HIGHER EDUCATION FUNDING COUNCIL FOR ENGLAND

DH Department of Health

The Health and Education National Strategic Exchange (HENSE)

Review of Medical and Dental School Intakes in England

(A report commissioned jointly by the Department of Health and the Higher Education Funding Council for England)

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Contact Details	Andrew Matthewman Education and Training Policy Quarry House Leeds LS2 7UE 0113 2546442
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Executive summary

In 2011, the Department of Health (DH) and the Higher Education Funding Council for England (HEFCE) agreed it was an appropriate time to review whether the current levels of medical and dental student intakes were in line (as far as is possible) with predicted future workforce requirements. They commissioned the Health and Education National Strategic Exchange (HENSE) to undertake the review and to make recommendations. HENSE in turn established a time-limited Review Group for this task.

The Review Group acknowledged the challenging nature of this work. With so many possible variables impacting on the potential demand for, and supply of, doctors and dentists over the next few decades any such review is inevitably going to be difficult and based on the best assessment of the impact of all those variables over time.

However, to ensure the analysis was as comprehensive and robust as possible, the Centre for Workforce Intelligence (CfWI) was commissioned to take forward an extensive piece of work to develop a dynamic model of medical and dental workforce supply and demand. The model was developed following extensive consultation with a wide range of partners to “horizon scan” and develop a set of credible scenarios for the future. Using the most robust data available these were then tested within the model to demonstrate the impact of these possible scenarios. The model could also be run to assess the impact of changes to different variables.

As a result, whilst clearly not possible for any model to be relied upon accurately to predict the future, the CfWI developed a sophisticated model that the Review Group believes could best inform its deliberations and those of future review groups looking at the same issue. It had the added advantage that it could continue to be developed in the future. Part of that work will entail plotting real time data against the projected workforce predictions to confirm convergence or divergence from the modelling. This will allow future reviews

to either confirm the initial modelling and the Review Group's conclusions or indicate how the model and future conclusions should be revised.

The results of the modelling are summarised in this report. Based upon analysis of the results, the Review Group made ten recommendations:

Recommendation 1

All partners across the system should recognise the need for, and work towards the provision of, high quality robust workforce data in all areas. This is critically important with respect to demand side estimates.

Recommendation 2

Specifically, the DH's report on the Workforce Information Architecture, and the activities of Health Education England (HEE) and its Local Education and Training Boards (LETBs), should formally prioritise this work.

Recommendation 3

Future reviews of medical and dental student intakes and continued modelling of future demand and supply must, as far as possible, be placed in the wider workforce context; taking account of developments and further analyses of workforce trends. This is required to understand both how such developments could influence future medical and dental workforce requirements and how medical and dental student intakes could also have implications for other healthcare professions.

Recommendation 4

A rolling cycle of reviews of medical and dental student intakes should be established; to be undertaken every three years (not necessarily concurrently).

Recommendation 5

There should be a 2% reduction in medical school intakes, to be introduced with the 2013 intake – and this level should be adhered to until further decisions to change.

Recommendation 6

There should be a further review of medical school intakes in 2014 (for 2015 intakes) – followed by a 3 year rolling programme of further reviews.

Recommendation 7

There should be no immediate change to dental school intakes.

Recommendation 8

There should be another review of dental school intakes in 2013 (for 2014 intakes) following further work on the data on which such a review should be based – followed by a 3 year rolling programme of further reviews.

Recommendation 9

There should be no immediate change to the level of the overseas “caps” for medical and dental student intakes, but the “caps” should be kept under review and decisions informed by the outcomes of the continuing work of the four UK Health Departments.

Recommendation 10

A UK-wide perspective should be applied to future reviews where possible.

Setting the Context

Introduction

Determining an appropriate input to medical and dental schools is a key component of any plans for the healthcare workforce of the future and the UK's broad aim of increasing self-sufficiency. It also has more immediate implications for the whole of the education and training pathway as the output from medical and dental schools needs to be aligned with the plans for the available programmes in the postgraduate education and training grades. At the same time, there is a wide range of demand and supply factors that need to be considered and these will impact upon the decisions taken.

The Department of Health (DH) and the Higher Education Funding Council for England (HEFCE) share responsibility for determining the medical and dental school undergraduate intakes in England. (The strict constitutional position is that DH is responsible for determining overall numbers, and HEFCE has responsibility for the individual distribution to medical and dental schools).

To discharge this responsibility, they periodically, jointly, review the numbers. The last joint medical review was in 2006 and at that time Ministers concluded that the numbers being trained were about right. Dental school numbers were last reviewed in 2004 after which a 25% increase was agreed.

In 2011, HEFCE and DH agreed it was an opportune time for a further review of the numbers of medical and dental school places required in the future. As a result, the Health and Education National Strategic Exchange (HENSE) accepted an invitation to undertake this review with the following remit:

To ensure an adequate and affordable supply of good quality trained doctors and dentists, to improve health outcomes and ensure high quality patient care and the sustainability of the healthcare and research sectors, to advise on future:

- total intakes to undergraduate medical and dental training in England; and
- within that total, the respective limits on overseas medical and dental students.

The full terms of reference are shown at Annex A.

Overarching aim

There is a shared, UK-wide, overall long term goal of increasing self-sufficiency in the supply of doctors and dentists in the long-term. It is not realistic or desirable to expect a workforce comprising entirely UK doctors and dentists. Indeed, the goal could be more accurately defined as to produce a modest over supply to provide contingency and competition - but within the World Health Organisation projections of under-supply of doctors and dentists it is, equally, not reasonable to expect significant immigration.

That goal requires the input to medical and dental schools at the start of the continuum of medical and dental education and training to be broadly aligned with future demand for trained doctors and dentists (and with the opportunities provided at the different postgraduate training grades along that continuum). However, this is inevitably an inexact science with a wide range of factors influencing both supply and demand over the long periods of time required to train doctors and, to a somewhat lesser extent, dentists.

The length of medical and dental training provides perhaps the biggest challenge to the HENSE Review. For example, decisions taken now will not impact on the number of fully trained doctors in many medical specialties until around 2025, at the earliest. Given continuing changes in medical science and practice, developments in the healthcare workforce and expectations and organisation of the health service it is difficult to predict, accurately, requirements so far into the future. Added to this are wider demographic, economic, societal and political changes that are equally difficult to predict, but that have the potential to influence the wider requirements for the medical and dental workforce to a significant extent. For these very reasons it is important to make the best attempt to ensure future supply marginally exceeds demand.

Recent history

Medical

The third report of the Medical Workforce Standing Advisory Committee (MWSAC) Planning the Medical Workforce (December 1997) recommended “the annual intake of medical students should be increased by about 1,000 as soon as possible”. This was agreed and a total of 1,129 places were allocated in 1999, with the establishment of two new medical schools, at the University

of East Anglia and, jointly, at the Universities of Plymouth and Exeter (the Peninsula Medical School).

Following publication of the NHS Plan in July 2000, the Government created a further 1,000 medical places. These additional places were allocated in late 2000 through a similar bidding process as before, with a total allocation of 1,033 places.

This, along with the introduction of graduate entry courses to boost student numbers, resulted in significant increases in medical student numbers in the years to 2005/06.

Since then, DH and HEFCE have periodically reviewed the total number and distribution of undergraduate medical students. The last joint review was in 2006, and at that time Ministers concluded that the numbers being trained were about right. An internal modelling exercise by Department of Health statisticians in 2008 came to the same conclusion with intakes remaining broadly level from 2005/06 to date.

All these reviews recognised the need for a proportion of undergraduate intakes to be made up of students from overseas. An agreement in the mid-2000s enabled all medical schools to admit 7.5% of their overall target as “overseas” undergraduates.

Students from within the EEA have equal rights to apply to UK medical schools, so “overseas” in this context refers to non-EEA students. It is important to keep this distinction in mind as the impact of the supply of overseas doctors is considered in the overall modelling:

- the UK is bound by European Treaties of free movement and any doctor within the EEA is free to apply for and take up employment within the UK;

- the nature of the NHS labour market means that supply shortages in specific specialties and geographies may exist and it is likely that some degree of international recruitment will be necessary for the foreseeable future. NHS employers are only allowed to employ foreign doctors if there are no suitable staff available in the UK or EEA (the resident labour market test), although the Government has implemented an annual limit on the number of economic migrants from outside the EEA. This will help to ensure that only individuals with essential skills from overseas are employed in the NHS.

Dental

In the last decade it was generally assumed that the difficulties people had finding an NHS dentist were due to a shortage of dentists. Although the reasons were complex, in 2004 the Government agreed to a 25% expansion in dental training in England with the initial allocation of 170 (later increased) additional training places for dentists. (Separately, there was also a recruitment of 1,000 additional dentists to the NHS, including dentists returning to practice and overseas dentists). A Joint Implementation Group (JIG) approved the establishment of two new dental schools in the SW Peninsula and Central Lancashire and also set a 5% cap for the admission of overseas students. Whilst acknowledging that it should be possible to meet service needs from home and EEA students, this recognised some provision should be made for overseas students wishing to gain experience of NHS dentistry by training in the UK.

Because of the long lead time (5 years to train a dentist) the student expansion began to have an impact only in 2010. Meanwhile immigration of foreign dentists – particularly from the EEA - has continued at about the same level as when the DH conducted its recruitment campaign in 2005/06. These factors coupled with improvements in oral health and better recognition of the contribution professional skill mix can make in dentistry indicate the need for a new workforce/student intake review. This is reinforced by the fact that total intake to dental schools has exceeded the target in every year since 2006.

Data

The charts at Annex B show headcounts of student intakes on pre-clinical medical and dental courses in England and the UK from 1996/97 to 2011/12 (provisional data).

The tables below show that total intake has exceeded the target every year since the last review.

Table 1: Target number of medical and dental students and intakes in England in each year from 2006-07 to 2011-12

	2006/07	**2007/08**	**2008/09**	**2009/10**	**2010/11**	**2011/12***
Target	7,078	7,096	7,096	7,096	7,096	7,096
Intake	7,306	7,197	7,403	7,384	7,418	7,322

Table 2: Target number of medical students and intakes in England in each year from 2006-07 to 2011-12

	2006/07		2008/09	2009/10	2010/11	2011/12*
Target	6,195	6,195	6,195	6,195	6,195	6,195
Intake	6,401	6,264	6,477	6,437	6,418	6,377

Table 3: Target number of dental students and intakes in England in each year from 2006-07 to 2011-12

	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12*
Target	884	901	901	901	901	901
Intake	905	933	926	947	1,000	945

The HENSE Review

HENSE invited Sir Bruce Keogh, NHS Medical Director, and Sir Graeme Catto, Emeritus Professor of Medicine, University of Aberdeen to co-chair a Review Group to oversee this work and make recommendations. Membership of the Review Group is shown at Annex C.

The Centre for Workforce Intelligence (CfWI) was commissioned to provide data handling and analytical input taking into account the wide range of variables that will influence the demand for, and supply of, doctors and dentists in the medium and long term – technological, economic, environmental, political, social, ethical and demographic. The approach they adopted is described in more detail below.

At all stages, both CfWI and the HENSE Review Group were committed to engagement with individuals and organisations able to provide valuable input and "sense check" emerging recommendations. This include liaison with colleagues in the Devolved Administrations. Although the remit of the review was to recommend future intakes in England, it was important to obtain data and understand the position around the UK since it is not possible to compartmentalise the medical and dental workforces across the UK.

The objective of the review was to make recommendations in 2012 so that decisions could be taken to determine the intake to medical and dental schools in England in 2013/14 and beyond.

There was no pre-set agenda and the Review Group was asked to consider all options presented. At the outset, however, the Review Group agreed that

there should be no “big bang” change to intakes in 2013/14 and the outcomes of the review should be regularly reviewed.

Conclusion of the review in Scotland

Given the UK context of this work, the Review Group noted the results of a similar review of medical student intakes undertaken in Scotland in 2011. This concluded that there was to be a small reduction in medical school places for 2012/13 (6%, representing 50 places), to balance intake and consequent supply with future predicted demand requirements. However, it was understood this position would be reviewed regularly (and, indeed the Medical Undergraduate Group in Scotland has provided recommendations on intake for 2013/14 and these are now with Ministers for consideration).

The Case for Strategic Workforce Planning

The Review Group first addressed the fundamental question of whether there should be central control of medical and dental student numbers.

The Review Group supported the case for continued strategic workforce planning, accepting that Government inevitably would need to exercise some control given the costs associated with such education and training. It was acknowledged, however, that market forces could be increasingly used to determine the workforce, and that it was important the Group considered this option.

The Review Group highlighted costs as the key factor in the balance between centralism and localism. Unless students were totally self-funding in a market-based system, there would be higher central costs linked to increased numbers given the system of placement fees, bursaries etc. There were also concerns about the capacity and resources within Universities and linked healthcare providers (required for clinical placements) to accommodate increased numbers - and it was stressed that vice-chancellors would wish to have some form of control over intakes.

The overseas "caps"

Before considering the CfWI's analysis, the Review Group also debated issues around the caps on students from outside the EEA – 7.5% of the total intake to medical schools, and 5% for dental schools.

Recent developments

Although in recent years a significant number of Universities had been exceeding their targets for both medical and dental student intakes, HEFCE reported there were encouraging signs that recruitment was now more in line with targets following measures to reinforce the importance of compliance. A further complicating factor for medicine was how to account for the recent development where a number of medical schools admit students to their third years once they have completed two years at an overseas campus: for example, in Malaysia.

Implications

Although overseas students contribute significantly to the costs of their University education, it was acknowledged that they still generated costs, especially in relation to clinical placements. For example, in medicine non-EEA students pay the full costs of their undergraduate tuition (approximately £22k pa). The NHS, however, still picks up the related SIFT (approximately £40k[1] pa per student) and Foundation Programme costs (approximately £30k pa per trainee) on the basis that these students are then part of the UK healthcare professional education and training workforce resource.

The potential impact of increased overseas students on applications to the Foundation Programmes was also recognised. Following a consultation in 2008 the Government agreed changes to the immigration rules that allowed students from non-EEA countries studying at UK medical and dental schools to be eligible to apply to the Foundation Programme and subsequent specialty training. It was queried whether "closed loop" schemes could be introduced

[1] The average funding for a medical undergraduate placement is £42k, ranging from £34k to £50k across the SHAs and the average funding for a dental undergraduate placement is £31k, ranging from £29k to £35k.

that required the overseas students to return home following graduation were feasible, and conclusions have yet to be reached on this question.

Immigration policy

Given the government commitment to reduce immigration numbers, the caps on student numbers coming from outside the EEA to medical and dental schools in the UK should be reviewed.

The coalition government agreement included a commitment to “reduce the number of non-EU immigrants”. This statement was clarified by the current Home Secretary, as reducing migration from hundreds of thousands to tens of thousands. Home Office policy now seeks to ensure that no migrant worker should displace an appointable UK (or EEA within the scope of Directives governing freedom of movement) national.

The Home Office has reduced the numbers of migrants coming to the UK through a number of rule changes including Tier 4 (Students), Tier 1 (Highly Skilled Workers & Post Study Work) and Tier 2 (Skilled Workers). Significantly, the Tier 4 rule changes have only a small effect on medical and dental undergraduates; these students, however, acquire beneficial rights under the immigration system such that they do not need to satisfy the resident labour market test when moving to Tier 2 employment and are not counted within the new cap on Tier 2 numbers.

Debate

Medical and dental schools welcome recruitment of international students since it:

- enhances the reputation of UK Universities internationally;
- allows developing countries access to knowledge and understanding of NHS practice through the graduates returning home on completion of their training;
- adds to the diversity of the UK student population in medicine and dentistry;

- supports wider policies around the promotion of “UK plc” and international cooperation; and
- provides a source of income to the Universities.

At the same time, the Review Group recognised there cannot be unlimited access to overseas students given the financial consequences for the NHS – currently each student results in a cost to the NHS education and training budget at a time of increased financial pressure. If the students return to their home countries, this could be regarded as an unnecessary drain on scarce NHS resources. In addition, there is a limit on the capacity of the NHS to provide clinical placements. Consequently, the targets were set to balance these different factors.

The Centre for Workforce Intelligence Modelling

A strategic review of the future healthcare workforce: informing medical and dental student intakes

This section describes the work carried out by the Centre for Workforce Intelligence (CfWI) in support of the HENSE Review Group's recommendations on medical and dental student intakes. For a glossary of terms please see Annex D.

In this section you will find:

- an introduction to the work
- stakeholder involvement
- an outline of the approach taken
- developing the approach and the new demand and supply model
- summary of the data used
- sensitivity analysis
- uncertainty analysis

Introduction

This review is driven by the need to provide sustainable, high-quality healthcare for patients and therefore the need to ensure effective longer-term workforce planning and better decision making. The CfWI had previously forecast medical workforce supply to the year 2020 based on the current workforce and training pipeline, i.e. those already in the system. A new approach was needed to support decisions that impact further into the future.

Stakeholder involvement

It was recognised at the outset that this work needed to be done with the support and collaboration of people who understand the system and who have an interest in improving the quality of services for the future. The CfWI approach involved stakeholders extensively throughout this work, both to improve the quality and credibility of its models and to improve stakeholders' understanding of the intelligence that will underpin the decisions of the review group. The CfWI involved professionals, employers, students and trainees, lay people and policymakers in their work throughout. The HENSE review group has been encouraged by the level of interest and engagement in this work. A table outlining the approach to stakeholder engagement is included in Annex E.

