coming 'retirement boom' among physicians will be preceded by a falling off in the hours of work and a decreasing productivity. Again, inference about future medical supply should be done with caution. First, as life expectancy in good health is increasing and there is no legal retirement age for physicians (except in Germany), physicians might contribute longer to medical supply in the future. Second, the decision to retire more or less lately also depends on a number of incentives in the societal and professional environment (see point 5.3.8).

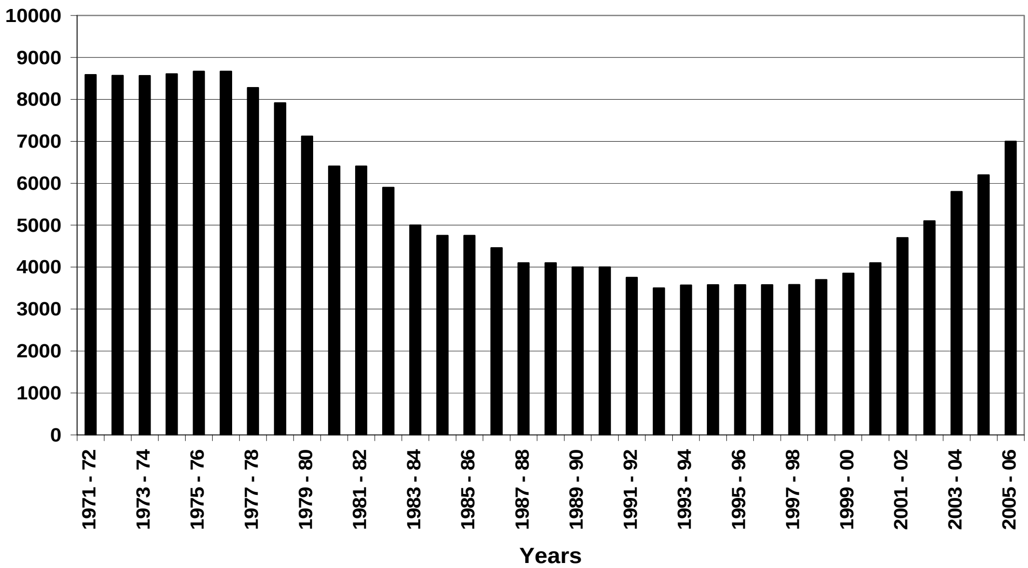
5.3.3 Numerus clausus

Study countries have put in place a variety of policies either to sustain / amplify the national stock of practising physicians or to limit the production and the installation of newcomers according to a perceived medical shortage or oversupply.

5.3.3.1 France

From 1965 onwards, the number of students entering the medical schools grew steadily. Limiting supply rapidly came to be seen as an essential mechanism on the basis of the potential "supplier induced demand" in health care. The numerus clausus system, established in 1971, became effective five years later. Every year, a ministerial decree specifies the number of places available for each of the 33 education and research units (Figure 27).

Figure 27. Evolution of the number of places in medical faculties from 1971 to 2006 (numerus clausus)



Source. Berland (2006)[126]

The numerus clausus determines the number of students allowed to access to second year of medical studies after having passed a competitive exam. A drastic reduction in the numerus clausus took place (from 8 000 to 3 500 places between 1978 and 1992) in order to substantially limit the number of doctors (8 935 new physicians were registered in 1980).[127]

The numerus clausus policy has resulted in an overall stabilization of the number of doctors.[128] However, a significant decrease of working physicians is forecast from 2008 onwards, commonly explained by massive retirement of MDs graduated in the 60's (papy boom). This expected demographic decrease, combined with a predicted increase in health needs, currently generates fear of pending undersupply. Difficulties occur in recruiting doctors in specialties such as anaesthesiology or gynaecology and obstetrics. As a result, the intake of students has been raised again from 3 850 in 1998 to 4 100, 4 700 and 5 200 in 2002-2003-2004 and is raised to 7 000 in 2006 and 7 100 in 2007. Depending on the level of the numerus clausus in the coming years, the physician-to-population ratio in 2025 should be around 28–29 doctors per 10 000 inhabitants.[129]

The numerus clausus is fixed annually at national level both by the Ministry of National Education and by the Ministry of Health. Subsequent repartition of training posts by orientation, region and medical faculty at the end of classification exam ('Examen Classant National') is also determined annually. The regional distribution of training posts tries to take into account current inequalities in the geographical distribution of doctors and attempts to correct any imbalance by adjusting the flow of trainees.[128] Regional disparities have diminished slightly over the last thirty years (the gap between regions has been reduced from 2.1 to 1.7 physicians per 10 000 inhabitants, but imbalances remain (see paragraph 1.1.2. in Appendix D – case study: France).

MANAGEMENT: ACTORS AND PROCESSES

In 2003, the Ministry of Health created a National Observatory of Health Professions (Observatoire National de la Démographie des Professions de Santé, ONDPS). Its major responsibilities are to collect, analyse and communicate precise and objective information relating to all categories of health care professionals. The ONDPS also engages in research on working conditions, planning needs for health professionals and professional development. It also cooperates with regional Observatories of Health Professionals. These observatories bring together local representatives of doctors, state authorities, sickness funds, hospital agencies and medical schools. They also coordinate surveys and other initiatives to help ensure the health workforce matches demand.[125]

5.3.3.2 Germany

The German post-war constitution stressed individual rights and limited rights of intervention and regulation by the state. One right included the right to free choice of an occupation and corresponding educational opportunities. This meant that the government was not able to approach workforce planning by controlling the number of students in medical schools at university.[130] In the mid-seventies, there were almost seven times as many applicants as places available in medical faculties.[131]

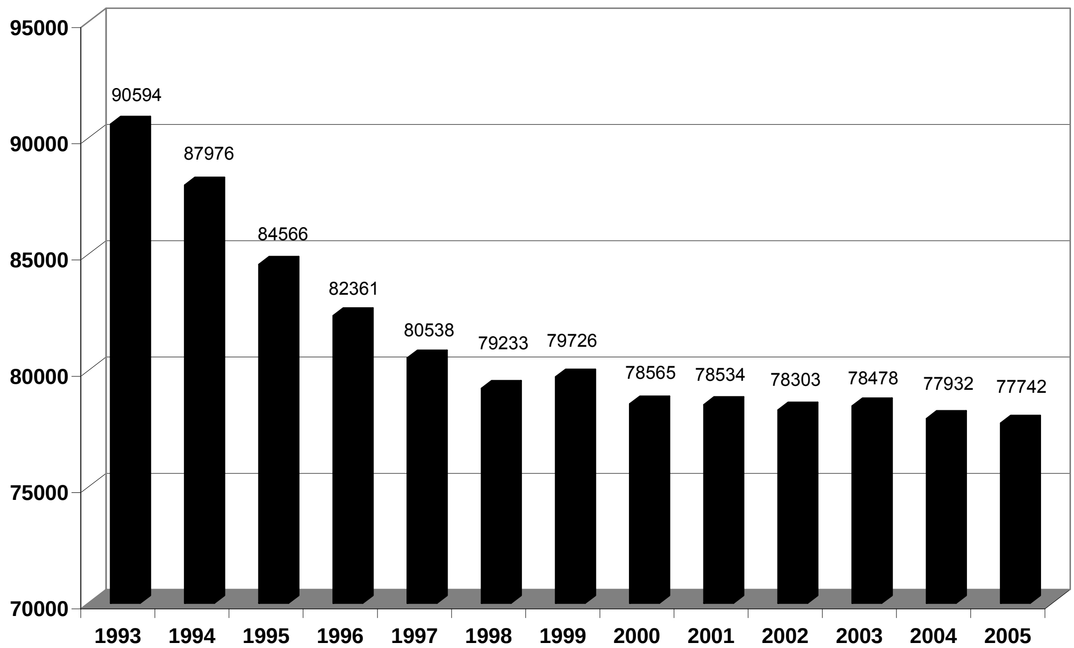
In the 1980s, the growth in the number of physicians was considered to be a major cause for spiralling health expenditures. Sickness funds and physicians' associations demanded a reduction in the supply of physicians by reducing the number of medical students and limiting access of physicians to the mandatory health insurance system. Education ministers from the Länders have been traditionally opposed to decreasing the number of students, in the name of free access to education. In April 2002, a revised set of licensing regulations was introduced, implying a statutory reduction in the number of new registrations. This reduction as well as new regulations covering courses and examinations has to apply in the start of the academic year of 2003/2004. The number of available places for studying medicine will decrease as the size of the groups of students being trained in hospitals. The aim is to obtain a reduction of up to ten percent in the number of places to study medicine in Germany.[131]