An outline of the approach

Rather than attempt to predict the future, the CfWI developed a scenario-based approach that recognises the complexity of factors influencing **demand**

and supply and the intrinsic uncertainty of the future. The key benefits of this work were to support **longer-term planning**, here looking out to 2040; to support more robust **decision making**, taking account of the uncertainties of the future; and to **help decision makers be more alert to emerging risks as the future unfolds.**

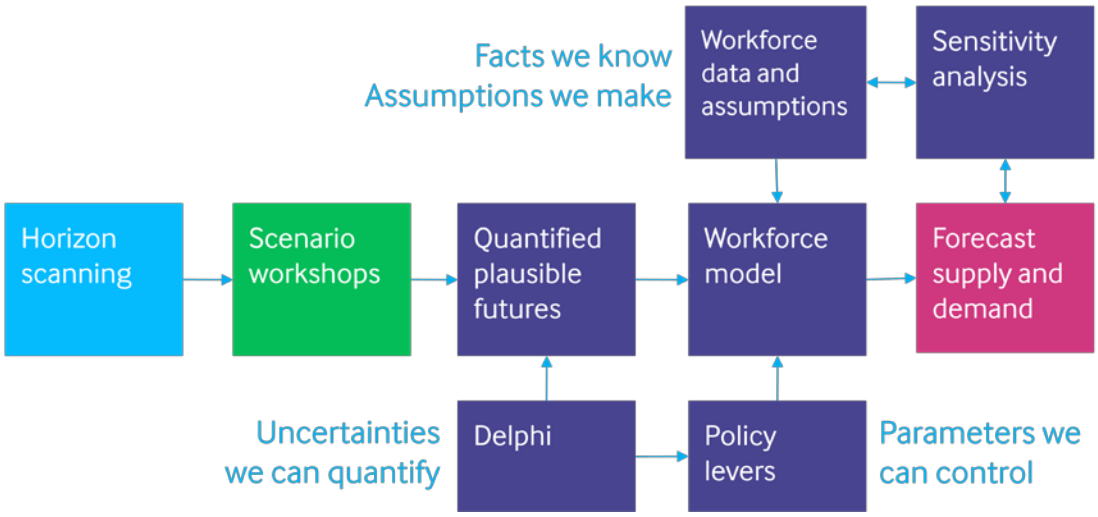
This is the first time an approach of this kind has been used in healthcare workforce planning and is outlined in figure 1. It starts with horizon scanning, to identify the key drivers that stakeholders are concerned will impact on the future workforce. Following this, the stakeholders work to generate future scenarios: plausible futures based on the things that will most impact on the future healthcare workforce and which are the least certain.

Data from a range of sources are compiled to populate the medical and dental models, and a consensus view was sought using a Delphi[2] process to quantify key uncertain parameters for modelling, such as the retirement age, as these may vary across the scenarios (plausible futures).

Following this, supply-related data were put into medical and dental system dynamics models using Vensim software. The demand models used Microsoft Excel. The supply and demand models were integrated and driven from an Excel spreadsheet, which allows a user to set up scenarios and policy actions. It calls Vensim to calculate the supply, uses Excel to calculate demand, and then combines the outputs.

The robustness of the new medical and dental supply and demand models were validated with stakeholders. A sensitivity analysis helped the HENSE review group understand the large impact of small changes in some data sources and the importance of accuracy in others.

Figure 1: An overview of the CfWI's new approach to workforce planning



[2] Annex D glossary of terms

Developing the approach and the new demand and supply models

At the end of 2011 the CfWI began **horizon scanning**. The CfWI horizon scanning team asked experts to tell them the drivers that may influence requirements of the future workforce. Their ideas – whether frequently mentioned or not – were included in the horizon scanning reports published on the CfWI website http://www.cfwi.org.uk/publications.

In early 2012 the CfWI gathered groups of stakeholders to develop four **challenging but plausible future scenarios to 2040** for each of the medical and dental workforces, taking into account the plausible technological, economic, environmental, political, social and ethical drivers of both demand and supply. Figures 2 and 3 show the two dimensions of greatest uncertainty deemed by each group to be of highest impact, combined to create four scenarios. The scenarios are not intended to be exhaustive nor necessarily 'likely' but rather a plausible range of ways the future could unfold, which can be used to test policy options for robustness. Any number of additional scenarios could also be modelled. Key variables in the scenarios were later quantified with the help of **Delphi panels**.

Figure 2: Dental scenarios

	Desires of dentists prevail	Desires of patients prevail
Lower resource environment	*Scenario1*	*Scenario 2*
Higher resource environment	*Scenario 3*	*Scenario 4*

Figure 3: Medical scenarios

	'Compression' of morbidity	'Expansion' of morbidity
Lower resource environment	*Scenario 2*	*Scenario 4*
Higher resource environment	*Scenario 1*	*Scenario 3*

As expected, some elements of the full scenario stories are already playing out in reality: for example some 'big pharma' companies are relocating outside the UK.

The CfWI's new approach models both demand and supply. Their **demand modelling** used a framework from the Canadian research programme on health human resources[3]. The framework separates out four key elements of demand:

[3] Birch, S. Kephart, G. Tomblin-Murphy, G., O'Brien-Pallas, L., Alder, R., MacKenzie, A. (2011) *Human resource planning and the production of heath: a needs-based analytical framework*, Canadian Public Policy, 33:S1-S16.

1. **Population** – the size of the population being served, by age and gender.
2. **Level of need** – the needs of this population given the distribution of health and illness, and future risk factors.
3. **Level of service** – the service planned to be provided according to the population's level of need.
4. **Productivity** – the capability of the workforce to deliver the necessary services, taking into account factors such as skill mix and technology (see later section for more on productivity in healthcare).

This framework was chosen because it provides a clear logical separation of the key factors, and this allowed the CfWI to use a Delphi process to quantify them.

System dynamics modelling makes extensive use of simulation in order to understand how a system changes over time. It represents changes to a system over time by using the analogy of flows of stocks (people, money, materials) accumulating and depleting over time. In the CfWI models, 'stocks' of people can be segmented by age, gender and country of origin, where data exists. This simplifies the modelling of changes over time, for example migration, stage of training and ageing of the workforce.

After considering several potential suppliers of software, the CfWI chose *Vensim DSS* to model the complex flows of the medical and dental training and the workforces in order to project the future supply of doctors and dentists. The chosen software was able to handle the complexity of modelling supply including the ageing oif the workforce, and also offered sophisticated sensitivity and uncertainty analysis functionality, an important feature given the poor quality of key data and assumptions available to the CfWI.

System dynamics is a modelling technique for studying and managing complex feedback systems, such as business and other social systems. The advantages of using commercial system dynamics (SD) modelling software like Vensim are that it enables the user to model the complexities of workforce supply and an ageing workforce in an intuitive, graphical fashion. This greatly reduces the likelihood of errors, in comparison with using spreadsheets or other methods, and enables the model to be developed and tested quickly; this was important due to the time constraints on this in-depth work.

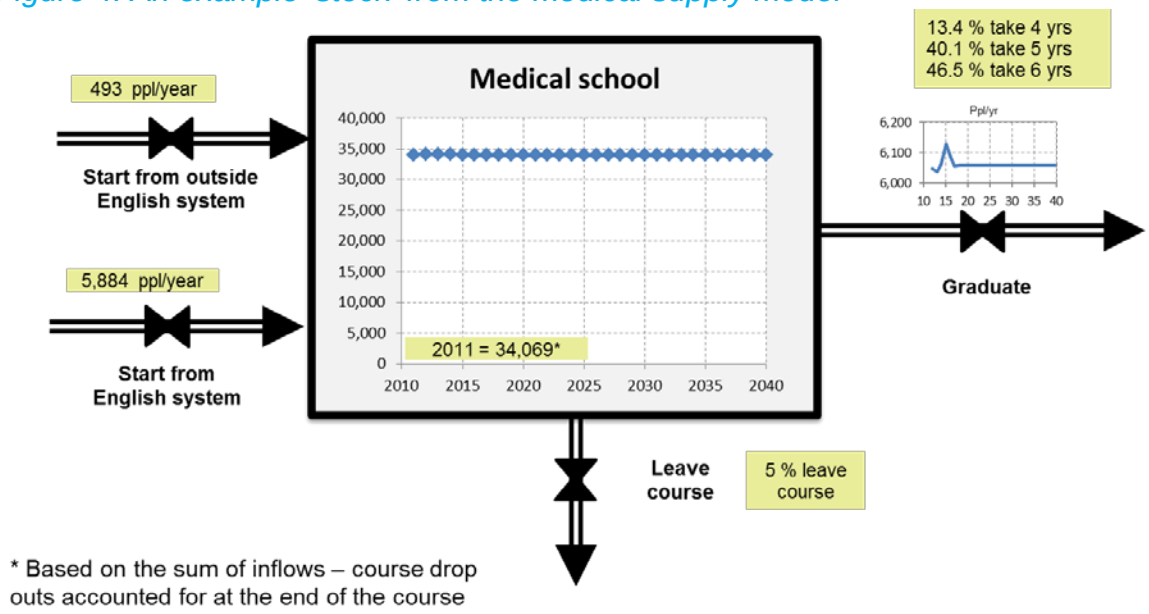
The models are highly flexible (stocks and flows can be added, removed or altered) and adaptable (for example to other workforces). The CfWI has formally tested and validated the models to ensure reliability, and conducted sensitivity analysis of the medical model to ascertain which input variables have the greatest effect on the outputs from the model if the data or assumption is changed by a set amount. This identifies the variables for which it is most important to seek better data.

This piece of work aims to better reflect the dynamic nature of the workforces, to encourage longer-term and better-informed decision making. The CfWI can

now do this by sharing intuitive, visual representations of the workforce stages (as compared with previous models built using spreadsheets). Overviews of the dental and medical supply models are included in Annex F, showing 2010 and 2011 stock levels.

Figure 4 below is an example of the first stock in the medical supply model: medical school. The graph shows that the number of people in this stock will remain constant – assuming the student intake and current time-to-complete and attrition remain the same.

Figure 4: An example 'stock' from the medical supply model



Source: Various, see below for key sources.

Note that the medical workforce model includes all medical specialties and academic doctors, but does not deal with individual specialities. Similarly, both models deal with the whole of England but do not deal with geographical distribution. In addition, although the model has been set up to handle the workforce migration (including visa status), in practice, data relating to this is not collected, and so not available for the CfWI to use.

The variable quality of workforce data is a risk, particularly to the dental model.

The models the CfWI has built rely on data from a number of sources, including:

- 2007 –11 accepted applicants to preclinical dentistry (UCAS);
- 2007–11 medical school intakes (Higher Education Funding Council for England);
- 2011 foundation programme data (Foundation Programme Annual Report);

- 2008–11 medical and general practice (GP) workforce census for England (Health and Social Care Information Centre);
- Collective judgments of a Delphi panel about future demand and supply factors;
- 2010 national population projections (Office for National Statistics);
- 2010 –11 hospital episode statistics for England (Health and Social Care Information Centre).

Where data are needed, but do not exist, the CfWI has made assumptions, which have been tested with stakeholders.

Sensitivity analysis

Figure 6 and Annex G both set out some of the key assumptions that were made for the **medical model** to which the model is highly sensitive. The CfWI tested the sensitivity of the medical supply model to its input data and assumptions, by either increasing each input parameter by 10 per cent or shifting age profiles by one year. They removed capacity constraints on training courses to determine the impact.

Impact is defined as the maximum percentage difference to the activity level of GPs and trained hospital doctors[4] (for brevity referred to as THDs throughout this report) by 2040, as a result of a change to a particular input variable. The CfWI classifies data quality as very high (VH), high (H), medium (M) or low (L), which are defined in figure 5.

Figure 5: Definitions of high, medium and low data quality

	CfWI judgment of data quality	Definition of data quality level
VH	Very high	Referenced data source, direct one-to-one mapping of data to input variable
H	High	Referenced data source, but not a direct one-to-one mapping to the variable
M	Medium	Subject matter expert judgement, including Delphi panel collective judgment
L	Low	Referenced to similar medical data (if dental) / CfWI expert judgement
N	None	Value assigned but no confidence in the data value

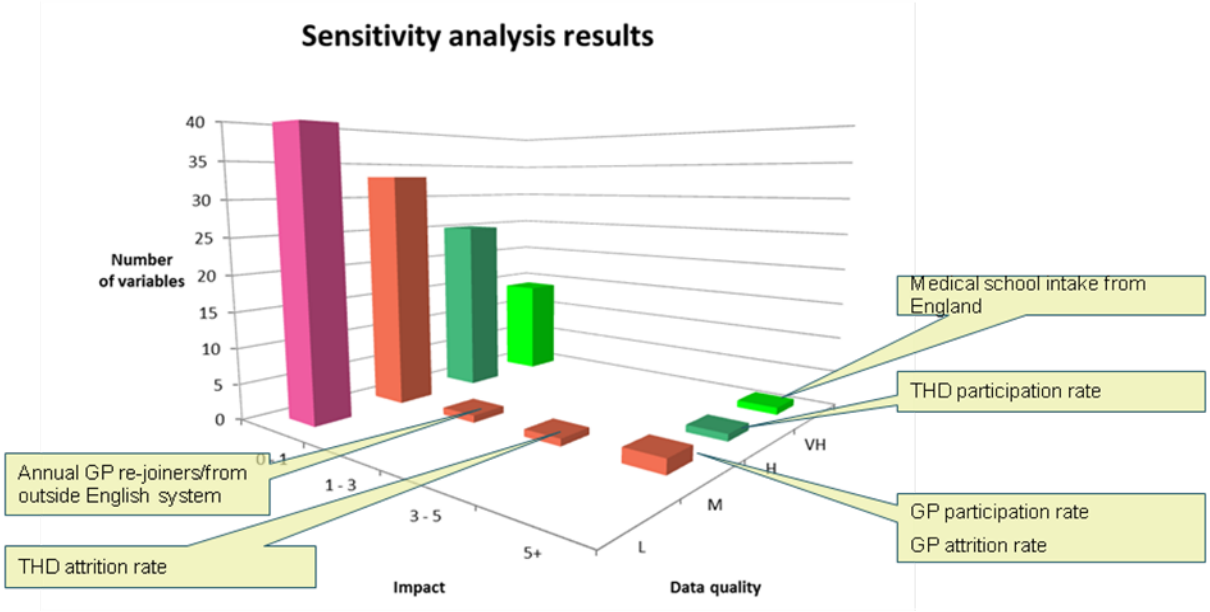
The three-dimensional chart in figure 6 summarises the findings from the CfWI's sensitivity analysis of the medical supply model. The coloured columns show the number of input variables in the supply model that have a greater or lesser impact on the model output, and the number of those input variables relying on data of lower or higher quality.

[4] Annex D glossary of terms

For example, the orange square in the foreground represents the GP participation and attrition rates (the extent to which GPs work full or part time and how many of them leave the workforce), both of which have a significant impact on the model outputs and currently rely on medium-quality data. The tall pink column on the far left represents the high number (approximately 40) of input variables that rely on low-quality data but which only have a low impact on the model – we need worry less about each of these individually, though their combined impact may be significant.

In figure 6, six key variables are highlighted using callout boxes.

Figure 6: Chart showing the number of model variables that are sensitive (or not) to poor data quality



Source: CfWI analysis

Annex H details the top 10 variables to which the medical supply model is most sensitive that currently rely on low- or medium-quality data, i.e. the variables where data quality is of most concern. To improve the reliability of the model, it would be advisable for the NHS to focus its efforts on improving the quality of data for these variables, many of which relate to the GP workforce. We are aware that the DH 'workforce information architecture' project is making progress in this area.

Work is underway to complete the sensitivity analysis for the dental model, where we understand the data quality is less good than the medical. For example, dentist attrition data by age and gender is not available.

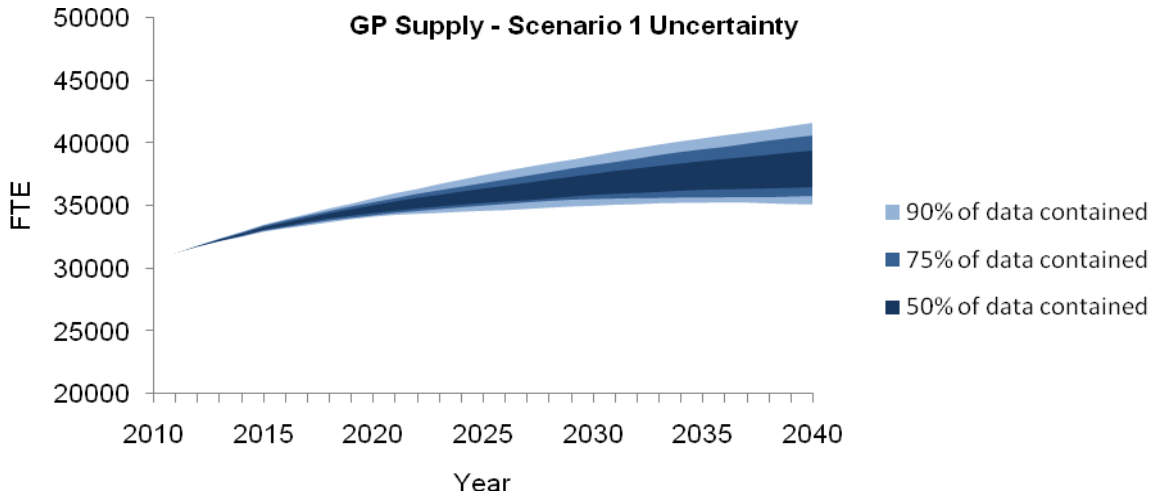
Key modelling assumptions

Some of the key overarching modelling assumptions are included in Annex G. We refer you to the CfWI's full-length report, which will be published at the end of this project, for more detail on the list of key assumptions employed in the CfWI modelling.

Uncertainty analysis

It is best practice in modelling to quantify the uncertainty that is inherent in any forecast of the future, in this case: workforce demand and supply. Decision makers need to understand this to inform their analysis of findings and to make effective decisions. Here the CfWI is forecasting up to 2040. We understand that it is not possible to predict the future with certainty, which is why we welcome a scenario-based approach, to characterise this uncertainty and identify plausible future conditions. However, although a Delphi process was used to quantify each individual scenario, the experts involved were – as might be expected – not in perfect agreement.
Figure 7 below provides an example of this uncertainty as a fan chart, giving a probability distribution for supply under one specific scenario.

Figure 7: An example 'fan chart' illustrating a probability distribution for GP supply under one specific scenario



Source: CfWI analysis

The diagram above shows the most likely forecast (90 per cent probability) and the spread of uncertainty. All model outputs, including demand, will exhibit a degree of uncertainty that increases towards 2040. However, the scenarios taken as a whole provide a realistic estimate of the spread of uncertainty for both demand and supply, so the CfWI does not plot all individual lines as fan charts. However, the inherent difficulty and uncertainty of forecasting to 2040 should be considered in any decision-making process, especially given the issues around data accuracy and sensitivity.

The CfWI has considered the potential impact of productivity gains on its demand forecasts

In this section you will find:
- potential impact of productivity on projected demand

One way of closing a gap between healthcare demand and workforce supply is to boost supply, but this takes time. Another method is to boost the efficiency or productivity of care delivery. Clearly, the greater the capacity of the NHS to improve productivity through new ways of working, technological innovation and changes to the skill mix, the less need there is for an increase in supply.

The medical Delphi panel's advice was that although healthcare demand is expected to rise substantially by 2040 in all scenarios, the amount of service provided by doctors would not change as a result of skill mix. The Delphi panel also considered that the amount of service delivered by doctors as a result of technology would increase, but only in scenarios 1 and 3. In other words, both the medical demand baseline and demand scenarios 2 and 4 describe no productivity improvement in the NHS services delivered by doctors over the forecast horizon.

This is a conservative assumption. It is likely that some level of productivity improvement in the delivery of NHS medical services by doctors is both necessary and achievable between now and 2040. However, estimating healthcare productivity is notoriously difficult, and results are often inconclusive.

Following the OECD (2006)[5], Office for Budget Responsibility (2012)[6] central projections assume that real health spending per head grows in line with real incomes, and that annual productivity growth in healthcare keeps pace with the whole economy rate of 2.2 per cent. However, given the labour intensity of healthcare provision:

'In practice, productivity growth in the health sector may lag behind whole economy productivity growth ...while real wages in the health care sector keep pace with whole economy incomes.' (OBR 2012: 135).

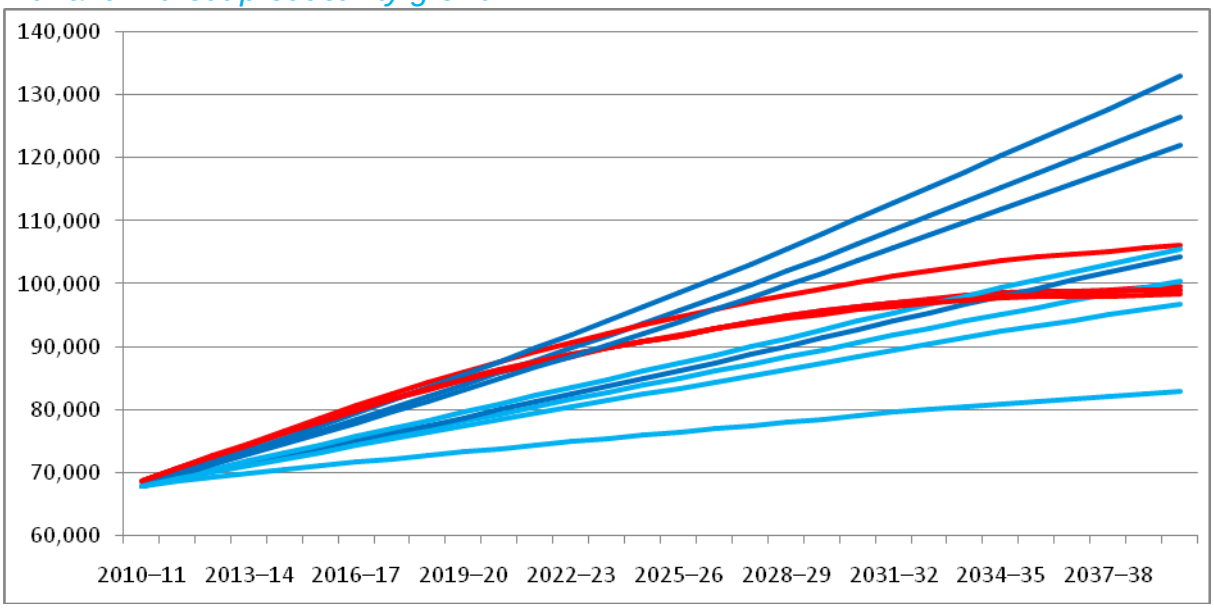
The OBR presents four long-term scenarios for healthcare productivity growth: 0.8%, 1.7%, 2.2% (central projection) and 2.7% per annum. Even opting for

[5] OECD (2006), Projecting OECD Health and Long-Term Care Expenditures: What Are the Main Drivers?, OECD Economics Department Working Papers No.477, OECD. Available at: http://www.oecd.org/tax/publicfinanceandfiscalpolicy/36085940.pdf

[6] Office for Budget Responsibility (2012), 'Appendix B: Long-term pressures on health spending', in Fiscal Sustainability Report 2012, OBR, London. Available at: http://budgetresponsibility.independent.gov.uk/pubs/FSR2012WEB.pdf

the OBR's lowest productivity growth assumption (0.8% per annum) would be enough significantly to curb projected growth in healthcare demand over the forecast period, as figure 8 below demonstrates.

Figure 8: Demand (and supply) scenarios for combined medical workforce with and without productivity growth



Source: CfWI medical model

Note: The figure shows demand and supply scenarios for the combined medical workforce – GPs and trained hospital doctors. Dark blue lines are the standard demand scenarios, while the light blue demand scenarios include the additional assumption of 0.8% pa productivity growth. The standard supply scenarios (red) are also shown. Baselines are not shown.

However, both the UK and US evidence suggests that achieving significant and persistent productivity improvement in healthcare services is challenging. While the CfWI does not consider the 'no productivity change' assumption to be realistic (especially in light of challenging health settlements and rising demand), the assumption of 2.2 per cent annual productivity growth is on the high side of likely outcomes, given that the available data suggest much weaker NHS productivity growth (ONS 2011[7]). This is an area that merits further research.

[7] ONS (2011) Public Service Output, Inputs and Productivity: Healthcare 2011, Office for National Statistics, Newport. Available at: http://www.ons.gov.uk/ons/rel/psa/public-service-productivity/healthcare-2011/public-service-output--input-and-productivity.pdf

Workforce forecasts and the impact of skill mix and policy changes

Dental workforce

In this section you will find forecast model outputs for:

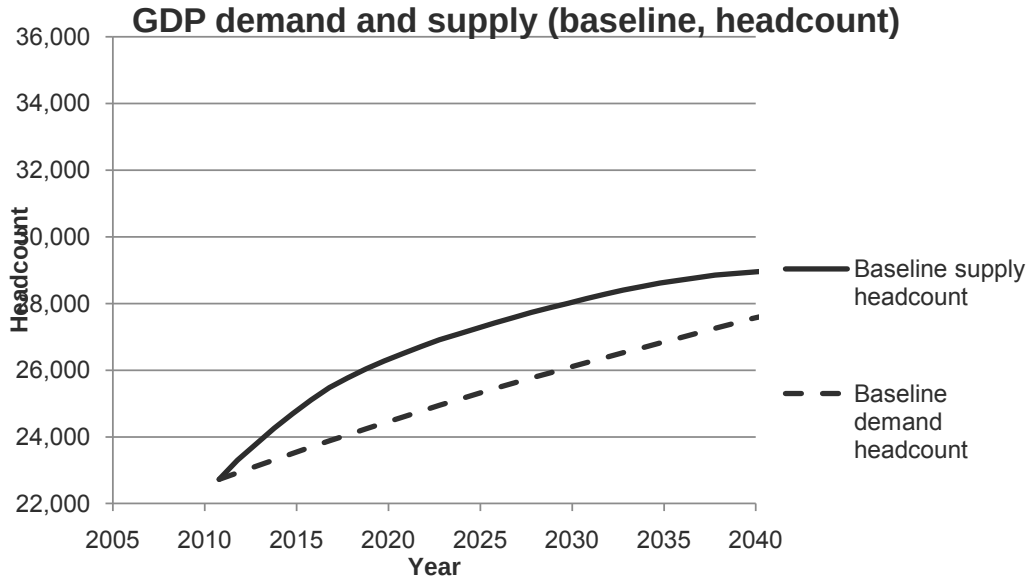
- dental workforce
  - baseline projections for general dental practitioners
  - future demand and supply projections based on the future scenarios
  - impact of increasing expected change in skill mix
  - impact of changing average retirement age.

Figure 9 shows the CfWI's 'baseline' forecasts of demand and supply for general dental practitioners (GDPs). **The baseline forecasts show where demand and supply in England will end up by 2040 if we stay on our current course.** This enables comparison of alternative policies in terms of doing 'better' or 'worse' than the baseline. We do not have modelling and baseline graphs for specialist dentists, as the data was not available to the CfWI.

Defining a baseline is difficult. Despite the fact that some trends can be predicted to continue with a high degree of certainty, for example growth and ageing of the population, others, such as retirement age, are far less certain. This is particularly problematic because of major policy reforms that will impact health and social care, plus the uncertainty around the pace of economic recovery.

For these reasons the CfWI baseline only includes population growth, following the Office of National Statistics national population projection (principal projection). All training and workforce intakes, exits and returns are assumed to be maintained at current values, by age and gender.
The baseline forecast suggests a potential oversupply of GDPs.

Figure 9: Baseline forecasts of demand and supply for GDPs

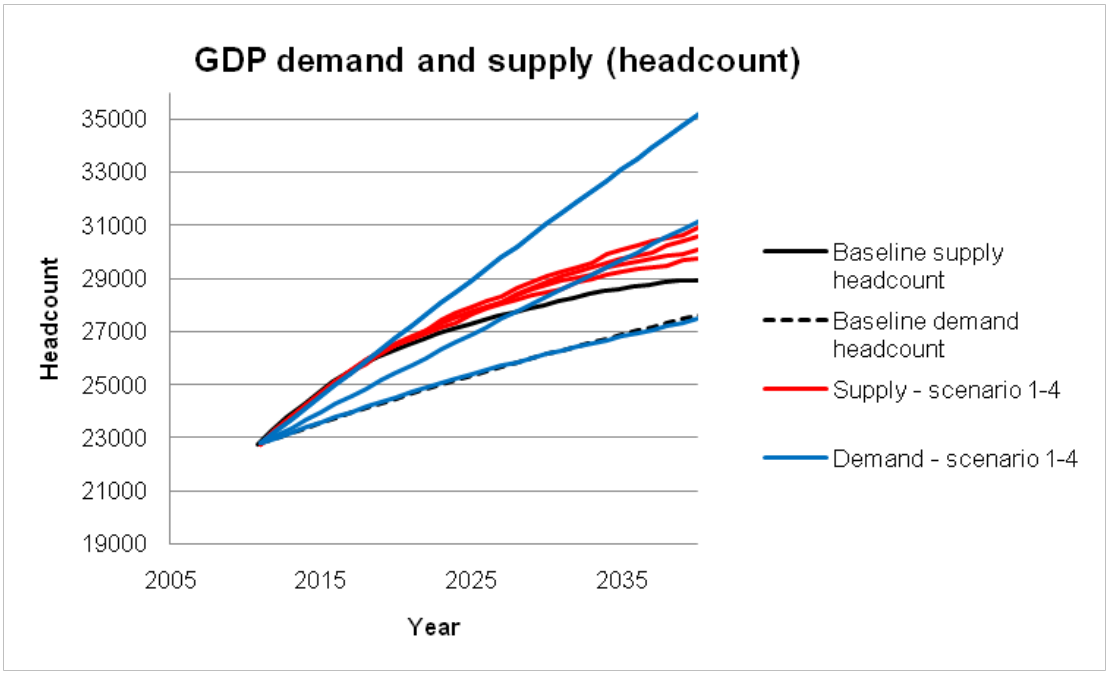


Primary data sources: NHS Dental Statistics for England 2010-2011, population projections for England 2010 (ONS), hospital episode statistics 2010-11 (HSCIC)

Figure 10 shows the CfWI's forecasts of demand (blue lines) and supply (red lines) for GDPs for the four future scenarios, compared with the baseline (shown throughout as black lines). The variation between the scenarios represents the judgment of the expert Delphi panel about the range of ways the future might plausibly unfold. The individual scenarios are not of particular interest; what matters most is the range of uncertainty they represent.

Figure 10 shows considerable uncertainty about future demand (as indicated by the divergent blue lines); though in all scenarios the Delphi panel expects demand to be greater than or equal to the baseline. Future supply is more certain (indicated by the red lines running closer together). All of the supply scenarios (red lines) are above the baseline case, indicating that the Delphi panel feels that in all scenarios dentists will work longer and/or more hours by 2040 than they do today. Due to the uncertainty about demand, it is unclear whether we might face an oversupply or undersupply of GDPs in the future.

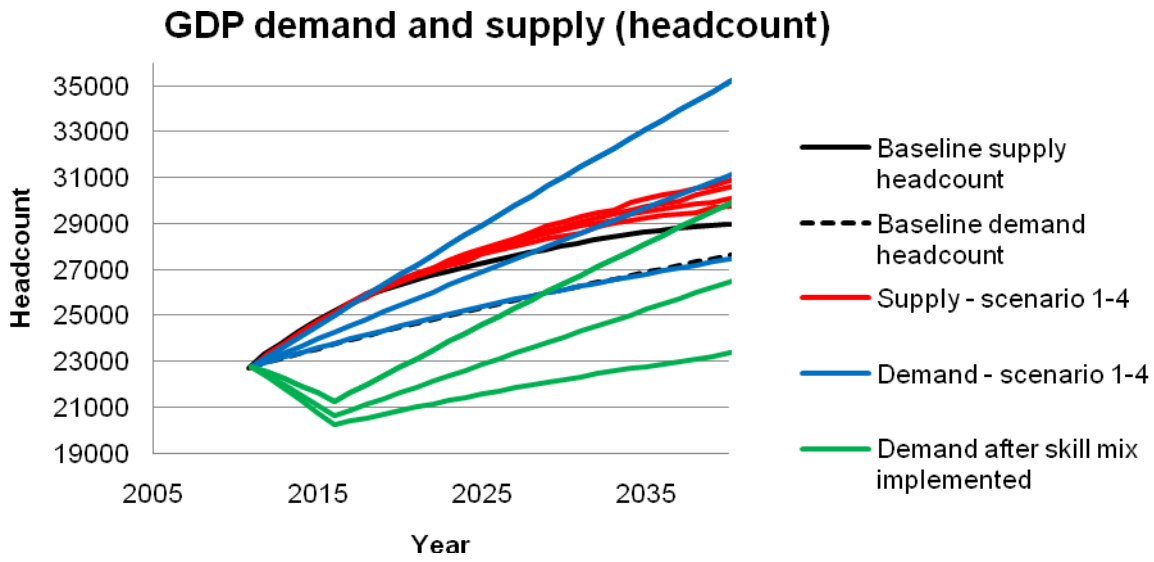
Figure 10: Forecast demand and supply for GDPs in the four scenarios



Source: CfWI system dynamics modelling, September 2012

Figure 11 gives an indication of the impact of increasing skill mix on demand for GDPs. If employers increase their dental skill mix (that is, dental care professionals do an increasing amount of the work previously done by dentists) the demand for general dental practitioners will decrease.
Figure 11 shows the impact (indicated by green lines) of a 3 per cent reduction in demand for GDPs for each of the next five years, as a result of skill mix. The review group feels that if a moderate number of small dental practices choose to employ a different skill mix, this drop in demand for GDPs could result. Such a shift might result in a significant oversupply of GDPs, with immediate effect.

Figure 11: Forecast demand and supply for GDPs in the four scenarios, showing the impact of a 3 per cent reduction in demand for GDPs for each of the next five years, as a result of skill mix.