At all universities of the Federal Republic of Germany, medical training is subject to a restriction on admission according to an admission procedure established by the

Federal Länder. Moreover, the universities themselves can select applicants.[132] Access to German universities is usually limited to people with an A-level equivalent (12 or 13 years of school) plus completing a special Medical School-entry test. Admittance is according to academic records in conjunction with the test result, waiting times and special quotas (for example, foreigners or the disabled). Fifteen per cent (15%) of medical students are accepted by means of interviews at universities.[132] The numerus clausus in medicine is nationwide, with enrollment handled centrally by the Central Office for the Allocation of Study Places (ZVS, Zentralstelle für die Vergabe von Studienplätzen). Study places are centrally allotted by this agency according to an admission procedure established by the Federal Länder. Basically, responsibility for the implementation of the Federal Medical Code (Bundesärzteordnung - BÄO) and the Regulation on the Licensing of Doctors (ÄAppO) lies with the Federal Länder. For matters concerning the admission to examinations and the law governing examinations, the authorities responsible are generally the Land examination offices of the Länder. The Federal Ministry of Health and Social Security has no direct influence on their decisions.

A decline on the total number of medical students has been observed from 90 594 in 1993 to 77 742 in 2005 (Figure 28). Besides restriction of the student intake, the attrition of medical students in the course of their training has grown steadily within the last 3 years: from 38% in 2000 to 45% in 2002.[131] According to Reinhardt Busse (personal communication), these percentages could be even higher. Hypotheses for explaining this decline are: high dissatisfaction of students towards the medical training (highly theoretical training without practical experiences and exchanges between teachers and students); temporary restrictions on new practices; unattractive working conditions in hospitals (many working hours, bureaucratic work, academic establishment, lack of supervision) combined with the lack of hope to practice a subsequent career.[131]

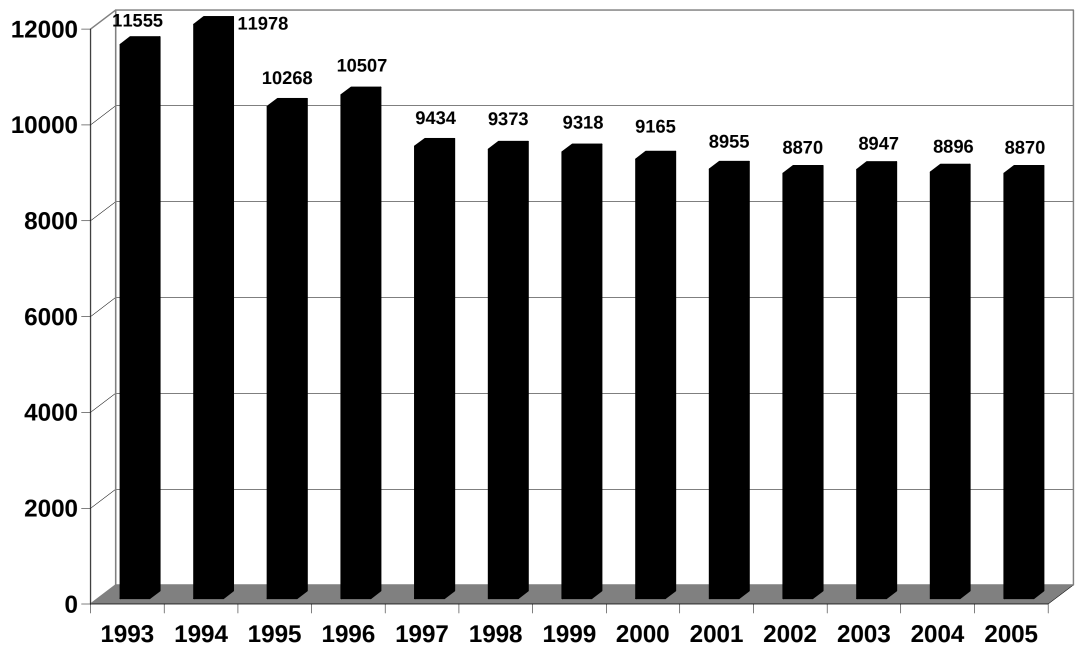
Figure 28. Evolution of the total number of medical students (1993-2005)



Source. Statistisches Bundesamt, 2006

The number of physicians graduated in 1993 was 11 555 whereas in 2005, this number declined to 8 870, representing a drop of 23.2% (Figure 29; Federal Statistical Office, 2006).

Figure 29. Evolution of graduated physicians (1993-2005)



Source. Statistisches Bundesamt, 2006

5.3.3.3 Austria

The access to medical studies is still free and not limited by a numerus clausus. In Austria, ÖBIG, a research organization created to produce studies on health care provision and health care management, recommended to reduce the training places by 48% since 2000. Nevertheless, no measure was taken in this direction and there are no intentions to introduce a numerus clausus in any subject field.[133] Indirect market barriers for physicians are created by the waiting list for specialisation. The number of physicians that can contract with health insurance funds is also limited on a geographical basis.

5.3.3.4 The Netherlands

The number of students entering in universities for medical training is restricted by the government on a numerus clausus basis (numerus clausus is labeled numerus fixus in the Netherlands). The manpower planning policy for physicians was always directed at limiting the total number of doctors in order to limit the costs of medical care.[134] The system of *numerus fixus* was introduced for the first time in 1972. The numbers evolved from 1 485 in 1992 to 2 850 in 2006 (NIVEL, 2006).

Over these last years, the number of places in medical faculties was revised in order to raise the intake of physicians.

The number of students admitted to medical faculties in the Netherlands has grown from less than 1 500 in 1992 to over 2 800 in 2006. During the 1999-2004 period, the number of students increases by 4.2% a year. For academic year 2002-2003, the number of places was 2 550 and increased to 2 850 in 2006.

Three types of *numerus fixus* exist: *a national quota, an institutional quota and a labour market-related quota*. When the number of applicants exceeds the teaching capacity at the national level or within a specific institution, the Minister decides upon the number of places which will be available (national or institutional quota).[135]

The Minister of Education, Culture and Science may also limit the intake of students if it can be shown that the supply of graduates[rr] exceeds the need of the labour market by a substantial amount and when this is expected to be the case for a number of years (labour market-related quota).[135]

If the number of applicants is over the numerus fixus, the selection mechanism is applied. The main characteristic of this mechanism is that a lottery decides on admission to courses with entrance restrictions (irrespective of the type of numerus fixus). However, it is a weighted lottery, which provides greater chances for admission for candidates with higher average examination results in secondary education. Candidates are divided into five lottery categories. Category A, which is the highest, includes candidates with the highest examination grade point average (8.5 or higher). Category F, the lowest one, includes students with an average examination grade of 6 to 6.5. A sixth category is added for foreigners. In general, it can be stated that the higher the lottery class, the higher the chance on admission. Since September 1999, all candidates with an average grade of 8 or higher in secondary education are directly admitted to the programme of their choice. The other applicants have to go through the weighted lottery procedure.[135] The distribution of candidates over the locations where the *numerus fixus* program is offered takes place on the basis of the preferences of the candidates, as far as possible, but it could turn out that students are admitted to a university which was not preferred by the student. Students who are not placed may reapply in a later year but do not receive any credit for the waiting period.[135]

General practitioners are confronted to a double numerus fixus: 1) at the beginning when they enter at the university; 2) to be admitted in the specialization "family medicine" (the access to family medicine is limited by the number of places to the training course).[135]

MANAGEMENT: ACTORS AND PROCESSES

In the Netherlands there was no comprehensive government medical or general workforce planning until the early 1990s. The Capacity Body for physician workforce planning was created in 1999.[134] The organization, funded by government, has a tri-partite composition with representatives from the professional groups, the health insurance companies, and the training institutions. The three participating organizations are responsible for establishing the forecasting model. The Capacity Organization provides physicians workforce advice on an annual basis regarding the number of doctors to be trained. The Capacity Body uses experienced research institutes like the Netherlands Institute for Health Services Research (NIVEL), to examine both supply and demand within the health system with 10 to 20 year planning horizons. The first report in March 2001 proposed recommendations, supported by government to increase the number of medical students admitted to universities, the number of training positions for general practitioners and additional funding has been set aside for training medical specialists. NIVEL also conducts various studies on health professions.[116] The admission of students is administered by an independent agency, the *Informatie Beheer Groep* (IBG).