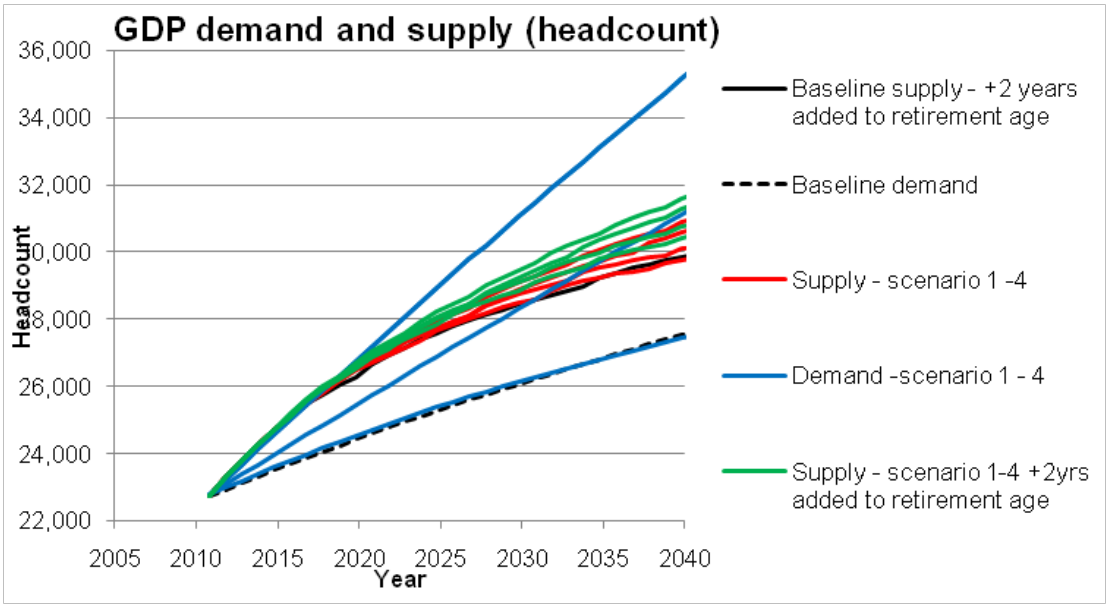


Source: CfWI system dynamics modelling, September 2012

Figure 12 gives an indication of the impact of dentists working two years longer on average, assuming the minimum retirement age for dentists rises to 67 (and the average retirement age also rises by two years).

Dentists working longer will add height to the supply scenarios. Therefore, in an oversupply situation the policy change would rapidly exacerbate the oversupply; in an undersupply situation it would relieve it. The impact of this policy change is shown as green lines in figure 12.

Figure 12: Forecast demand and supply for GDPs in the four scenarios, showing the impact of dentists working for two years longer on average than they do today.



Source: CfWI system dynamics modelling, September 2012

The CfWI has not included analysis relating to dental specialists due to data limitations. Key data sources were not available, for example specialty attrition rates by gender and age.

Medical workforce

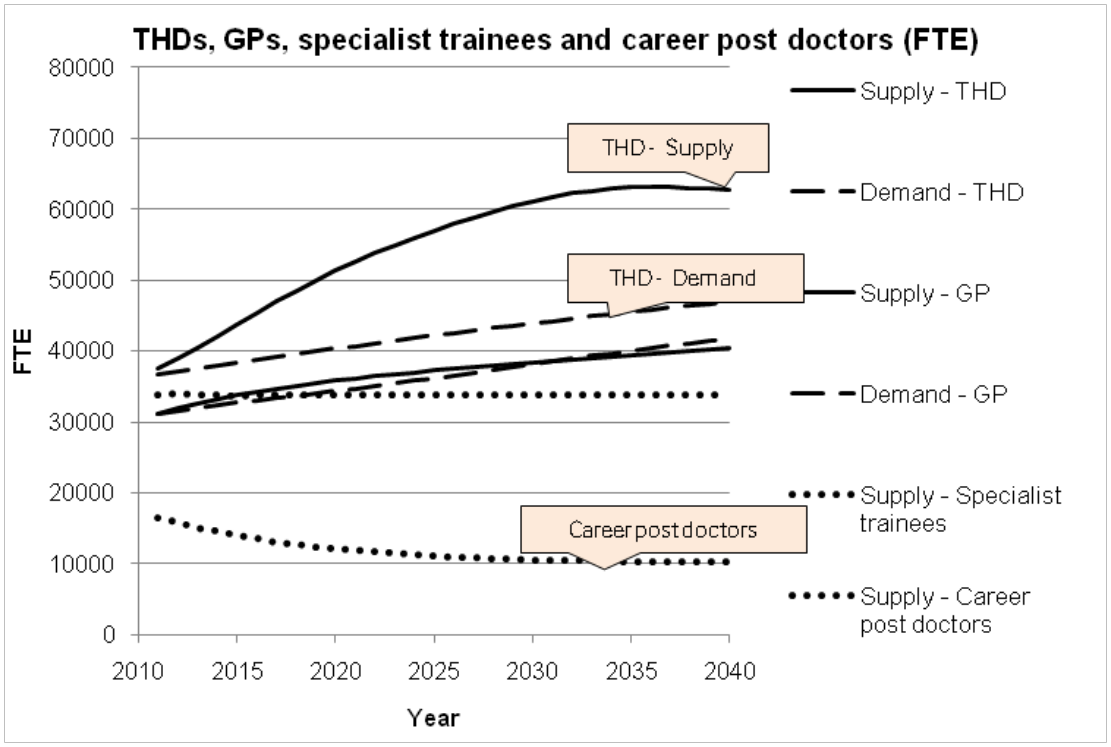
In this section you will find:

- our 'baseline' forecasts of demand and supply for general practitioners (GPs) and trained hospital doctors (THDs which in the current NHS environment means consultants)
- forecasts of demand and supply for GPs and THDs for each of the four plausible future scenarios compared with the baseline forecasts
- an indication of the impact of increasing skill mix on demand for THDs
- an indication of the impact of all doctors working two years longer on average
- an indication of the impact of achieving in the near future a 50:50 ratio of GP:hospital specialty entry-level training posts
- an indication of the impact of extending GP training to four years in the near future
- an indication of the impact of increasing the international student limit to 10 per cent or decreasing it to 5 per cent (from 7.5 per cent as at present)
- an indication of when the medical workforce could be available to deliver a seven-day service

Figure 13 shows the CfWI's baseline forecasts of demand and supply for GPs and for THDs. For an explanation of what is meant by 'baseline' forecasts, please see the dental section above.

The baseline forecasts show a balance of demand and supply for GPs, and an overall oversupply of THDs. Please note that the model does not deal with individual specialties or geographical differences, so the overall oversupply of THDs is likely to mask shortages in specific specialties or areas. The figure also shows, for comparison, the forecast supply of specialty trainees and career post doctors. This forecast shows a drop off in career post doctors over time. This is because the model assumes that career post doctors will continue to enter specialty training at the rate they do now, and fewer will be recruited in the future, based on current trends.

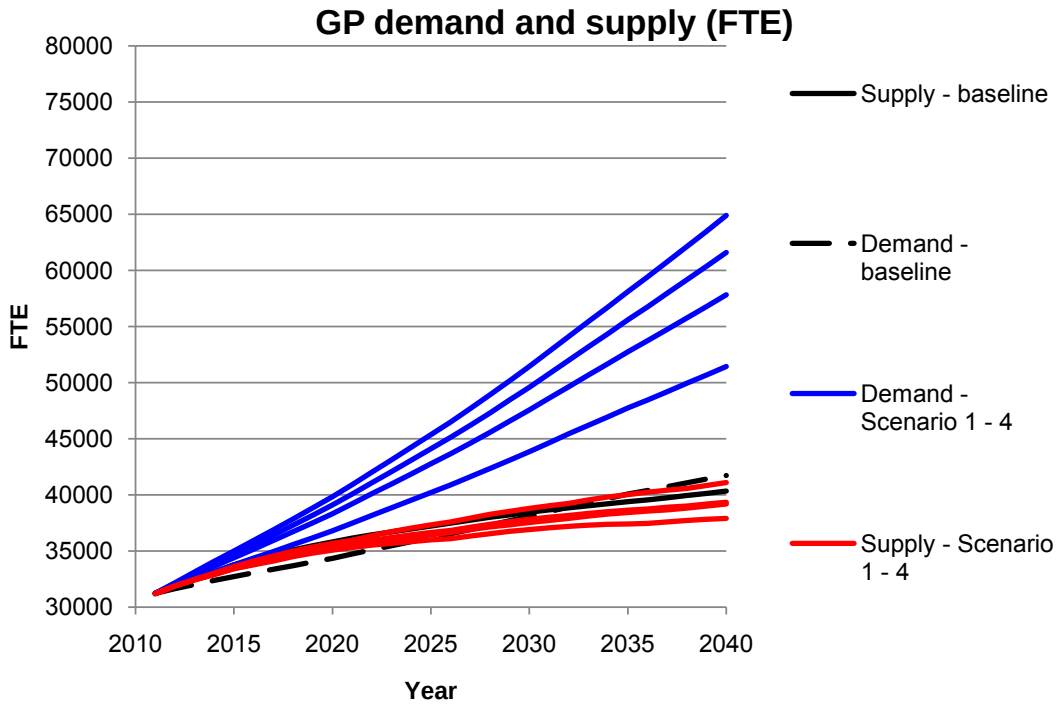
Figure 13: Baseline forecasts of demand and supply for trained hospital doctors and GPs. Career post doctor and trainee numbers are also shown for comparison. Note that the legend lists the forecasts from top to bottom, with the top line representing the baseline supply forecast for trained hospital doctors, and so on.



Primary data sources: medical census for England 2011 (HSCIC), medical school student data 2011 (HEFCE), population projections for England 2010 (ONS), hospital episode statistics 2010-11 (HSCIC)

Figures 14 and 15 show the CfWI's forecasts of demand and supply for full-time equivalent (FTE) GPs and trained hospital doctors for each of the four future scenarios compared with the baseline forecasts. Figure 14 indicates a sustained rise in demand for GPs and a significant undersupply in all scenarios if no rebalancing (from other specialties to general practice) occurs.

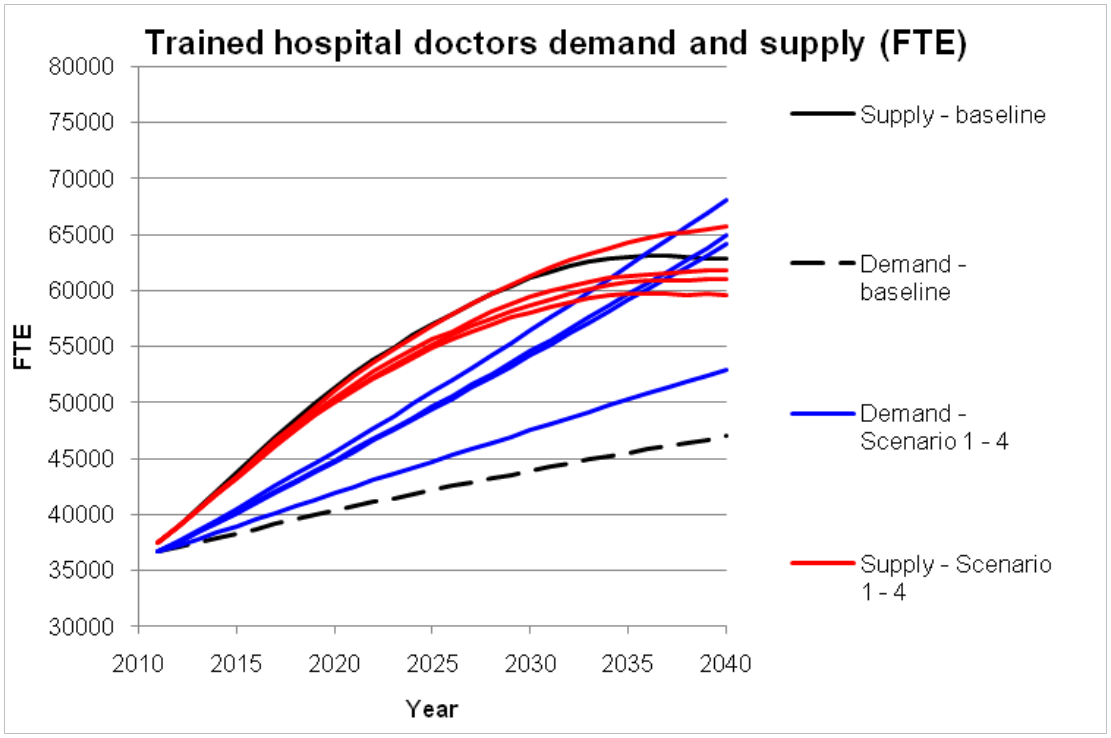
Figure 14: Demand and supply forecasts for GPs in the four medical scenarios.



Source: CfWI system dynamics modelling, September 2012

Figure 15 indicates a sustained rise in demand for trained hospital doctors, but despite this a significant oversupply of trained hospital doctors in all scenarios for approximately two decades if no rebalancing (from other specialties to general practice) occurs.

Figure 15: Demand and supply forecasts for THDs in the four medical scenarios.

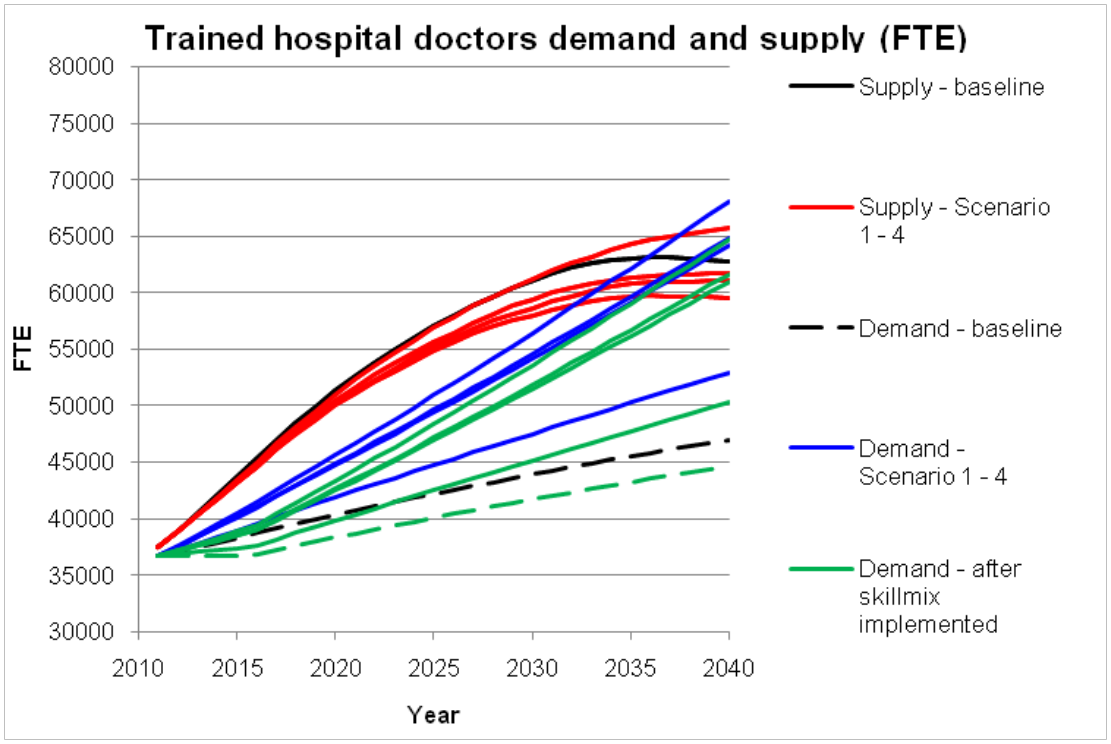


Source: CfWI system dynamics modelling, September 2012

The clear implication of figures 14 and 15 is that the system must do more to ensure a greater proportion of trainees choose to specialise in general practice.

Figure 16 gives an indication of the potential impact of skill mix on workforce productivity for THDs, modelled as a 1 per cent reduction in demand for THDs for each of the next five years as a result of local employer decisions about skill mix. The CfWI has established from employer organisations that this productivity goal is not implausible. The green lines represent the reduced demand.

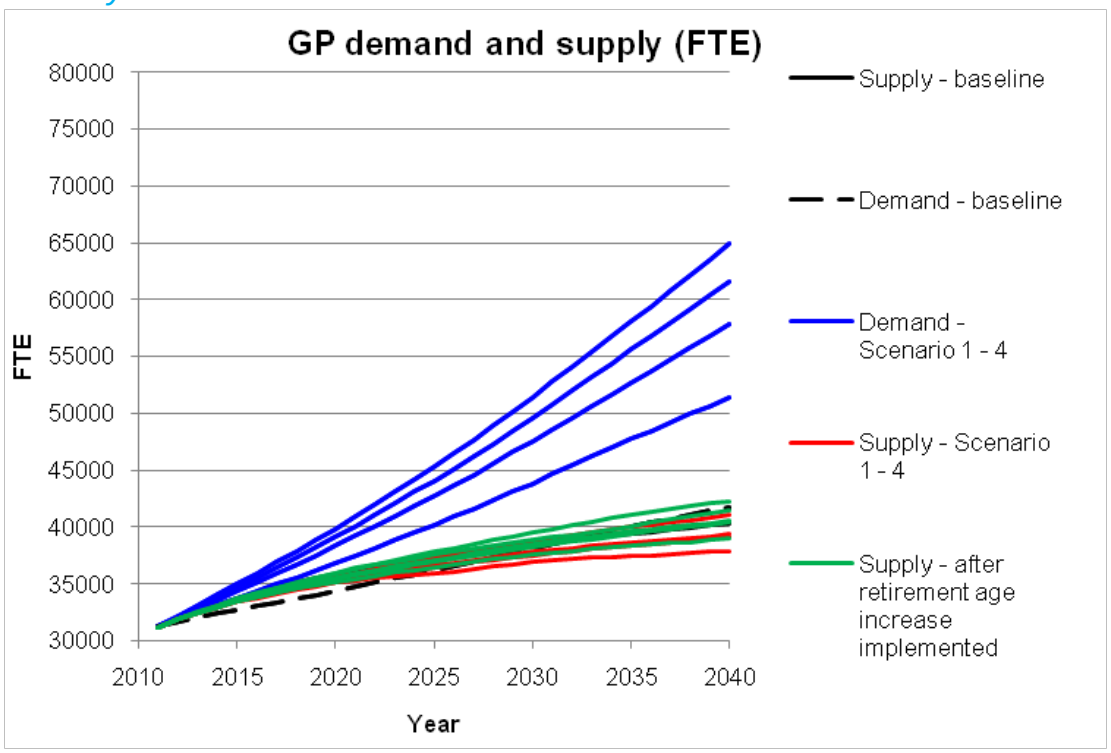
Figure 16: The impact of a 1 per cent reduction in demand for THDs for each of the next five years as a result of local employer decisions about skill mix



Source: CfWI system dynamics modelling, September 2012

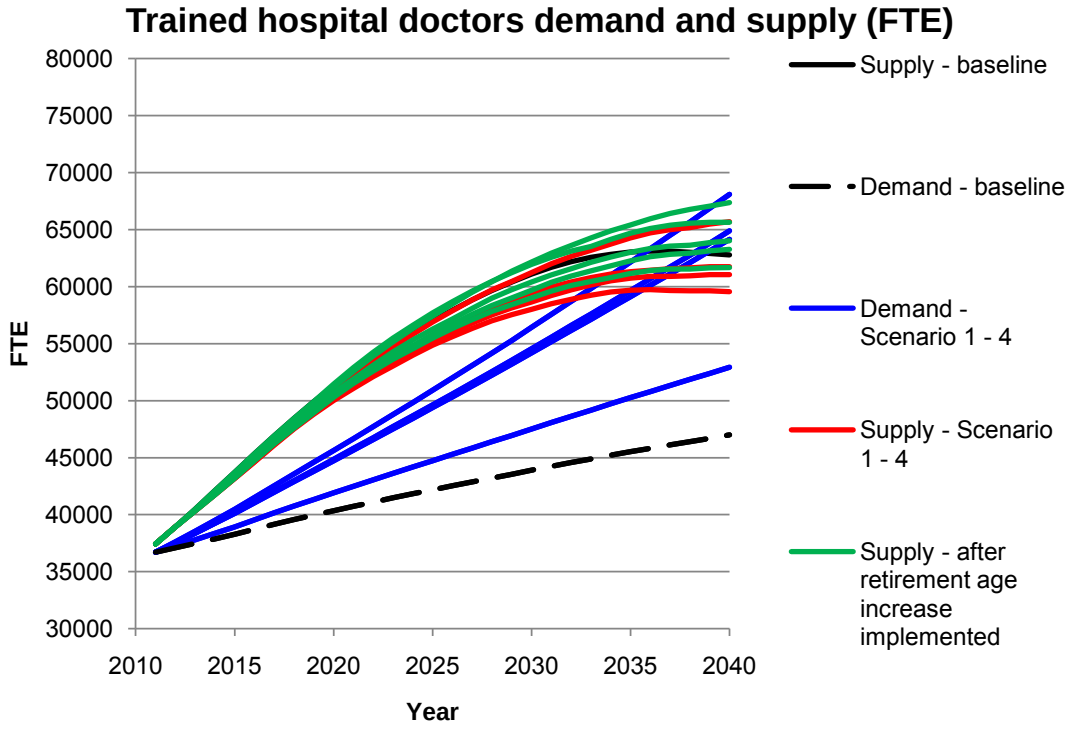
In case of an imbalance of demand and supply as suggested by the graphs above, the CfWI's analysis shows that student intakes are not the most effective 'lever' to close the gap. For example, in an undersupply situation if we could decrease attrition in training and from the workforce, encourage return to work or increase productivity, these changes would have a more immediate impact. The following graphs give an indication of the impact of various other potential policy changes on the balance of demand and supply. What might be the impact if the minimum retirement age for doctors rises to 67 (and the average retirement age also rises by two years)? Figures 17 and 18 indicate the impact of doctors working for two years longer on average than they do today. If GPs work for two years longer, this will help to relieve the anticipated undersupply. If hospital doctors do so, this will exacerbate the anticipated oversupply.

Figure 17: Forecast demand and supply for GPs in the four scenarios, showing the impact of GPs working for two years longer on average than they do today.



Source: CfWI system dynamics modelling, September 2012

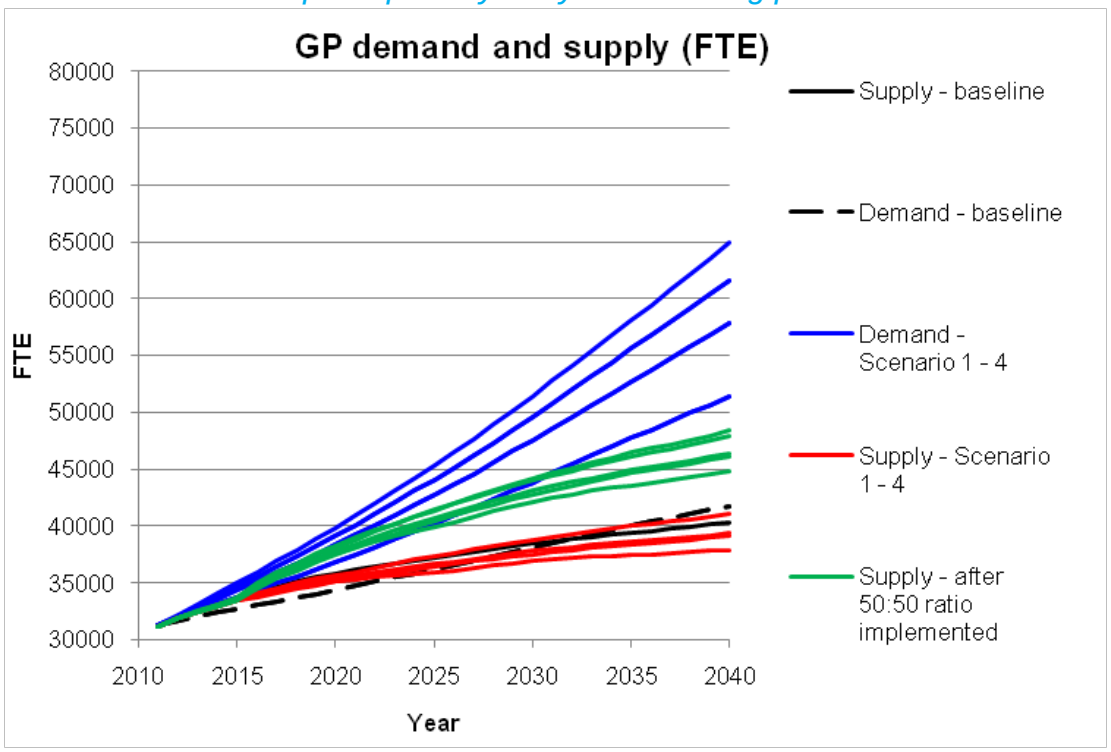
Figure 18: Forecast demand and supply for THDs in the four scenarios, showing the impact of THDs working for two years longer on average than they do today.



Source: CfWI system dynamics modelling, September 2012

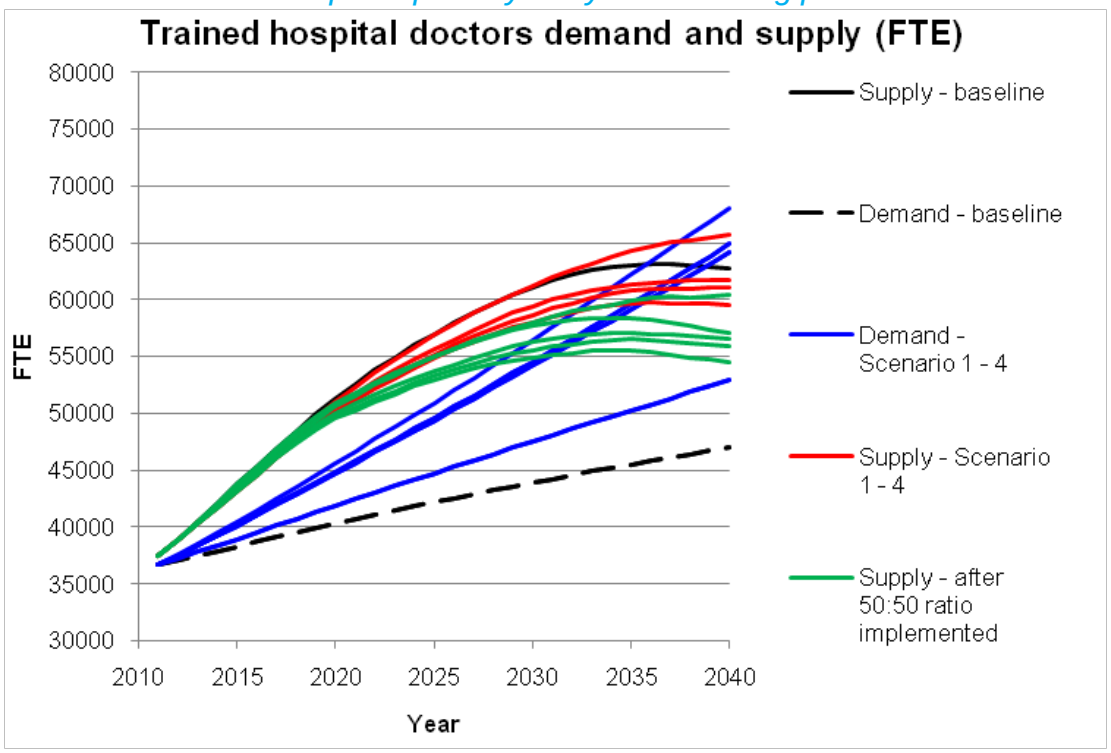
Figures 19 and 20 give an indication of the impact of achieving the intended 50:50 ratio of GP:hospital specialty entry-level training posts in the near future. Figures 19 and 20 show that this slight rebalancing in favour of general practice leads to a significant improvement, both in the undersupply of GPs and the oversupply of trained hospital doctors. The 50:50 policy will reduce the undersupply of GPs, but will not be sufficient to resolve it.

Figure 19: The impact on forecast GP supply of achieving in the near future a 50:50 ratio of GP:hospital specialty entry-level training posts



Source: CfWI system dynamics modelling, September 2012

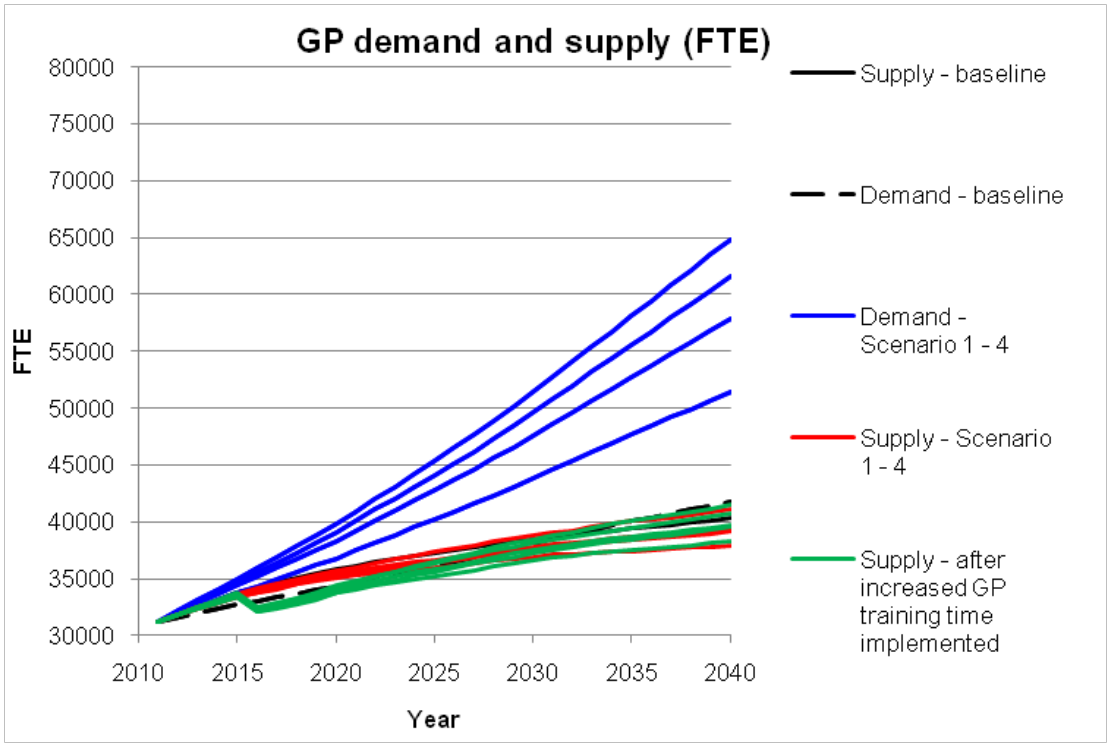
Figure 20: The impact on forecast THD supply of achieving in the near future a 50:50 ratio of GP:hospital specialty entry-level training posts



Source: CfWI system dynamics modelling, September 2012

Figure 21 gives an indication of the impact of extending GP training to four years in the near future. It shows a sudden and significant drop in GP supply, which then takes a number of years to reach the level that would be maintained without the policy change. Caution would be needed, as well as a clear plan for a safe transition, if a policy to extend GP training were to be implemented.

Figure 21: The impact on GP supply of extending GP training to four years



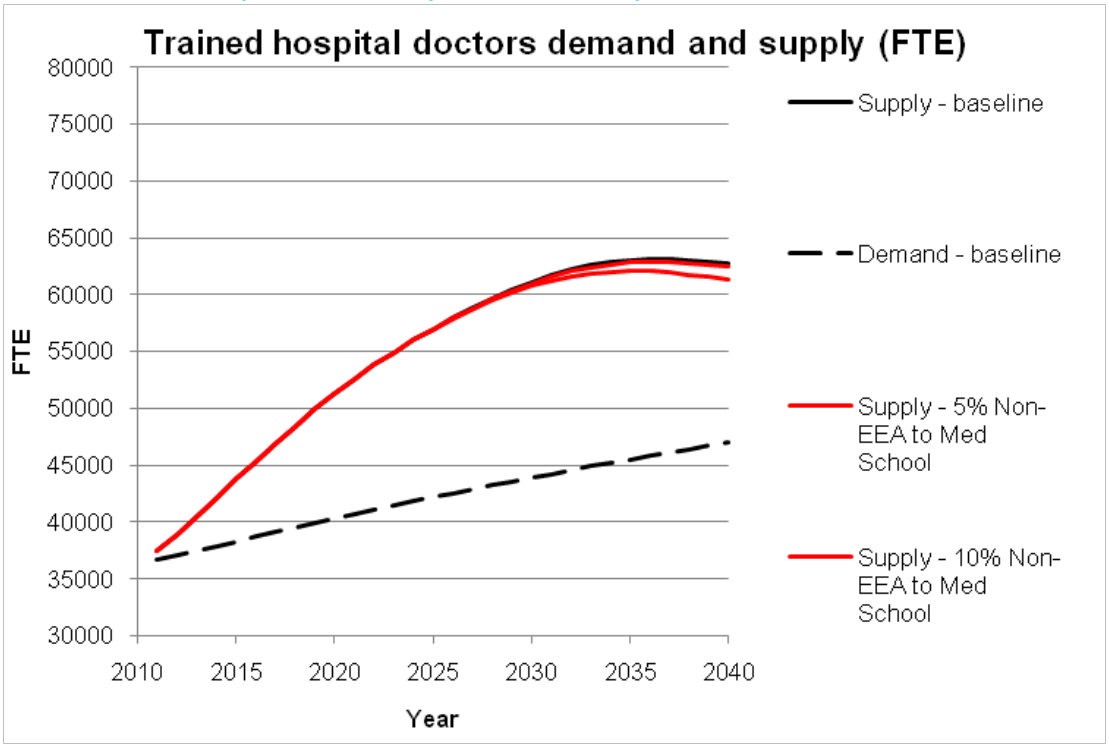
Source: CfWI system dynamics modelling, September 2012

Figure 22 gives an indication of the impact on demand and supply for trained hospital doctors of increasing the international student limit to 10 per cent or decreasing it to 5 per cent (from 7.5 per cent as at present) with no changes in current behaviour and no changes in total number of students.