5.3.3.5 Australia

Medical school intake is controlled by the Commonwealth Government through the funding of university places. Entry to a higher education course is normally determined by the student's tertiary entrance score, rank or index (referred to here as the tertiary entrance score) which is calculated on the basis of results in the senior secondary school certificate.

In 1973, the Report of the Committee on Medical Schools to the Australian Universities Commission recommended an increase in medical school intake, including the establishment of two new medical schools to provide 1 560 graduates per year by 1991. Graduations from medical schools rose steadily from 851 in 1970 to 1 278 in 1980.[136]

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rr The same rule applies for any university training

In 1988, the Committee of Inquiry into Medical Education noted a surplus of GPs in urban areas. In the mid-1990s, AMWAC advises to contain the growth of the medical workforce. Since 1996, the Commonwealth Government has imposed a cap on medical school places to assist in controlling the supply of the medical workforce. The cap applies to domestic medical students only.[123] On the advice of AMWAC, the Australian Health Minister's Advisory Council (AMHAC) in 1996 called for a reduction in the annual intake from 1 200 to 1 000.[137] When doctor shortages became evident a few years later, the previous Australian government policy of limiting the number of medical school places has been completely reversed to again expand medical school intakes, with an extra 234 students in place in the 2004 intake, increasing to an extra 246 in 2005 (AHWAC 2004). Fourteen universities offer medical degrees in Australia and additional 5 new medical schools have opened since 2000. A further seven programs are planned by 2008, doubling the number of medical schools since 2000. Combined with increases to intake numbers in existing medical schools, this represents a wave shift which contrasts to the static pattern of graduate numbers over the previous two decades.[136] Over the period 1997 to 2004, the total number of first year advanced vocational training places has increased by 30%, to 1 782 positions in 2004. The major areas of increase have been in surgery (an increase of 231 positions) and adult medicine (an increase of 219 trainees), with smaller increases in intensive care, radio diagnostic, psychiatry, rehabilitation medicine and occupational medicine. From 2004, there was also an increase of one third in general practice training places from 450 to 600, reflecting additional Australian Government funding for this area.[138] The number of Australian medical graduates is set to increase by 60% in the next few years, from 1 300 in 2005 to more than 2 100 after 2010.[84] Overall by 2007, Australian medical school intake is expected to be at least around 1 860 - 1 900, representing nearly a 100% increase in intake compared to a decade earlier.[84]

Besides limiting entry to medical schools, other measures implemented in 1996 are about limiting the immigration of doctors; and restricting the number of medical practitioners eligible to bill Medicare.[137]

MANAGEMENT: ACTORS AND PROCESSES

The Australian Health Ministers' Advisory Council (AHMAC) established the Australian Medical Workforce Advisory Committee (AMWAC) in 1995 to advice on national medical workforce matters, including workforce supply, distribution, and future requirements. AMWAC oversaw a medical workforce research program which was linked with the broader health workforce research agenda. Its roles included: to provide advices to the Australian Health Ministers' Advisory Council on a range of medical workforce matters (structure, balance and geographic distribution of the medical workforce; number and distribution of education and training places needed to meet future demand; models for predicting future medical workforce requirements,…). The increase in training places is generally based on targets recommended in the Australian Medical Workforce Advisory Committee's (AMWAC) specialty workforce report. Overall, 87% of AMWAC recommendations for additional training places have been fully met.[138] AMWAC was disbanded in 2006 and has been replaced by a new national workforce planning structure, The Health Workforce Principal Committee (HWPC). This new structure provides a forum for reaching agreement on key national level health workforce issues requiring government collaborative action and provides advice on health workforce issues to the Australian Health Ministers' Advisory Council (AHMAC)[ss].

ss see http://www.health.nsw.gov.au/amwac/ahwoc/index.html.

5.3.3.6 Belgium

Belgium has introduced numerus clausus in medical faculties in 1997, proposing different quotas for physicians' selection according to Communities and categories of medical practitioners (GPs or SPs and according to specialties). Please see chapter 2 (section 2.2.7.) for more details.

5.3.3.7 Conclusion

France, Belgium, Germany, the Netherlands and Australia have implemented a numerus clausus, while in Austria the access to medical studies is still free and not limited by a numerus clausus. The numerus clausus is made effective in controlling the intake of medical students through either a competitive entrance exam or, in the case of France and the French Community of Belgium, controlling the number of students entering the second year of study in medical schools. In the Netherlands, students are selected by lottery.

The level of intake can be determined on the basis of forecast (as in France and Belgium) or by adapting the number of training places in universities (as in Germany), or both (Australia and the Netherlands).

The numerus clausus has been effective for a long time in the Netherlands and France, while it was implemented in the mid 90s in the 3 other countries. The objective remains limiting the student intake in Belgium and Germany. By the contrary, France, the Netherlands and Australia, following a perceived medical workforce undersupply, tend to reverse the situation by increasing the students' inflow. The recent history of these 3 countries demonstrates the difficulty of reaching and keeping a medical workforce that would be appropriate. The diagnosis of undersupply can succeed to the one of oversupply, sometimes within a few years, as in Australia. Several factors can explain this observation. The main one is probably that, in the five countries applying a numerus clausus, appropriate numbers are determined by relatively crude forecasting methods. They are essentially based, on the one hand, on estimating the current stock and its likely demographic changes, and, on the other hand, on estimating future demand for health care. Demand forecasts are mainly based on demographic changes in the population; more recently, they tend to include epidemiological or system-wide changes (see chapter 4 for more details). Another factor relates to the important time lag involved in training medical students (12-13 years for some specialties). This implies that, after such a period, health care system and its suppliers may have evolved and supply may no longer match demand.

5.3.4 Geographical distribution of medical practitioners

Geographical imbalances are assumed to generate inequity in health care accessibility. Policies regulating the national supply of physicians do not necessarily influence the geographical distribution of medical supply. Therefore, countries implemented one or a number of complementary policies designed to make the geographical distribution of the medical workforce more even. Two main policy options have been considered. Countries like France, Belgium and Australia focus on financial incentives, educational measures, education-related funding instruments or administrative regulations.

Others like Germany and Austria, besides regulating the inflow or not, also regulate the practice location, prohibiting new physicians to settle in areas with high medical density.