The baseline assumption is that 5 per cent of all current foundation year 2 (F2) doctors leave at the end of their F2 year, which implies that not all of the current non-EEA medical school students leave after F2. The two policy scenarios show the case where, from 2012 onward, the total number of medical school students remains constant, but the fraction of non-EEA medical school students is either 5 per cent or 10 per cent, as opposed to the current level of 7.5 per cent. The policy scenarios, in red in the graph, assume that all the non-EEA students leave at F2. Therefore the baseline and 5 per cent non-EEA lines overlap because there is a similar rate of leavers as we have now. However, the 10 per cent non-EEA supply line is lower than the baseline, as more F2 doctors leave.

If this modelling is applied to the possible policy lever that all non-EEA graduates must leave the UK after completion of foundation year 1 (F1) and attaining full registration, we can estimate an increase of 7.5 per cent leaving on an increased 'headroom' of 10 per cent compared to today. By around 2033 we will see a small reduction in supply emerging with a growing but still small gap by 2040.

Figure 22: The impact of changing the non-EEA student intake to medical schools from 7.5 per cent to 5 per cent or 10 per cent



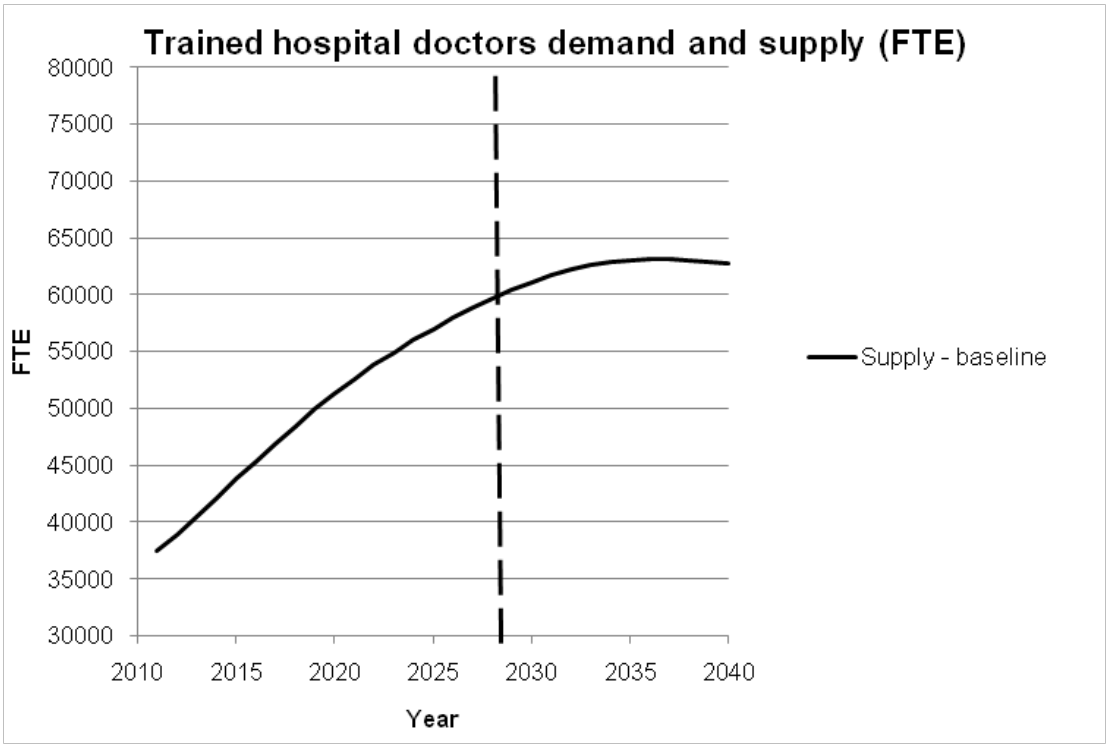
Source: CfWI system dynamics modelling, September 2012

Finally, figure 23 gives an indication of when there may be enough trained hospital doctors to deliver seven-day services in key specialties. Referring to

the baseline supply curve for THDs we would have enough doctors by around 2030 (see dashed vertical line), but without intervention we could 'overshoot' this level.

[NB this work was extrapolated from work carried out by the CfWI in 2010 with the specialties to understand what is meant by a trained-doctor service and which services were considered, by the specialties, as being likely to need 24/7 service delivered by trained doctors].

Figure 23: The baseline forecast of THD supply, indicating when there may be enough doctors to provide seven-day services.



Source: CfWI system dynamics modelling, September 2012

The CfWI has considered funding and cost constraints in order to support the review group's discussion about affordability

In this section you will find:

- funding scenarios
- projections of baseline supply against realistic funding scenarios.

Funding scenarios

The HENSE review group recommendations about student intakes need to take into account not just future workforce demand and supply, but also whether or not projected staff numbers are affordable. To support this

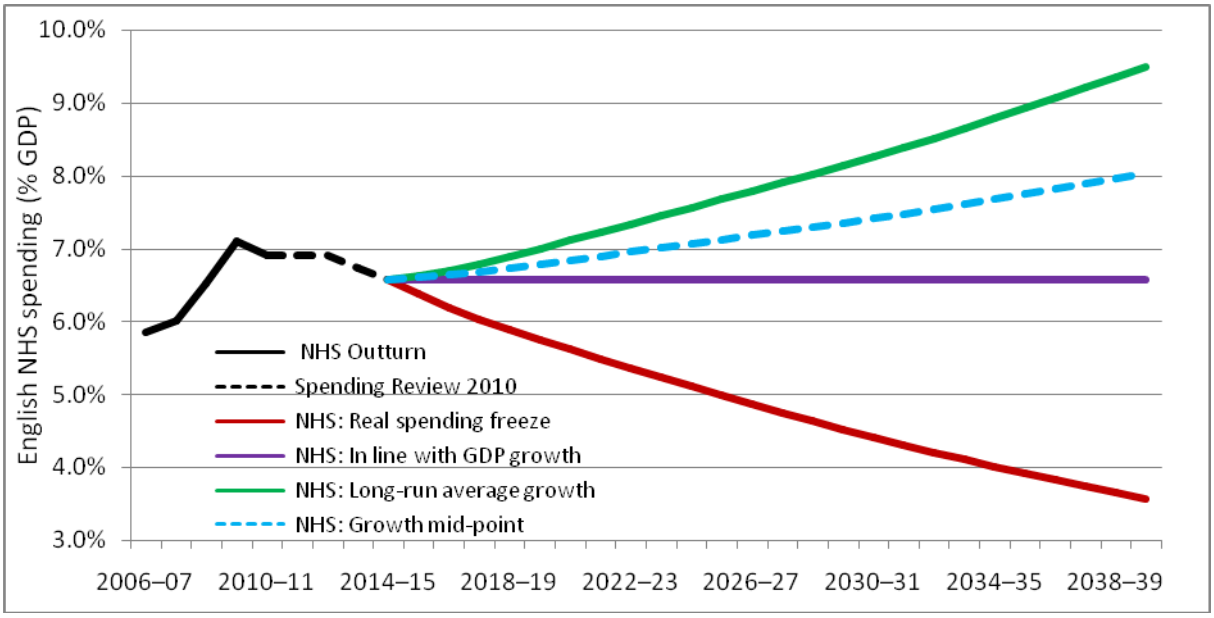
objective, the CfWI reviewed the funding and cost constraints likely to face the English NHS over the forecast period.

The CfWI's starting point is the recent Institute for Fiscal Studies (2012)[8] report for the Nuffield Trust, which outlines three funding scenarios for English NHS spending between 2015–16 and 2021–22:

- spending is frozen in real terms (extending the current Spending Review freeze)
- spending grows in line with national income (i.e. constant share of national income)
- spending grows in line with its long-run average for the UK (around 4.0% per annum since 1950/51).

The CfWI has extended these three scenarios to 2039–40 and revised them using the latest Office for Budget Responsibility (OBR) (2012)[9] long-term growth projections.

Figure 24: NHS England funding scenarios (percentage of national income)



Based on Figure 2b from the Institute for Fiscal Studies (2012), revised and extended to 2039–40. Data sources: NHS (Health) Total Departmental Expenditure Limit, Outturn data are from HM Treasury (2011), Table 1.8;

[8] Institute for Fiscal Studies (2012) *NHS and social care funding: the outlook to 2021/22*, Nuffield Trust, London. Available at: http://www.nuffieldtrust.org.uk/nhs-financial-challenge

[9] Office for Budget Responsibility (2012a), Fiscal sustainability report – Supplementary data series July 2012, Available at: http://budgetresponsibility.independent.gov.uk/pubs/FSR-2012-Supplementary-Tables.xls

Spending Review forecasts are from HM Treasury (2012)[10]; forecasts for real national income growth 2012–13 to 2016–17
are from HM Treasury (2012)[11]; for 2017–18 onwards these are from the Office for Budget Responsibility (2012).

As figure 24 shows, however, a 30-year real spending freeze is unsustainable. Freezing real spending to 2039–40 would halve public health spending from around 7 per cent to around 3½ per cent of national income. This would create large unmet demand for healthcare services, and is at odds with the history of healthcare spending across developed economies. OBR (2012) analysis of Organisation for Economic Cooperation and Development (OECD) data found that 'health spending as a share of Gross Domestic Product (GDP) has increased in all countries since 1970', typically by 3–6 percentage points (+¾ to 1½ percentage points a decade).

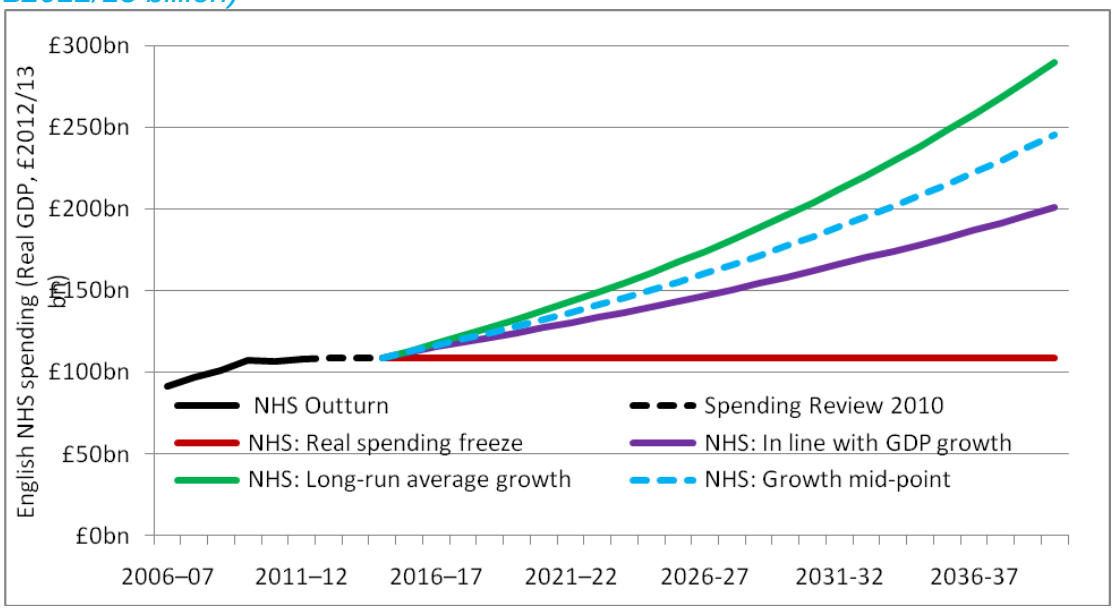
Given the possibility, however, that NHS healthcare spending may not increase in coming decades at the rapid pace seen over the past fifty or sixty years, the CfWI has added a fourth funding scenario – the mid-point of the high (4 per cent pa) and constant GDP growth scenarios. This would take NHS spending from around 6.6 per cent of national income at the end of the Spending Review period to 8 per cent by 2039–40 (+0.6 percentage points a decade). This is the CfWI's central projection for NHS funding over the forecast horizon: a real spending freeze to 2014–15, followed by sub-trend growth.

Figure 25 shows what those funding scenarios look like in real (constant price) billions of pounds. Omitting the real spending freeze scenario for reasons already outlined, they provide for real budget increases of between 88 per cent and 171 per cent between 2010–11 and 2039–40 (central projection: +129 per cent).

[10] HM Treasury (2011) Public Expenditure Statistical Analyses 2011. Available at: www.hm-treasury.gov.uk/pespub_pesa11.htm

[11] HM Treasury (2012) Budget 2012. Available at: www.hm-treasury.gov.uk/budget2012.htm

Figure 25: Four NHS England funding scenarios in constant pounds (real £2012/13 billion)



Sources: CfWI estimates. Based on HMT, IFS and OBR sources as per figure 24.

Cost and budget scenarios

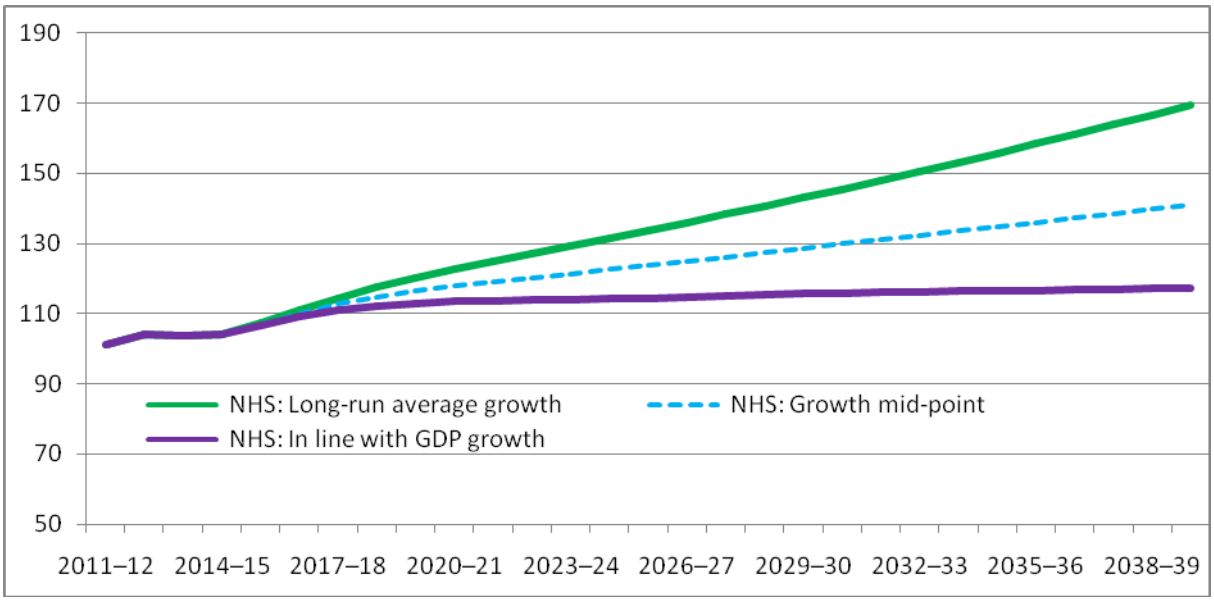
What are the implications of these funding scenarios on the ability of the NHS to employ additional staff? That depends on four cost-related factors: changes to the skill mix of the NHS workforce over the next three decades, changes to terms and conditions, pay increases over the period, and changes to non-wage NHS costs.

The CfWI has assumed that:

- the composition of the NHS workforce remains broadly unchanged
- average terms and conditions – aside from pay – remain around present levels
- NHS non-wage costs (property, medical equipment, drugs, etc.) rise in line with overall price trends in the economy (GDP price deflator).

On those simplifying assumptions, changes in remuneration are the key cost driver. What is the outlook for pay growth in the NHS? We expect it to be similar to the rest of the public sector, so for its cost scenarios, the CfWI has used the OBR's latest central projections for public sector average earnings growth. These forecast nominal pay growth to remain weak (below 1 per cent per annum) through to 2017–18, then pick up to average 2¼ per cent per annum from 2021–22 onwards. After adjusting for price increases, real public sector pay is projected to rise by a total of 60 per cent by 2039–40. As wages account for around two-thirds of NHS spending, and these are substantial real pay increases, the budget remaining for managers to be able to hire additional staff (or increase other spending) would be significantly reduced compared with figure 25 above.

Figure 26: Available real NHS England budgets after adjusting for estimated pay rises (100% = 2010–11)



Source: CfWI estimates of % change compared to 2010-11 baseline (100%). Based on HMT, IFS and OBR sources as per figure 24

After adjusting the funding scenarios for real pay growth (OBR 2012), and making the simplifying assumptions outlined above, the CfWI estimates that there may be scope to hire extra NHS staff by 2040, ranging from +17 per cent (growth in line with national income) to +69 per cent (long-run average growth). The CfWI's central funding scenario (growth mid-point) could accommodate increases in NHS staff of around 41 per cent over the forecast horizon, subject to the important caveats above.

The CfWI's baseline supply forecasts (full-time equivalent basis) between 2010–11 and 2039–40 are for:

- the supply of dentists to increase by 27 per cent
- the supply of GPs to increase by 29 per cent
- the supply of trained hospital doctors to increase by 64 per cent .

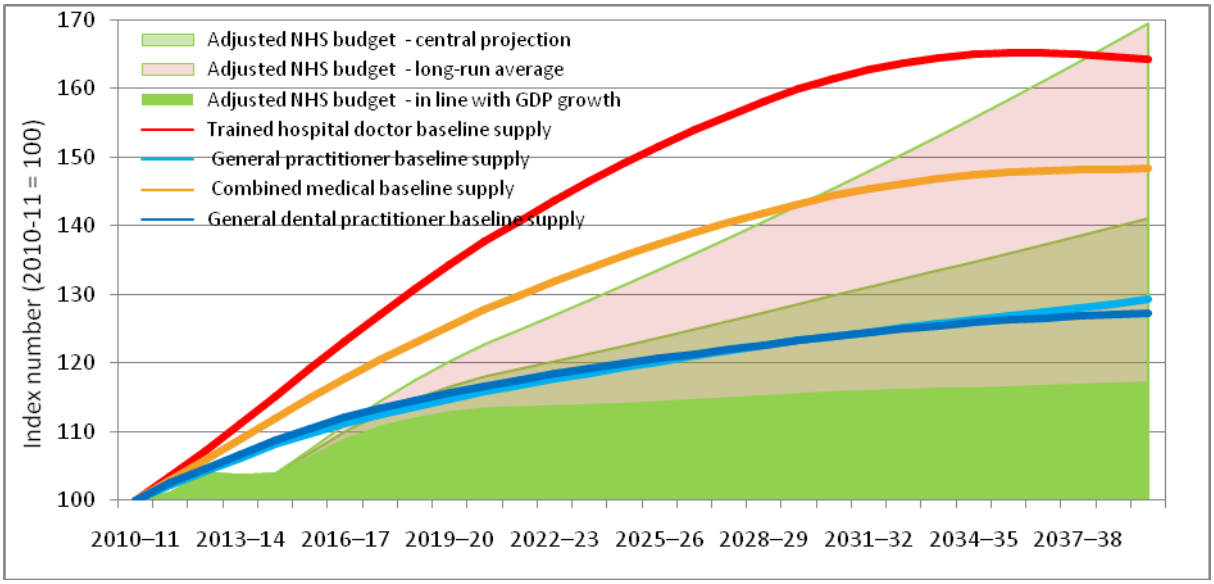
As increases in both dentists and GPs are well below the central projection of a 41 per cent increase in available real NHS England budgets (after adjusting for pay rises), **there is a reasonable prospect that the costs of hiring additional dentists and GPs may be accommodated** within projected NHS budgets. An important caveat to this conclusion is that it relies upon:

- average pay growth being broadly in line with the OBR's central projections
- no major change in average staff terms and conditions (e.g. pensions and benefits)
- NHS non-wage costs not strongly outpacing overall price trends

- the NHS not moving towards a skill mix that is considerably more expensive than at present.

If any of these assumptions were not to hold, the additional costs would reduce the capacity of future NHS England budgets to pay for extra clinical staff, and would lower these budget projections accordingly.

Figure 27: Medical and dental baseline supply projections and adjusted NHS real budget scenario, 2010-11 to 2039-40



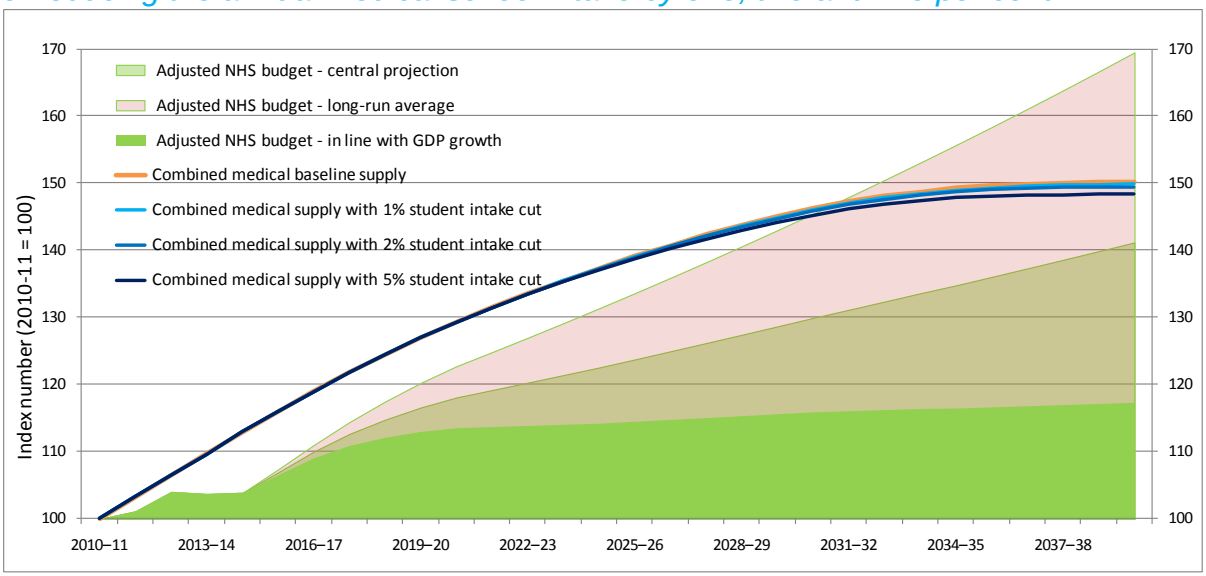
Source: CfWI estimates, as outlined above. Supply lines show the percentage growth on a full-time equivalent basis.

By contrast, the projected 64 per cent increase in trained hospital doctors is near the top of the 17–69 per cent forecast range of the three budget scenarios, and well above the central budget projection. Such a large increase in the trained hospital doctor workforce could have serious budget implications for the NHS. **It is doubtful that the cost burden of a 64 per cent increase in trained hospital doctors could easily be accommodated within projected NHS England budgets.** An increase of this magnitude, were it to occur, may necessitate substantial offsetting cost savings to be made in other areas.

This is not just about the need to rebalance the THD/GP mix, however. The combined medical baseline supply is projected to increase by 48 per cent over the forecast period, which is also above the CfWI's central budget projection. This suggests that the NHS may encounter difficulties in seeking to fund all of the projected growth in baseline supply of doctors over the forecast period.

Figure 28 below illustrates the impact on the combined medical baseline supply (the orange line in figure 27) of reducing the annual medical school intake by one, two and five per cent.

Figure 28: Combined medical baseline supply projections showing the impact of reducing the annual medical school intake by one, two and five per cent.



Source: CfWI estimates, as outlined above. Supply lines show the percentage growth on a full-time equivalent basis.

Recommendations

Data quality

The extensive work undertaken in this project, the discussion and debates and the sophisticated and novel dynamic modelling undertaken by the CfWI have all been valuable – but have clearly highlighted the critical importance of robust data. Clearly, the more robust the data, the more reliable is the modelling based upon them and the greater the confidence that can be invested in recommendations arising from them.

The CfWI work exposed some key issues: in particular with the dental workforce data. Steps have already been taken to improve the situation, but more work is needed.

There is more confidence with the medical data, although of course there will always be scope for improvement. The most significant weaknesses were identified with respect to the GP workforce.

The Review Group noted current work on the Workforce Information Architecture (WIA) and the establishment of HEE and its LETBs. The forthcoming WIA report could be influential in enabling the provision of robust data. Similarly, HEE and LETBs have a formal duty to provide workforce information that should be reaffirmed and built into their routine activities.

Consequently, the Review Group recommends:

Recommendation 1

All partners across the system should recognise the need for, and work towards the provision of, high quality robust workforce data in all areas. This is critically important with respect to demand side estimates.

Recommendation 2

Specifically, the DH's report of the Workforce Information Architecture, and the activities of Health Education England (HEE) and its Local Education and Training Boards (LETBs), should formally prioritise this work.

This is important if future data are to be plotted against the modelling to date. In the absence of high quality, robust data such plotting will not offer the key insights anticipated by the Review Group.

Wider workforce context

The Review Group was conscious of the dangers of focusing solely on the medical and dental professions: recognising that the healthcare workforce overall and models of delivery in the future may well look different. The opportunities for greater team-working, more innovative skill mix and development of new roles all have the potential to radically alter current ways of working and models of delivery. Such developments could influence future medical and dental

workforce requirements – and, conversely, recommendations on medical and dental student intakes could also have implications for other healthcare professions.

These factors were considered in this review, but it was felt their impact might be better understood as events unfold in the coming years and in the light of further analyses planned by the CfWI (for example, forthcoming reviews of general practice and pharmacy).

Consequently, the Review Group recommends:

Recommendation 3

Future reviews of medical and dental student intakes and continued modelling of future demand and supply must, as far as possible, be placed in the wider workforce context; taking account of developments and further analyses of workforce trends. This is required to understand both how such developments could influence future medical and dental workforce requirements and how medical and dental student intakes could also have implications for other healthcare professions.

Rolling programme of reviews

The Review Group also recognises the challenge of any review such as this in accounting for, and balancing against each other, the significant number of variables that might impact on future demand and supply.

It was noted that gradual changes over time can result in a large impact – for example:

- reducing attrition in education and training;
- understanding changes in participation rates within the workforce;
- improving retention in the employed workforce, including encouraging and/or supporting return to work;
- managing education and training pathways so that training output more closely matches that expected from the input;
- changes in skill mix and innovative ways of working;
- the impact of technology and related medical/dental advances; and
- increasing productivity year-on-year.

At the same time policy decisions that are imminent or likely to be made in the medium term will, themselves, impact on future demand and supply. Examples relating to this include:

- seven day, 24 hour service;
- shift of care closer to home;
- the Quality, Innovation, Productivity and Prevention (QIPP) initiative;

- integrated care: across health and social care; and
- changes to international borders and patterns of migration.

Consequently, the Review Group recognised the value of further reviews taking into account developments and policy decisions as described above. This would also have the benefit of building upon the modelling undertaken to date with the insertion of real-time data that would better inform possible future outcomes.

Consequently, the Review Group recommends:

Recommendation 4

A rolling cycle of reviews of medical and dental student intakes should be established; to be undertaken every three years (not necessarily concurrently).

Medical school intakes

The CfWI modelling for the medical workforce shows that there is reasonable certainty about supply and less certainty about demand. Supply across the four scenarios is higher than the expected baseline supply and demand. Demand across all four scenarios is less certain and much higher than the baseline. All scenarios demonstrate an increasing demand for primary care, which supply projections will not meet. There is likely to be an oversupply of hospital doctors, which falls outside of reasonable affordability projections.

CfWI expect that new ways of working, technological innovation and changes to the skill mix will result in modest productivity growth over the forecast period to 2040. This will help to close the gap between overall healthcare demand and workforce supply. There is a reasonable prospect that the costs of additional GPs may be accommodated within projected NHS England budgets. However, it is doubtful that the cost burden of the projected 64 per cent increase in trained hospital doctors could so easily be accommodated.

Given this clear oversupply, the Review Group considered it would be a missed opportunity if it was to delay signalling this to the system. Delaying a decision now would simply defer solving a problem we know we face: too many hospital doctors, an affordability issue and the need for greater productivity driven by new ways of working, skill mix and technology. At the same time, the many variables that might impact upon the modelling suggest that any adjustment should be relatively cautious. With continuing improvement to the quality of the data and the ability to track real-time changes, this would allow future reviews to monitor the potential impact of change and assess whether to make further adjustments.

Consequently, the Review Group recommends:

Recommendation 5

There should be a 2% reduction in medical school intakes, to be introduced with the 2013 intake – and this level should be adhered to until further decisions to change.

Recommendation 6

There should be a further review of medical school intakes in 2014 (for 2015 intakes) – followed by a 3 year rolling programme of further reviews.

Dental school intakes

The CfWI's development of a model of the complex 'system dynamics' of the dental workforce has highlighted that the data collected by the system about this workforce is not yet of the quality needed to support effective longer-term planning and better decision making. Impediments to the CfWI's ability to forecast dental workforce supply include a lack of specific age data that would enable modelling of attrition by age and gender at all stages of training and the workforce. This includes the ability to model retirement. There is also a lack data on specialist dentists, so the model does not include this workforce.

The Review Group considers that skill mix will be particularly relevant for future roles in dentistry which, along with other factors, suggests that a downward move in dental school intakes may be required. However, the issues with data mean no immediate decision can be made with confidence. On the other hand, it is believed the data quality will improve, suggesting a further review would be appropriate.

Consequently, the Review Group recommends:

Recommendation 7

There should be no immediate change to dental school intakes.

Recommendation 8

There should be another review of dental school intakes in 2013 (for 2014 intakes) following further work on the data on which such a review should be based – followed by a 3 year rolling programme of further reviews.

Overseas caps

Whilst the Review Group was asked to make recommendations on the overseas caps, the discussion summarised at paragraphs xx-xx highlighted the many factors at play and different policy perspectives. The Review Group noted these were the subject of continuing discussions by the four UK Health Departments and consequently recommends:

Recommendation 9

There should be no immediate change to the level of the overseas "caps" for medical and dental student intakes, but the "caps" should be kept under review and decisions informed by the outcomes of the continuing work of the four UK Health Departments.

UK-wide perspective

The Review Group's remit was to make recommendations for England. It noted the separate review in Scotland and the interest registered in this work in Wales and Northern Ireland. Whilst recognising the independence of the four separate national Administrations, but given healthcare staff work within a UK context, the Review Group recommends:

Recommendation 10

A UK-wide perspective should be applied to future reviews where possible.

Acknowledgements

The Review Group would like particularly to thank the team at the Centre for Workforce Intelligence for their contribution to this project and for the development of new medical and dental models that should also be invaluable in informing future reviews. The Group would also like to thank the numerous stakeholders that contributed to the project through the range of activities and opportunities facilitated by the CfWI.

Annex A

Terms of Reference

To ensure an adequate and affordable supply of good quality trained doctors and dentists to improve health outcomes and ensure high quality patient care and the sustainability of the healthcare and research sectors, to advise on future:

- total intakes to undergraduate medical and dental training in England; and
- within that total, the respective limits on overseas medical and dental students.

The review should take account of:

- a system-wide analysis of long-term overall workforce supply and demand;
- changing roles within the health workforce and similarly, the growth of skill mix within dentistry;
- the evolving nature of care with, for example, greater emphasis on community services;
- the development of private medical and dental schools and faculties of UK medical school overseas;
- the UK dimension - given that undergraduate education is a UK-wide market, a consistent approach to intakes across the UK would be desirable. In particular, account should be taken of the decisions arising from the Scotland Review of Medical Undergraduate Numbers that will be implemented for the intake to medical schools in Scotland in 2012 – and any parallel reviews of the dental workforce by the other UK Health Departments;
- the EEA and overseas dimension – similarly, account will need to be taken of likely demand for places from overseas applicants and forecast numbers of migrant doctors and dentists in the UK workforce;
- the potential impact upon the sustainability of English medical and dental schools;
- the risk to graduate career intentions following training; and
- the development of Health Education England and its emerging agenda and strategic direction.

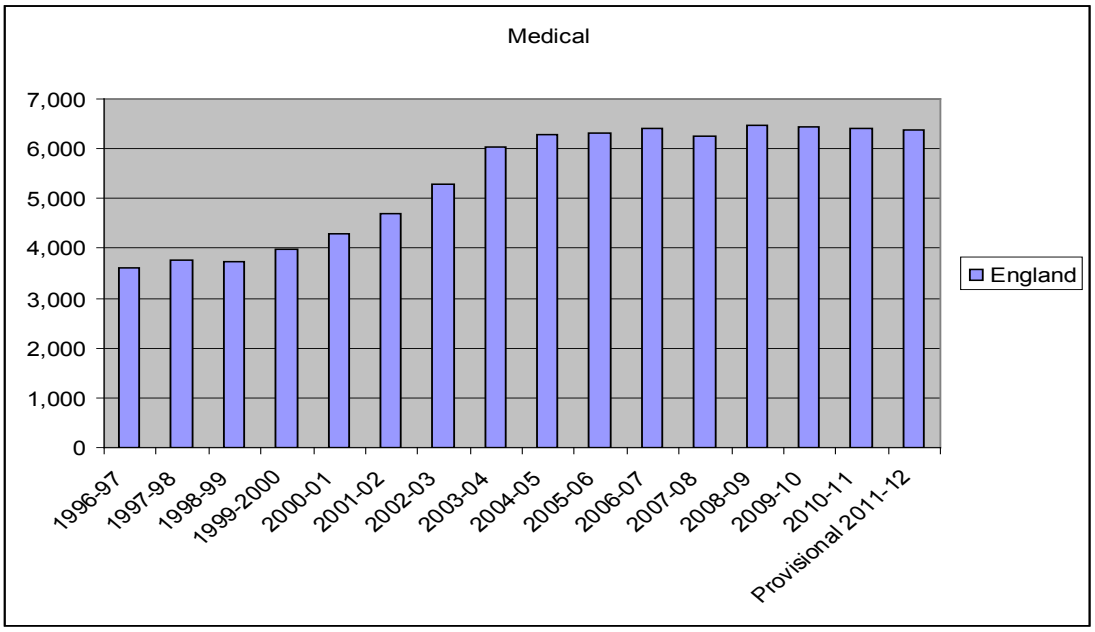
Recommendations should be made so that decisions can be taken to determine the intake to medical and dental schools in England in 2013/14 and beyond.