Countries in which doctors are free to choose their practice location show considerable differences in the regional availability of physicians. This is the case in Belgium, in France and in Australia, but not in the Netherlands. Professional, personal, educational and social/lifestyle-related factors influence the practice location. Physicians are more likely to settle and practise in affluent, metropolitan areas than in rural and deprived urban areas. A lot of them practise in the region where they did their training. In fact, the low numbers of physicians in rural area have more to do with retention than with recruitment, as heavy workloads and professional isolation lead doctors to look for better working conditions.[139]

Higher turnover in medical personnel result in work overload for doctors in rural districts, further pushing them to urban areas. Lack of equipment and supplies and of appropriate facilities has a deterrent effect for health professionals to accept positions in rural and underserved areas.[139]

In France, public authorities have tried, within the frame of a national numerus clausus, to remedy the wide disparity in regional physician-to-population ratios[tt] by allocating a relatively higher inflow to regions with a low ratio. This policy has contributed to reducing regional disparities over the past 30 years. However, policies intended to influence the regional numbers of medical students have not always led to the expected results. In fact, while in 1980, 80% of specialists having obtained their diploma 5 years ago did practise in the region where they did their training, this proportion fell in 2000 to 66%. Many specialists find internships in regions where there are fewer doctors ('forced migration') and then return to their region of origin to practise. In the future, however, capacity between regions might be balanced, as the regions that currently have the most generous provision (Ile-de-France, Provence – Alpes – Côte d'Azur, etc.) are also those in which a high proportion of older doctors practise.[128]

In Belgium and France, plans were introduced to encourage doctors to practise in medically deprived areas. These plans combine financial incentives and improvements in working conditions. In Belgium, since 2006, a specific fund (Impulseo I) is proposed to help Belgian general practitioners to install in areas where more general practitioners are required, i.e. having a low medical density in GPs or being a sparsely populated region, and in precarious areas ("positive action area") of big cities. In France, municipalities can also provide financial aid to doctors who wish to set up a practice (for a minimum period of three years) in deprived areas, or provide them with professional facilities or personal housing. They can also give a study allowance, offer a housing grant or provide accommodation to medical students in their sixth year of study if these students commit to locating for a minimum period of five years in a medically deprived area. Finally, doctors participating in out-of-hour services in such areas will benefit from a tax revenue rebate on their income from this activity. The evaluation of these initiatives is not currently reported. However, the Commission for medical demography (2005) indicated two weaknesses: first, these initiatives were not accompanied by a large diffusion of information among those GPs who could be interested by these advantages; second, financial incentives alone are not sufficient to attract GPs without local and regional development of infrastructures.[140] In low-developed areas where the spouse has many difficulties to find a job and children have difficulties to find a school and sportive or cultural activities, financial incentives alone show their limits.[140]

Another incentive to attract/retain MDs in specific areas is encouraging group practice. In France, the health insurance fund will pay a 20% higher rate of remuneration to doctors working in a group practice in medically deprived areas. As the Belgian project Impulseo II, a special fund (*Fonds d'Aide à la Qualité des Soins de Ville*, FAQSV) set up within the national health insurance budget, will be used to make capital investments to set up multi-speciality group practices. Additionally, a new status of 'associated partner' has been created for young doctors. This will allow them to join a practice without having to make a capital investment.

Strategies to sustain health professionals working in rural areas encompass new technologies such as telehealth and telemedicine. These innovations have the potential to increase the supply of health professionals to rural and deprived areas by facilitating professional collaboration and development, by supporting, for example, continuing education and access to some services (interpretation of x-rays, specialist opinions).

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tt For example, in 2004, the proportion of training places devoted to Ile-de-France was 23.1% though its population was 18.2% of the country population. The opposite was observed in the Centre (part of numerus clausus = 2.6% for a part of population = 3.9%).

The use of videoconference technology has opened many prospects for those working in rural and remote areas, as a treatment and diagnostic tool as well as a means to gain access to education and training over long distances.[139]

It is noteworthy that proper evaluation of these policies is lacking so far, but results are mild. Therefore, there is currently in France a political will to shift from incentive to coercive regulation. This idea is already being adopted for self-employed nurses[uu]. Until now, the implementation of this measure is impossible because law forbids selective health contract. A positive political impulse could accelerate the process and extend it to doctors (president speech on September, 18 2007).[141]

Australia has implemented both education-related funding instruments and educational policies in combination with financial incentives. Selective admission policies of medical schools which take the form of affirmative entry programmes and scholarships for students with a rural background have been shown to be effective in attracting physicians to rural areas. Moreover, medical students have at least eight weeks of rural experience in their curriculum. Legislative changes introduced in 1997 limited International Medical Graduates to districts of workforce shortage if they wish to access a Medicare provider number.[142] Other measures include relocation grants to assist practitioners and their families to move to rural areas, and higher rebates for GPs who bulk-bill in regional, rural and remote Australia. It is still too early to determine whether these initiatives have led to long-term improvements in the distribution of practitioners.[137]

Measures involving financial assistance for training, in the form of grants or loans at favourable rates in return for working in underserved areas for a predefined period of service are ineffective in the longer term. This is because the requirement to work in a particular area is for a finite period, but also because many doctors pay off the loan or the grant in order to avoid this obligation. Restricting the location of immigrant doctors is effective in the short term to attract health professionals, but these measures have a high cost and do not allow the continuity of practice in the medium and the long term as the obligatory service is limited in time. More positive results in the long term are reported for policies designed to reform basic training: including a significant rural experience in the training curriculum or particular attention to students living in rural areas and who are likely to locate in underprivileged areas in the future, or measures to adapt the content of training to the skills needed in these areas.[143]

Austria and Germany have adopted a regulatory policy that imposes conditions on the choice of practice location. Physicians are not able to get a contract with a regional health insurance fund if the threshold number of physicians is reached in a region. For instance, in Germany, since 1993, new practices may not be opened in areas where supply exceeds 110% of the requirements, requirements being established on the basis of the physician-to-population ratio of 1990 (see Appendix D3 for more details). In both countries, the geographical distribution of doctors has become more even, although the existing oversupply in specific areas, like large cities, was not resolved since there was no instrument for closing practices or preventing others from taking over the practices and registrations of retiring doctors (even in over-supplied sectors). Although there is almost no possibility to establish new practices for specialists in Germany, general practitioners are free to set themselves up in practice in two-thirds parts of the country, mainly in the eastern part of the country. This policy combined with the lack of hope to practice a subsequent career were seen as partly responsible for attrition of medical students during training and the subsequent decline of new graduates.[131] German doctors also prefer to emigrate to NHS in Great Britain (where they are particularly welcome) instead of working in East Germany where remuneration conditions are poorer as well as the working conditions.

uu On June 21 2007, an agreement was signed between self-employed nurses and sick funds envisaging the possibility to introduce regional restrictions for setting up a nursing practice with compulsory health insurance on regional levels of demand. According to this agreement, only self-employed nurses who would install in medical undersupplied areas would benefit from the national health contract leading to the reimbursement of nursing acts for patients. The signatory parts of this agreement envisage introducing this regulatory measure for a test period of 2 years.

5.3.5 Reshaping professional profiles

Medical supply and requirement also depends upon professional boundaries.[4] Changes in the skill-mix may affect the workload as well as the number of physicians required. 'Skill mix' generally refers to the mix of different types of staff within a multi-disciplinary team or the demarcation of roles and activities among different categories of staff.[144] While skill-mix can refer to all healthcare professionals, most of the policy attention has been on the mix between physicians and nurses[vv].[145] Substituting nurse practitioners for doctors may be driven by medical workforce shortage and the willingness to reduce costs while achieving similar outcomes.[146,147]

Substitution refers to the situation where task(s) formerly performed by one type of professional (i.e. doctor) are transferred to a different type of professional (i.e. nurse or physiotherapist), usually with the intention of reducing cost or addressing workforce shortages.[148] Task substitution can involve the creation of new autonomous roles (e.g. nurse practitioners) or roles in which non-medical practitioners work under the supervision of someone else (usually a medical practitioner) (i.e. delegated care).[149] Nurses can substitute for doctors, either releasing doctor time to enhance care in other areas or reducing medical manpower requirements.[150]

Such changes of skill-mix have been observed in a number of countries.

5.3.5.1 Experiences of task transfer in countries under review

France has developed since 2005 pilot projects aimed at improving the cooperation between doctors and paramedics. These projects permit the transfer of some specific tasks from physicians to other carer categories. Law has been adapted to authorize drug prescriptions by nurses. For example, management of dialysis is delegated to nurses, prescription of eye glasses to orthoptists.

Evaluation of these experiments is currently realized. Ten new experiments look at the delegation of the follow-up of chronic patients to non-medical practitioners.[140] These experiments have pinpointed the importance of a continuous training to develop skills and knowledge of collaborators.

The Nurse Practitioner (NP) was implemented in the Netherlands at the end of 1997. The implementation was originally meant to be an answer to several human resource problems: a shortage of physicians, the need for continuity and coordination between patients and healthcare workers, and the lack of career possibilities for nurses. It turned out that NPs endorse tasks which were previously neglected by GPs (prevention, education, controls …). Consequently, although contributing to improving quality of patient care, they do not alleviate GPs workload. A national experiment is currently underway concerning the extension of primary care tasks for nurses, in twelve group practices and health centres. Within this programme, qualified nurse practitioners can visit patients at home, care for patients with chronic conditions (asthma, arterial hypertension, smoking etc.) and manage vaccination programmes. They may not however, make diagnoses or issue prescriptions.

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vv Sibbald et al. (2004) provide a useful framework for looking at nurse/doctor skill-mix, which includes:

- Enhancement – extending the roles or skills of a particular group of workers;
- Substitution – working across professional divides or exchanging one type of worker for another;
- Delegation – moving a task up or down a uni-disciplinary ladder; and
- Innovation – creating new jobs by introducing a new type of worker. Changes in skill mix may also be brought about by changing the interface between services, including:[144]
- Transfer – moving the provision of a service from one health care sector to another, e.g. substituting community for hospital care;
- Relocation – shifting the venue from which a service is provided from one health care sector to another, without changing the people who deliver the service, e.g. running a hospital clinic in a general practice setting;
- Liaison – using specialists in one health care sector to educate and support staff working in another sector, e.g. hospital 'outreach' facilitators in general practice.

5.3.5.2 *Evidence for substitution effectiveness*

A Cochrane review of nurse practitioners showed that NPs can achieve health outcomes that are as good as those of general practitioners and demonstrate superior interpersonal skills. However, nurses tend to provide longer consultations, carry out more investigations, give more information to patients and recall patients more frequently than do doctors.[148] The available research suggests that NPs do not reduce the general practitioners' workload, which can be explained by the type of tasks nurse practitioners perform but also because doctors may continue to provide the same services as nurses leading to duplication rather than substitution of care; moreover, nurses meet previously unmet patient need or generate demand for care where previously there was none. Consequently, nurses are not substitutes for doctors but provide a wider range of services than was available previously. The same observation was made for GPs assistants.[148]

5.3.5.3 *Implications of doctor-nurse substitution*

Experiences so far show that a number of accompanying conditions are necessary for substitution.

First, educational reforms to facilitate the empowerment of health professionals are needed. Nevertheless, until now, what level of training is required for extending nursing roles remains unclear. This vagueness is also reflected in the wide variety of nurses' titles and qualifications: "practice nurses", "nurse practitioners", "clinical nurse specialists" and "advanced practice nurses" sometimes overlap similar nurses' roles, sometimes encompass different realities. Shortened courses for professionals to acquire some of the key skills beyond their normal range should also be developed (e.g. nurses training in foot care or in diabetic follow-up).[151] A Cochrane literature review also supports the view that clinical guidelines or protocols may help to facilitate the transfer of tasks from doctors to nurses while maintaining quality.[152] Implementing task substitution also requires a combination of service redesign, using clinical practice improvement methodology, and progressive competency-based training.[149]

Second, appropriate HRH planning is necessary. Task delegation from doctors to nurses leaves doctors to manage the more complex patient problems while delegating care to nurses can lead to excessive workloads for nurses unless their numbers are increased and/or simpler tasks are delegated to nurse replacements, such as nurse auxiliaries or health care assistants.[145,147]

It is also important to prepare the staff for the task shift so as to avoid negative perceptions and frustration.[153,145] Uncertainty can emerge as the traditional roles change, which can affect relationships both among professional categories and between them particularly if changes were implemented for external reasons (e.g. because of policy requirements, economic reasons, shortages in workforce or because there is work that doctors no longer want). Nurses in advanced-practice roles could also feel lost in the hierarchical structure and towards the role they play between doctors and registered nurses.[145]

5.3.6 Specialty imbalances

In all countries, general practice seems to be less attractive for medical students than specialty, for different reasons (professional image, income levels…). This may be partly due to training exclusively in hospitals, with little opportunity to learn about primary care work. In all countries except Australia, specialists outnumber GPs. In countries such as France, Belgium and Australia, training posts in general practice remained unfilled. In France, students who were not ranked high enough to access a specialist training position preferred to repeat their exams the next academic year, rather than enter general practice training.

Different strategies have been implemented by countries to counter the phenomenon. First a specific quota can be assigned to general practice within the overall numerus clausus. Such initiative was adopted in France. Since 2004, the "concours d'internat" was replaced by other ranking exams, labelled "Examen Classant National" (ECN).

Whereas only future specialists had to pass the "concours d'internat" before 2004, all students who desire to access to the third cycle of their medical training have now to pass a ranking exam, the "Examen Classant National". The Examen Classant National, which ranks medical students after six years of study, determines what medical speciality a student may pursue.[125] According to their rank, students may choose the specialty (among 11 specialties including general practice) and the region where they will be trained. The numbers of posts by specialty and by region are fixed by the Ministry of Education and Health on a yearly basis.

Unfortunately, this system did not succeed in regulating repartition of students between specialties, because the number of posts proposed to students has always been beyond the number of students. In 2006 however, the number of candidates (5 176) was beyond the number of posts (4 760). Nevertheless, students' absences during exams (276), non validation of second cycle of medical training (375) and students' withdrawals (95), led to an important decrease in fulfilled posts to 4 430. In 2004, 50% of the training places were designed for general practice in France. In 2005, this proportion was increased to 60% according to the fall in active GPs numbers.[140] However, 330 posts remained unfilled in 2006, mostly in general practice (Table 42).[154]

Table 41. Fulfilled posts after the "Examen Classant National"

Examen Classant National	***2004***	***2005***	***2006***
Number of posts opened	**3 988**	**4 803**	**4 760**
Number of posts fulfilled	**3 368**	**3 822**	**4 430**
Number of posts unfilled	**620**	**981**	**330**
General practice (GP)			
Number of posts opened	**1 841**	**2 400**	**2 353**
Number of posts fulfilled	**1 232**	**1 419**	**2 030**
Number of posts unfilled	**609**	**981**	**323**
Ratio			
Posts opened in GP / Total number of posts opened	**46%**	**50%**	**49%**
Posts fulfilled in GP / Total number of posts fulfilled	**37%**	**37%**	**46%**

Source. Ministry of Health cited by Cour des Comptes (http://www.ccomptes.fr/CC/documents/RELFSS/Chap8-medecins-liberaux.pdf)

A similar situation is observed in Belgium with unfilled training positions in general practice, psychiatry and geriatrics (see chapter 2, section 2.2.7.3.).

A second strategy is based on adding value to primary care during the medical studies, by increasing exposure to primary care experiences during residency, or by appointing highly-rated primary care physicians to academic positions to act as role models. There is evidence that residency experiences and role models affect the choice of speciality.[123] For example, to improve students' knowledge about general practice, French universities organise, since 2006, a two-month training period in general practice for medical students. Previously, medical students did not have any training period in general practice before choosing their speciality.[125]

A third one, adopted in Germany, consists in financing half of the GP-trainees' salaries during the office based training period (minimum two out of five years). However, in practice, the subsidy is often the trainee's only income, which may explain the low attractiveness.

Some specialities are also considered as short of candidates. They are: anaesthesia and intensive care, gynaecology – obstetrics, emergency, paediatrics, psychiatry and radiology, neuro-psychiatry as well as radiology and medical imaging. Simoens has suggested that the specialities offering a more regular work schedule, more leisure time and higher earnings will be increasingly chosen, reflecting a desire among physicians to balance professional life and social commitments.[123]

Nevertheless, countries under study did not document potential initiatives taken to increase the interest of students for 'declining' specialisations.

One exception is proposed by Belgium who adapts each year the specialities-specific quotas according to perceived needs in the profession and defines minimal numbers to be fulfilled.

5.3.7 International mobility of healthcare students and practitioners

Medical supply planning has remained a national responsibility while European regulations, including those impacting on medical supply planning, have become mandatory for member states.

In particular, the right is granted to professionals to establish themselves or to provide services anywhere in the EU (the so-called "physicians directive", passed in 1993 (93/16/EEC)[ww]. The same rule applies for students.

Provided that the national admission conditions are fulfilled, any student should be accepted whatever his/her nationality is. This makes the medical supply planning an even more complex task.