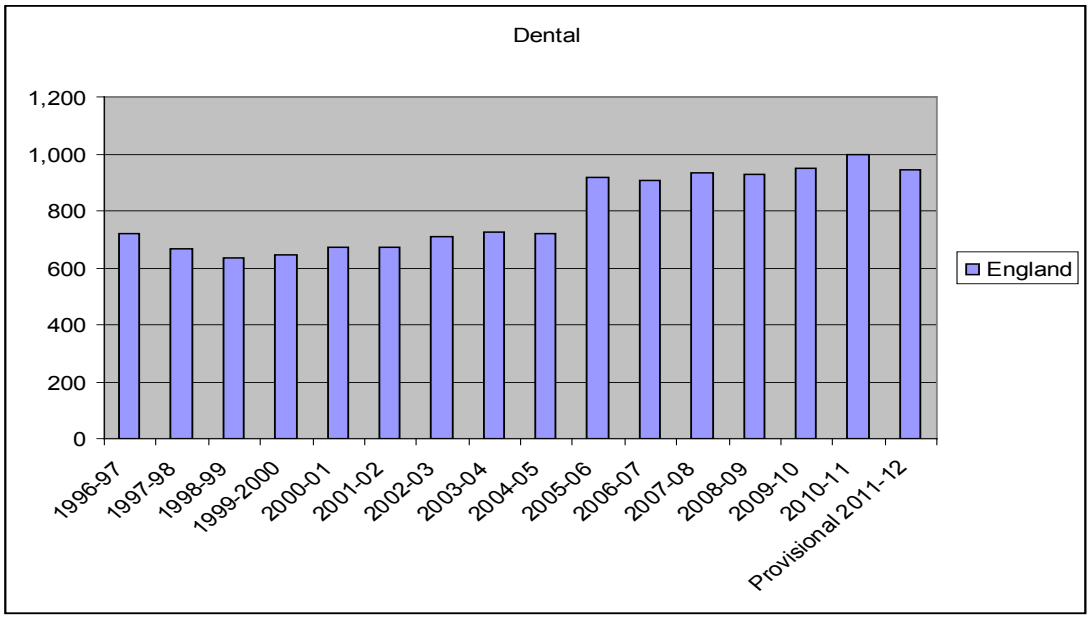
Annex B

Intakes	1996/97	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04
Medical	3,594	3,749	3,735	3,972	4,300	4,713	5,277	6,030
Dental	722	668	633	647	672	672	711	726

Intakes	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12 *
Medical	6,294	6,314	6,401	6,264	6,477	6,437	6,418	6,377
Dental	722	918	905	933	926	947	1,000	945

***** Provisional




Dental
1,200
1,000
800
600
400
200
0
1996-97
1997-98
1998-99
1999-2000
2000-01
2001-02
2002-03
2003-04
2004-05
2005-06
2006-07
2007-08
2008-09
2009-10
2010-11
Provisional 2011-12
England

Annex C

Review Group membership

Co-chairs

Sir Graeme Catto	Emeritus Professor of Medicine at University of Aberdeen
Sir Bruce Keogh	NHS Medical Director, DH

Members

Professor Hilary Chapman	Chief Nurse/Chief Operating Officer. Sheffield Teaching Hospitals NHS Foundation Trust
Barry Cockcroft	Chief Dental Officer, DH
David Noyce	Higher Education Funding Council for England
Sir Keith Pearson	Chair, Health Education England
Professor Bill Saunders	Honorary Consultant in Restorative Dentistry, University of Dundee
Professor Steve Tomlinson	Emeritus Professor of Medicine, Cardiff University
Professor Chris Welsh	Medical Director, NHS Midlands and East
Professor Steve West	Vice-Chancellor, University of the West of England
Robert Winter	Director, Academic Health Science Systems, Cambridge University Health Partners

Observers

Debbie Mellor/ David Sowden	DH
Jane Gardner	BIS
Professor Malcolm Lewis	Welsh Government
Professor Paul Padfield	Scottish Government

Secretariat

Andrew Matthewman	DH

Annex D

Glossary of key terms used in this report

Career post doctor	A doctor working in a non-training post who does not typically hold a CCT or CESR. The HSCIC categories included in this stock are: associate specialist, specialty doctor, staff grade, senior house officer, hospital practitioner/ clinical assistant and other staff.
CCT CESR	Certificate of Completion of Training (CCT) Certificate of Eligibility for Specialist Registration (CESR)
Delphi panel	The Delphi method is a structured communication technique, originally developed as a systematic, interactive forecasting method which relies on a panel of experts. Delphi is based on the principle that forecasts (or decisions) from a structured group of individuals are more accurate than those from unstructured groups.
Skill mix	Healthcare employers strive for the most effective mix of staff to provide sustainable, high-quality healthcare that can be achieved with the available resources while also taking into consideration local priorities.
Trained hospital doctor (THD)	A CCT or CESR-holder in a specialty other than general practice. Today these doctors are typically known as ‘consultants’.

Annex E

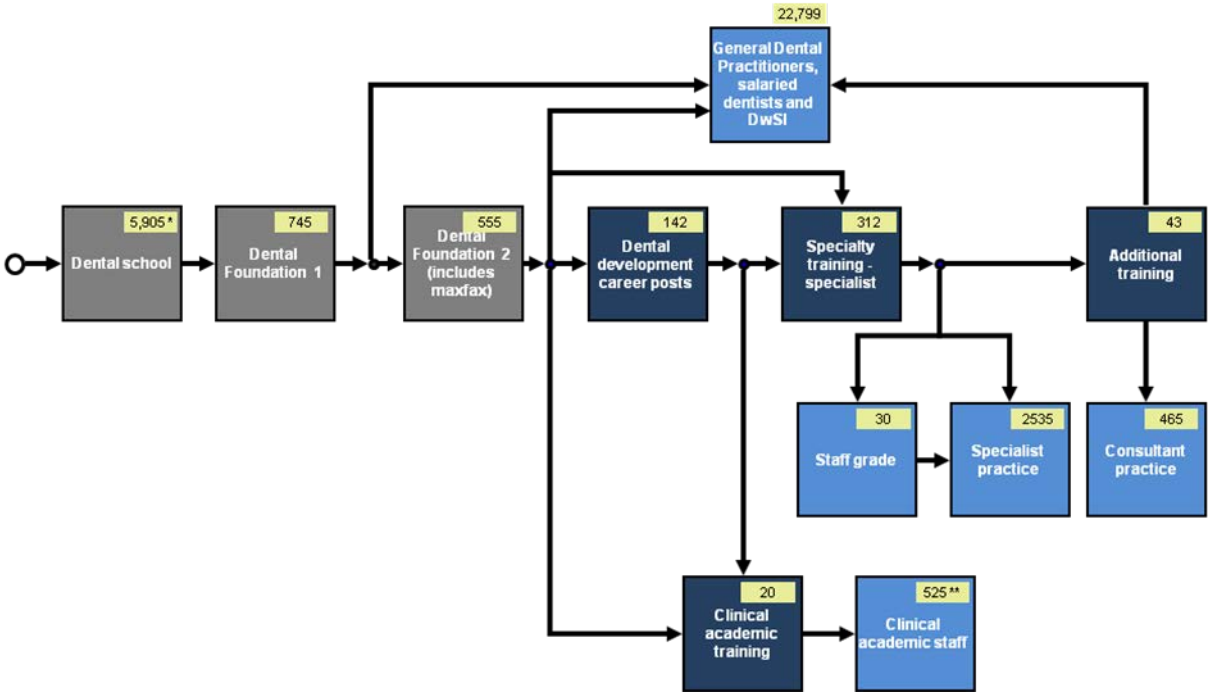
Summary of CfWI stakeholder engagement during the project

Nature of engagement	Impact
Horizon scanning telephone interviews	The CfWI interviewed 44 people from across the medical and dental sectors to ensure that no key driver of workforce requirements was excluded from consideration.
Scenario generation	Approximately 30 participants from across the medical and dental sectors attended two-day workshops facilitated by Professor George Wright. Participants including clinicians, professional leaders, educators, employers, policymakers, students, trainees, lay people, and other healthcare professionals.
Scenarios video	116 people downloaded the video from the CfWI's website.
Publications on website	CfWI publications (scoping report, technical reports parts 1 and 2, and two horizon scanning reports) have been downloaded more than 600 times.
Scenario quantification by a Delphi panel	58 people spent 2–4 hours each giving their judgment about how 'need', 'service', workforce participation, average retirement age and workforce attrition would shift by 2040 in each of the four scenarios. The CfWI then used the panels' median judgments as modelling assumptions.
Regional cluster roadshows	Approximately 180 people attended half-day roadshows at which the CfWI demonstrated the new models and sought input on key uncertainties such as future skill mix and migration behaviour.
Checking model accuracy, gathering and checking data and modelling assumptions	Numerous stakeholders helped to sense-check the accuracy of the models themselves or helped to provide or sense-check the data and modelling assumptions used. Key sources of help were the Department of Health's Workforce Data and Analysis Team, the Health and Social Care Information Centre, the BMA, GMC and specific deaneries, UCAS, NHS Pensions, and members of the medical project reference group.

Nature of engagement	Impact
Medical project reference group and dental project reference group	Members of the medical project reference group commented on the robustness of the CfWI's approach, participated in the Delphi panel, sense-checked the supply model and commented on key modelling assumptions. The Dental Programme Board acted in the capacity of dental reference group and made a similar contribution.
Attendance at standing committees/briefings	The CfWI has presented this work at least once to the Dental Schools Council, Dental Programme Board (which acts as the CfWI's dental project reference group), COPDenD, Royal College of Surgeons' Faculty of Dental Surgery, dental students and trainees (via BDA committees), Medical Schools' Council, Medical Programme Board, COPMeD, English Deans, JACTAG, WAPPIG, UK Scrutiny Group, UKHEAC, Academy of Medical Royal Colleges and individual royal colleges, medical students and trainees (via a focus group), employers (through NHS Employers and via CEOs/medical directors participating in scenario generation and so on), LETBs, and Health Education England.
e-briefings	The CfWI has sent periodic e-briefings (to date, six) to 608 stakeholders.

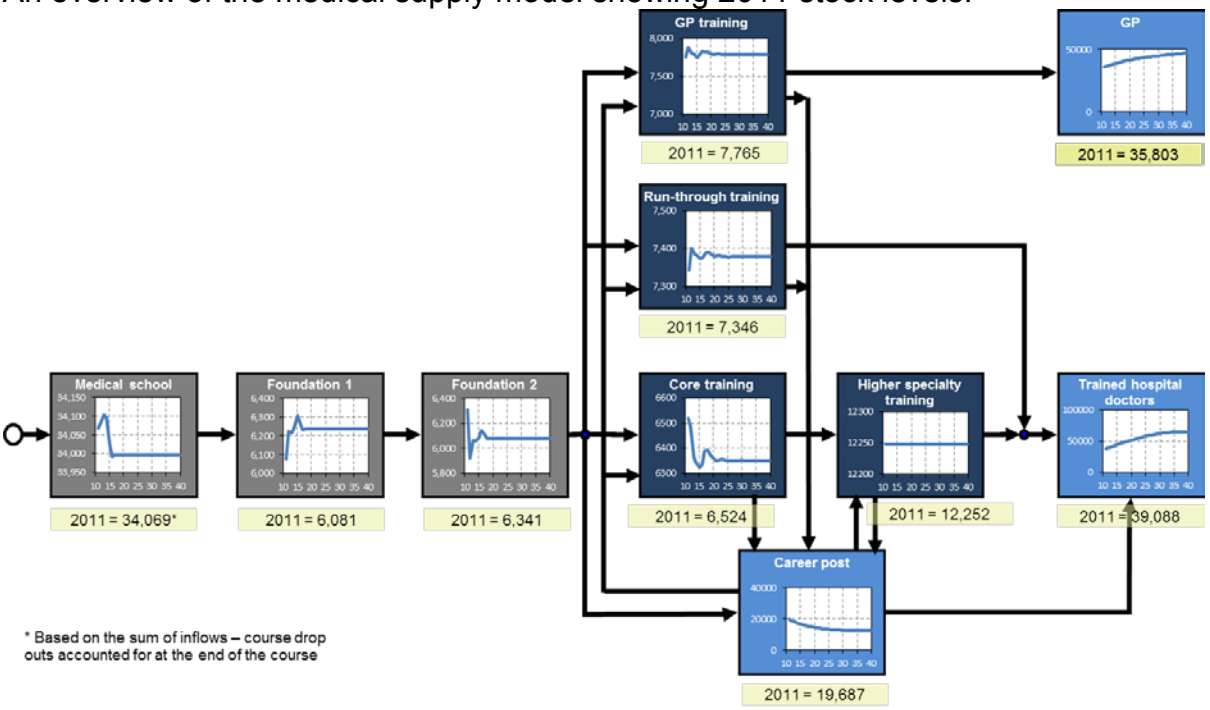
Annex F

An overview of the dental supply model showing 2010 stock levels.



Sources: see figure 4

An overview of the medical supply model showing 2011 stock levels.



Sources: see figure 4

Annex G

Some examples of key assumptions made in the CfWI demand and supply models

Demand is measured by utilisation

It is assumed that utilisation is a reasonable proxy for demand for services, so for example the demand for GPs is measured by the number of visits people make. In fact, utilisation is a function of demand, need, and supply. For example, demand could exceed utilisation, where people are not able to access or afford care.

Utilisation is independent of supply

Changes in supply, such as cost or ease of access, are assumed not to impact supply. In fact, an increase in supply can have a direct influence, for example through overprovision (supplier-induced demand).

Geographical distribution of health professionals is not modelled

This means that even if demand appears to be matched by supply, there may be geographical areas of under- or oversupply.

Specialties are not modelled individually

The workforce being modelled includes all medical specialties and clinical academics, but does not treat them individually. Future reviews of individual specialties will enable the CfWI to gradually refine the model.

Professions outside of health and social care have no impact on the workforce

It is assumed that changes in other professions, for example wages, do not influence health and social care workforce recruitment and retention.

No pre-existing unmet demand

Given the difficulty of quantifying need and demand, the starting point is that there is no unmet demand at a national level. However, there may be unmet demand at lower levels, for example geographical regions or individual professions.

Each additional health professional produces the same outputs

It is assumed that each additional health professional produces the same amount of activity, whereas increasing workforce numbers typically results in diminishing returns.

Linear change over time

It is assumed that changes in retirement age, participation rate, and demand factors including skill mix, technology and policy happen linearly over the time period being modelled.

No shortage of applicants for medical school

It is assumed that whatever the state of medical education or the health system, there will always be a surplus of applicants for medical school, and all undergraduate places will be filled.

Career decisions are not modelled

The behaviour of trainees in response to the state of the system is not modelled, for example, deciding to specialise as a GP rather than as a hospital consultant according to the number of places available or the difficulty of getting a job. In practice, both are likely to influence behaviour.

Annex H

The top 10 high-impact, low or medium data-quality variables in the medical supply model, their data sources, and the assumptions made

	Top 10 high-impact, low-data quality-variables in the medical supply model	Impact rating	Data quality rating	Source	Assumption
1	GP participation rate (full or part time)	> 5%	Medium	Health and Social Care Information Centre (HSCIC) GP census 2011, FTE and headcount data for GP Providers, Other/Salaried and Retainers.	Participation rate by age and gender
2	GP attrition	3-5%	Medium	Health and Social Care Information Centre (HSCIC) GP census 2008 to 2011, headcount data for GP Providers, Other/Salaried and Retainers.	Age profiles were compared for consecutive years to measure the likelihood of a GP leaving the workforce depending on their age and gender
3	Trained hospital doctor attrition	1-3%	Medium	Health and Social Care Information Centre (HSCIC) Medical census 2008 to 2011, headcount data by grade	Age profiles were compared for consecutive years to measure the likelihood of a doctor leaving the workforce depending on their age and gender
4	Trained hospital doctor participation rate (full or part time)	> 5%	High	Health and Social Care Information Centre (HSCIC) Medical census 2011, FTE and headcount data by grade	Participation rate by age and gender
5	Annual GP re-joiners / Joiners from outside English system	1 -3%	Medium	Not aware of data source for those coming from outside of the English system.	Historical estimates used as a base
6	Percentage who complete core training	0-1%	Low	No known data source	Estimated at 1 per cent

	Top 10 high-impact, low-data quality-variables in the medical supply model	Impact rating	Data quality rating	Source	Assumption
	and then seek a career post or alternative training				
7	Percentage who complete GP training and then leave the system	0-1%	Low	No known data source	Estimated at 5 per cent
8	Annual medical school intake from outside of country	0-1%	Low	Higher Education Funding Council for England (HEFCE) data for 'Other fees' starting medical school in 2011	No demographic or visa detail available for this group
9	Career post holders who start GP training annually	0-1%	Low	No known data source	Estimated at 100 men and 100 women per year
10	Annual run-through training intake from outside of the English system	0-1%	Low	No known data source	Estimated at 75 men and 75 women per year