First, in countries restricting student intakes (numerus clausus), students are keen to search for training opportunities in other countries. When graduated, they can go back to their native country and open a medical practice. On the reverse, national quotas include foreign students who are likely to return to their home country after the training period. Such dynamics impact on both countries' medical supply planning, increasing the numbers beyond the quotas in the first one, and reducing the expected numbers of practising physicians in the second one, with the additional effect of having impeded national students to train. For example, in France, the number of French-native physiotherapists who obtained their diploma in universities belonging to the European Community, increases overtime. The number of authorizations to practise delivered to French physiotherapists holders of a foreign diploma represented 10% of the annual quota of inscriptions in 1997; this proportion increased to 60% in 2002 and to 93% in 2003. Such a rapid increase impairs the supply control imposed by numerus clausus in universities.[140] Same observations are reported in Belgium where French and Dutch students obtain their diploma in medicine in Belgian universities and then return to practise in their home country.

Second, increasing immigration of medical practitioners is seen as a means to maintain an adequate stock of physicians in countries such as Australia and the eastern part of Germany.[10] In general, countries under study favour developing long-term policies of national self-sufficiency to sustain their physician workforces. However, in some cases, such policies co-exist with short-term or medium-term policies to attract practising physicians from abroad, on a temporary or permanent basis. Foreign-trained physicians can make a substantial contribution to the physician workforce, particularly in Australia, where they exceed 20% of practising physicians[xx]. Immigration increases the flexibility and reduces the cost of physician supply in the host country. Nevertheless, migration of foreign health professionals may raise ethical concerns both for home and host countries. For home countries, massive migrations of health professionals could imply a brain drain of qualified workers from developing countries that will need those professionals to establish a sustainable health care system. For host countries, immigration of foreign-trained professionals could raise concerns about quality and safety of care as well as the good fit between care delivered by these professional and specific needs of the population[yy].[123]

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ww Council Directive 93/16/EEC of 5 April 1993 facilitates the free movement of doctors and the mutual recognition of their diplomas, certificates and other evidence of formal qualifications

xx Moreover, there is a Mutual Recognition Agreement between Australia and New Zealand, providing for automatic recognition of primary medical qualifications conferred by all medical schools within these jurisdictions.[123]

yy Another illustration comes from Australia which has relaxed immigration requirements conditional on foreign physicians practising in rural areas. This practice could nevertheless be questioned for two reasons. Firstly, it is highly probable that foreign physicians do not remain in the long-term in Australia, leading to a persistent problem for sustaining an adequate and permanent medical workforce in rural and remote areas. Secondly, people in rural and remote areas generally have poorer health than their

In Germany, where there are important imbalances between geographical areas, with the lowest physicians' density in the eastern states, more hospitals look abroad for doctors, particularly in Eastern Europe. International recruitment campaigns are particularly active, involving advertisements in the medical press and participation in job fairs in Germany. The most common countries of origin are the former Soviet Union, Greece, Turkey, Poland, Iran and Syria.

The increasing influx of doctors from neighbouring countries such as Slovakia and Czech Republic becomes problematic for home countries where physician shortage is already forecasted.

According to the Czech medical chamber, Czech physicians, mostly anaesthesiologists, prefer to emigrate in Germany than working in their own country, since Germany became, in 2002, the first European country to begin hiring Czech physicians with automatic recognition of diploma.[155]

In Belgium, migration is not a new phenomenon. However, since 2000, the Federal register of health practitioners reflects an increase in migration influx certainly favoured by the application of the internal market for services. This recent increase could also be partially explained by the demand for physicians in some specific sectors, such as hospitals.

5.3.8 Shaping physicians outflow

In all countries except Germany, physicians are mostly independent workers and do not have to respect the legal age of retirement. In Germany, the retirement at age 68 is mandatory, in order to clear up the labour market. This initiative was taken in a period of physician oversupply when a lot of young doctors were unemployed. It has been strictly applied until recently (except in the exceptional circumstances that a minimum number of years in private practice was not reached – a clause which was done for physicians in the Eastern part of the country), and enforcement was easy: the contract with the sickness funds expired (which did not mean that the physician lost his/her licence to practice, i.e. they still can, and do, treat private patients). Most recently, staying on beyond 68 is possible in underserved areas to preserve the medical workforce (Reinhard Busse, personal communication).

In France, during the period of perceived oversupply, a plan was introduced to encourage doctors to early retire. This so-called plan 'Mécanisme d'Incitation à la Cessation d'Activité' (MICA) contained a financial incentive to retire early; it was set up in 1988 and reinforced in 1996.[128] As the perception of adequate physician supply reversed, the 2003 law reforming retirement rules allows individuals to have an activity based income on top of their pensions. The cap on the additional income has been raised for doctors retiring beyond age 65. Additionally, to retain physicians in the workforce up to their potential retirement date, more flexible working patterns that reduce workload were offered to older doctors, doctors older than 60 being declared exempt from out-of-hour shifts.[125] In 2006, 1 007 retired doctors chose to go back to work.[127]

In Australia, plans also have been proposed to entice physicians who plan to retire early to stay longer in the workforce. In countries where no retirement rules are applied, physicians' activity level declines with age and becomes negligible after 75 years. Female doctors retire earlier than male. In the Netherlands, about 20% of all male GPs and 33% of all female GPs aged 50 years have already left practice.

metropolitan counterparts related to lifestyle and behaviour factors, riskier occupations, country driving conditions and generally lower socioeconomic status. Medical practitioners are asked to deliver indigenous-specific primary health care which is more difficult for foreign physicians who do not know the specific condition and lifestyles of this population. In parallel, it is important to underline that training places for physicians are reserved for Indigenous candidates.

5.4 CONCLUDING REMARKS

5.4.1 Data availability and validity

Countries included in the benchmarking exercise share a number of common challenges. Undoubtedly, cross-national comparisons offer an interesting tool for obtaining evidence on successful initiatives developed and implemented in those countries. However, although reliable, consistent and comprehensive information on human resources working in the health sector is a prerequisite to any manpower policy in the health sector[115], our benchmarking exercise has brought up a number of deficiencies at this level.

First, in most of the countries, multiple datasets co-exist, but heterogeneous sources, collection strategies and parameters definition lead to important inconsistencies. These inconsistencies may even affect such crude measurement as headcount of physicians. Another example is the lack of common methodology to translate headcount into full-time equivalents (FTE).

Besides resources wastage, such proliferation of datasets makes medical supply planning difficult as problem analysis can vary according to the reference dataset. France illustrates how datasets can be harmonized. There has been a concerted effort to harmonise the data on physicians kept by DREES (ADELI), the national licensure body (*Conseil National de l'Ordre des Médecins*), CNAMTS and INSEE. A ministerial working group was set up in 1998 for this purpose by the national statistical commission (*Conseil national de l'Information statistique* (CNIS) – it is named the *Comité ministériel d'harmonisation des données relatives à la démographie médicale*. This initiative involved the government, professional licensure groups, CNAMTS, other sickness funds and medical unions. Figures published by the National Medical Council and DREES on total number of physicians are totally consistent. The Observatoire National de la Démographie des Professions de Santé (ONDPS) has conducted several methodological studies on source comparisons in the past two years. These studies have allowed a reconciliation of many discrepancies between sources due to differences in concepts or coverage. Physicians are classified according to their activity: regular activity, replacement, no activity.[156] These two databases continue to coexist because they aim at different objectives such as administrative management, social registries or hospitals management. Moreover, they encompass different professional groups. The validity of these databases is also checked four times a year by surveying sub-samples.

This effort to harmonize existing databases was also recently made in Belgium both by the Federal Administration of Public Health and INAMI/RIZIV. These two databases are linked with the National Register which communicates all changes in the identification of practitioners (death, departure for another country, and move in the country…). In early 2007, these two databases were cross-checked, discrepancies between categorisations were harmonised and missing values were filled in both sides. External validity will possibly be ensured in the future through new e-projects (e-cad, Be-Health and recording of out-of-hours duties by general practitioners) allowing registered practitioners to have online access to the Belgian cadastre of health practitioners.

Second, existing data may be poorly accessible. Countries collect a bunch of routine data, but their availability for analysts and policymakers is often not straightforward.

Third, important data is simply lacking. A striking illustration met during our benchmarking is the difficulty to differentiate numbers of registered, active, and practising physicians. While the former is generally available, and used by institutions for international comparisons, the latter, who reflects better actual workforce, is available only in some of the data sources. To fine tune analysis and assess proportions of part-timers for example, turned out to be impossible in most of the countries. The Netherlands address the problem, at least for data on GPs, by complementing routine data with cross-sectional surveys on sub-samples.

The second Dutch National Survey of General Practice took place, under the auspices of the Ministry of Health, between 2000 and 2002 in order to (1) monitor the morbidity in the population, the use of health services at patient level and its determinants, and (2) to update the existing information on the functioning and performance of general practice (utilisation of care, quality of GP care, contact frequencies, organisation and workload). Owing to this important data collection, knowledge about demographical data and activity profiles of general practitioners was updated.[91] Moreover, employers of health professionals (hospitals, healthcare centres, old people homes…) have to record posts which remain vacant.

Lastly, data collection is poorly coordinated at the international level, and specifically in Europe. Due to the different organisation and structure of the health care sector as well as the classification system used for health occupations and, finally, the policy priorities in each country, there is a strong variability of data among the various countries. Although this is a barely surprising statement given the low coordination level observed country-wide, there are two consequences.

First, international comparisons are an exercise which is methodologically bounded. Second, and more importantly, although new European regulations have an impact on national medical supply planning by allowing free movement of students and professionals, there is currently no good quality data to forecast, monitor and evaluate those international dynamics. There is little international standardization of migration-related documentation, making it difficult to compare levels of general migration between countries. There is also often a lack of specific data on health professionals. It is therefore not possible to develop a detailed pan-European or international picture of the movement trends of doctors, nurses and other health workers, or to assess the balance between temporary and permanent migrants.[157] Directorate General XV collates statistics on the migration of doctors within the EU. Unfortunately, data lack in many European countries or are incomplete when available.[158] EUROSTAT Labour Force Survey reports composition of foreign(-trained) physicians in selected OECD countries without mentioning the total number of immigrants.[123] Lodging a request to The European Social Observatory (October 2007) was also unfruitful to obtain precise data or statistics about physicians' mobility throughout Europe.

5.4.2 Policy innovations: proper evaluation is needed

Countries have implemented a number of initiatives to shape the medical supply. However, adopting successful initiatives from other countries may require significant adjustments in other sectors impacting health care systems (laws, financial regulations, labour market …). Moreover, implementing new regulations should be considered as acceptable by the population or by professionals themselves. It is also paramount that such policy innovations be adequately evaluated.

For instance, changing skill-mix to address medical shortage is a strategy that has been implemented or is foreseen in most of the countries reviewed. However, impact of such strategy on medical requirements and health expenditures is not straightforward. The available research suggests that Nurse Practitioners do not reduce the general practitioners' workload, which can be explained by the type of tasks nurse practitioners perform but also because doctors may continue to provide the same services as nurses leading to duplication rather than substitution of care.[144,159] Moreover, nurses meet previously unmet patient need or generate demand for care where previously there was none. Consequently, nurses are not substitutes for doctors but provide a wider range of services than was available previously. The same observation was made for GPs assistants.[148] As regards budgetary impact of substitution strategy, Hollinghurst et al. combined findings from two similar randomised trials[160, 161] to compare the cost of primary care provided by nurse practitioners with that of salaried GPs in UK.[146] Their results indicated that employing a NP in primary care is likely to cost much the same as employing a salaried GP. Sensitivity analysis suggested that the time spent by GPs contributing to NPs consultations (including return visits) was the main factor in increasing costs.

Integrating nurses (or other assistants) in a primary care team also increase transaction and coordination costs because people need to spend increasing amounts of time conferring with each other, thus decreasing the amount of time available for direct patient care.[147] From the perspective of the healthcare economy as a whole, it is generally cheaper to train nurses than it is to train doctors; but savings are again eroded because nurses tend to have lower lifetime workforce participation rates than doctors. Cost savings are therefore highly context dependent.[144]

Harmonizing medical distribution among geographical entities is also a policy field in which a lot of innovations have been tried in recent years. Unfortunately, as explained in the results section, it is also a field in which proper evaluations have been lacking.

5.4.3 Comprehensive planning

Even if it is largely accepted that all health care professionals have to be considered in a global strategy of human resource planning, countries have rarely adopted such a global strategy. Instead, they compartmentalize the evaluation of available resources and the forecasting for the future, leading to fragmentary vision of who is needed for what type of care, what professional category is / will be undersupplied or oversupplied in the country, without considering the possible inflow or outflow from / to abroad.[115]

Key messages

- **Important variations in the number of practising physicians per 10 000 inhabitants are observed, from a low 12.2 per 10 000 inhabitants in the Netherlands to 37 per 10 000 inhabitants in Germany.**
- **The medical profession is feminizing and ageing in all countries, impacting on the productivity. Plans have been introduced to prevent early retirement in a number of countries.**
- **France, Belgium, Germany, the Netherlands and Australia have implemented a numerus clausus, while in Austria the access to medical studies is still free. The numerus clausus is made effective in controlling the intake of medical students (competitive entrance exam; academic achievement after the 1st year; lottery).**
- **The objective remains limiting the student intake in Belgium and Germany, while France, the Netherlands and Australia are increasing again their students' inflow following a diagnosis of medical workforce shortage. The recent history of these 3 countries demonstrates the difficulty of reaching and keeping a medical workforce that would be appropriate.**
- **Two main policy options are considered to counter geographical imbalances. France, Belgium and Australia focus on financial incentives, educational measures, education-related funding instruments or administrative regulations. Germany and Austria regulate the practice location, prohibiting new physicians to settle in areas with high medical density.**
- **Changes of skill-mix have been tried in a number of countries to alleviate the workload of GPs, mainly in the form of task-substitution between doctors and nurses. The impact on physician requirements and health care expenditure is highly context-dependent.**
- **The low attractiveness of general practice is observed in all the countries and different strategies have been implemented to counter it: to set specific quotas for trainees; to review university curriculum; to subsidize training. The efficiency of those strategies has not yet been assessed.**
- **While the medical supply planning has remained a national responsibility, free movement of trainees and graduates in the Economic European Area blur the picture. This is a challenge for the educational system and the management of the health workforce, particularly in countries willing to restrict their medical supply.**
- **Initiatives to improve data collection on medical manpower to allow a responsive medical supply planning have been implemented in a number of countries. However, additional efforts are needed, in particular as regards international harmonization of data. There is also a need for proper evaluation of initiatives. It is also noteworthy that in most of the countries, the medical supply planning has been done in isolation of the other health professions and the global health system.**

6 SHAPING THE FUTURE OF MEDICAL WORKFORCE SUPPLY PLANNING IN BELGIUM

Planning of the medical workforce supply aims at ensuring that the right practitioners are in the right place at the right time with the right skills.[2,3] It involves determining the numbers, mix, and distribution of health providers that will be required to meet population health needs at some identified future point in time.[100] This is a complex task, and Joyce et al have proposed a framework to make it effective, including three essential fields of activities:

1. An effective monitoring of all key factors affecting supply and demand, i.e. an effective systematic collection of good-quality data to monitor trends over time.
2. A system-level perspective, integrating medical workforce planning with workforce planning for other health professionals, and with workforce development, service planning and financial planning for the health care system.
3. A dynamic approach, i.e. to undertake workforce planning in a planned cyclic fashion, with stochastic models to account for the uncertainty inherent to health systems.[113]

6.1.1 Effective monitoring of key factors

Good quality and timely data collection and analysis are crucial to allow flexible, relevant and valid health workforce planning.[100] In Belgium, a bunch of data on medical supply is routinely collected. However, operational difficulties limit the utilization of such data collection:

- Data are fragmented in various databases which overlap to some extent but also display inconsistencies, with different objectives and different methodologies for data collection and updating.
- Important data for in-depth appraisal of the medical supply are not available. Examples are the lack of information on actual workplace, practice arrangements, working hours, speciality boundaries, part-timing, skill-mix, attrition or migration rate of physicians.
- Future workforce needs are projected by applying a growth factor to the baseline level of need. The growth factor is based on demographic changes (i.e. population growth and ageing) but does not account for other factors such as technological advancements, changes in health care accessibility or disease trends.

Those issues can be addressed by:

- Coordinating and harmonizing routine data collection on the 'stock and flows' of the medical supply. Data on head counts, actual level of activity, attrition or migration rate, should be validated and made readily available to stakeholders and researchers. The function should be endorsed by the National Register of the Medical Profession ("cadastre").
- Implementing complementary data collection for more specific information not collected routinely, such as practice arrangements, workload indicators or determinants of medical productivity. Regular surveying, both quantitative and qualitative, of a sub-sample of health care practitioners is an option (see the Netherlands case).
- Identifying and monitoring indicators of heath needs, such as disease trends or new clinical management, so as to allow a proper gap analysis.

- Setting up a monitoring board accountable for providing policy-makers and stakeholders with yearly analysis of medical workforce. The National Observatory of Demography of Health Professions (http://www.sante.gouv.fr/ondps/), in France, is an example of body which:
    - gather and analyze data on medical demography
    - support methodologically local and regional studies on that topic
    - synthesize and diffuse data and results

6.1.2 A system-level perspective

Medical supply planning is not only a matter of manpower size, but also encompasses defining the desired skill-mix, availability and accessibility level of medical services, quality control and accountability of health care providers, regulatory measures shaping the demand for health care, and financing of the heath system. Without such system-level perspective, medical supply planning resumes basically to an exercise in demography based on implicit assumptions that population age structure determines the service needs of the population and that the age and sex of providers determines the quantity of care provided.[3]

We underlined, in this report, a number of challenges that must be tackled in Belgium:

- Geographical imbalances. Belgium as other countries in which doctors are free to choose their practice location shows considerable differences in the regional availability of physicians.
- Imbalances across medical specialities. Particularly noteworthy is the low attractiveness of general practice observed in recent years. There is a decrease of practising GPs, and, among new graduates, quotas are unfilled. The phenomenon is also observed in other European countries, and can be due to a number of reasons, such as the higher social value and income for specialized doctors; a medical training mainly hospital-based.
- International migrations of students and professionals. While regulation of national inflow has been enforced, EU regulations blur the picture by allowing free movement of trainees and graduates. Foreign students follow the same entrance (or after the 1st study year in the French community) selection procedure than Belgian ones, but foreign doctors are allowed to specialize or begin a practice out of quotas. The number of visas delivered to foreign doctors has been increasing in the recent years. The opportunity for European students to be trained in another European country also impairs the supply control imposed by the numerus clausus, as Belgian students can train in France or in the Netherlands, and come back to practise in Belgium, without restriction.
- Numerus clausus. The efficiency of restricting health professional numbers is at stake. First, the literature review and the empirical study on Belgian data do not yield straightforward results as regards a supplier induced demand (SID) (see chapter 3). In Belgium, the link between medical density and health care consumption is clear but weak for GPs. It is stronger for SPs but should be further investigated. It is also unclear if countries having implemented a numerus clausus managed to curb their health expenditures differently than other countries. That question, which should also address the relative impact of accompanying policies, was beyond the scope of the present project. Second, it has been proposed that a too low physician volume would result in a lower care quality. So, restricting physician numbers would be a means of maintaining a certain activity volume, and thus a certain quality level. However, the related evidence is ambiguous[162], or even counter-intuitive.[163,164] A last difficulty of a numerus clausus is the

necessary selection of students, which is done at the beginning of the curriculum on the basis of exam results and academic achievement during high school. The process does not necessarily guarantee the selection of the most appropriate health professionals.

- Lack of a comprehensive planning framework. A lot of policies are implemented that impact directly or indirectly on HRH. Examples are changes in the skill-mix, or the Impulseo initiative to attenuate geographical imbalances. There is a lack of coordination at this level. For instance, the Committee of Medical Supply Planning is not involved in the 2 aforementioned strategies, although its legal mission encompasses that field of activity. There is also as striking lack of formal evaluation scheme of such interventions.

Those challenges could be addressed by:

- Designing a national workforce planning framework. Examples of such framework can be found in France in 2003 (ONDPS[zz]), Scotland in 2005[aaa] or in Australia in 2004[bbb]. Their main characteristics are being: 1. integrated (with all other planning systems, but particularly with service planning and resource/finance planning); 2. consistent and evidence-based (decisions are informed by sufficiently reliable information and robust methodologies); 3. evolutive (flexible and adaptative to rapidly changing health system). Such framework define and diffuse the guiding principles of the medical supply planning, and identifies the actions that need to be taken at national or regional levels to tackle the challenges aforementioned, such as:
    - Addressing geographical imbalances. Diverse incentives-based initiatives to attract and to retain doctors in underserved areas are underway in France and in Belgium. Evaluation is not yet available. However, experiences show that financial incentives alone are insufficient without local and regional infrastructure development (schools for children, social and cultural activities …). Regulating by law the practice location is an alternative in a number of countries (Germany, Austria), but the efficacy of such strategies is not demonstrated.
    - Addressing speciality imbalances. In particular strategies to increase the attractiveness of the general medicine must be developed, such as increasing exposure to primary care experiences during residency, appointing highly-rated primary care physicians to academic positions to act as role models, or reinforcing the pivotal role of GP in the health system.
    - Defining the professional skills, not only numbers, necessary to address health needs. This implies re-defining and integrating into the general planning framework issues such as curriculum methods and content at the university; professional boundaries and collaboration (skill-mix); changes in the medical practice due to technological innovations or epidemiological changes.[4]
    - Curbing health expenditures. Controlling the volume of supply by limiting the number of physicians is an option which is based on a number of uncertainties and which efficiency is not documented. Other options are to be considered in a system-level perspective. In particular, as regards the supplier-induced demand, the regulating effect of practice guidelines, quality controls (feed-back, accreditation), organisational

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zz http://www.ladocumentationfrancaise.fr/rapports-publics/064000455/index.shtml

aaa www.scotland.gov.uk/publications

bbb http://www.health.nsw.gov.au/amwac/reports.html

("Dossier Médical Généralisé") or financial changes in health care delivery should be thoroughly evaluated.

  - Extending the system-level perspective to trans-national approach is required to address the issues of student, patient and professional migrations. Trans-national approach also allows comparing policies, e.g. countries such Austria or Germany put the focus on regulating practice location rather than on restricting student numbers.

- Setting up a body to design, monitor and evaluate the actions of the general planning framework. The Belgian Committee of Medical Supply Planning, which consists of a comprehensive panel of national stakeholders and whose legal mandate already encompasses the provision of recommendations on all aspects of HRH requirements, could be empowered to play that role.

6.1.3 A dynamic approach

Medical supply planning needs to be sufficiently responsive and flexible to retain relevance and validity in a rapidly changing health system. Our review has shown that there is no scientific means of assessing the appropriateness of manpower requirements. There are no agreed-upon indicators for gap analysis of current medical supply. Instead, the definition of the adequacy of the medical manpower is a political competency and responsibility, reflecting broader societal decisions. In Belgium, national inflow has been regulated through a numerus clausus since 2004. Quotas are revised annually by the Belgian Committee of Medical Supply Planning on the basis of a forecasting model. The extent to which simulation provides useful scenarios depends on the quality of the data used in the model and on the extent to which variables modelled reflect the system as a whole. Models currently used present limitations: important parameters are unknown; part of the changes is unpredictable; the statistics applied is methodologically bounded.

Those issues could be addressed by:

- Extending the current model to account for other parameters impacting on the medical supply (e.g. medical productivity, technology innovations, epidemiology) and updating the model with accurate data (see point 6.1.1).
- Evaluating the uncertainty of the model by deterministic sensitivity analysis or stochastic simulation.
- Considering the use of other types of model. The effective demand-based approach which accounts for economic, social, contextual and political factors that can influence health expenditure is an example of such alternative.
- Developing excellent linkages and exchanges among key stakeholders. Given the acknowledged limitations of the simulation tools, multidisciplinary and collaborative network, involving equally all stakeholders, is granted.4

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