CFWI
CENTRE FOR WORKFORCE INTELLIGENCE

A strategic review of the future pharmacist workforce

Informing pharmacist student intakes

September 2013

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Executive summary

The Centre for Workforce Intelligence (CfWI) was commissioned by the Department of Health (DH) to undertake a review to forecast and analyse the future supply and demand for the pharmacist workforce in England between 2012 and 2040. The report will support the DH, Health Education England (HEE) and wider Government in policy decision making to secure the pharmacist workforce of the future and the number of pre-registration trainees required.

Shape of the review

This review was driven by the need to provide sustainable, high-quality pharmacy services in a complex and evolving environment. The work was set in the context of the ongoing rise in pharmacist student numbers (more than doubling from 1999 to 2009 (MEE, 2011a)), and the Modernising Pharmacy Careers (MPC) Professional Board recommendation that the four-year pharmacy masters degree and pre-registration training year should be integrated into a single five-year course. Following ministerial consultation, it was agreed that this process should also consider the risks of an oversupply of MPharm graduates compared with the demand for qualified pharmacists and supply of pre-registration placements. (MEE, 2011b and DH 2012).

The purpose of the review is to consider how a complex set of factors interrelate to impact on the supply and demand of the future workforce. Short-term decisions may have a significant impact on the long-term availability of pharmacists in the workforce. Additionally, any immediate decisions by employers to reduce the number of funded training places could compound an imbalance between graduates and available training places. Therefore, it is important that local workforce planning is undertaken to inform decisions that may affect variations in supply and demand. In the short term, the focus is to support the MPC Professional Board's wider review of pharmacy training. In the longer term, the CfWI future pharmacist workforce review has a more strategic remit: to provide the evidence base for sustainable improvements in planning for the pharmacist workforce of the future, looking ahead to 2040.

Project approach

In this report, we share the results of a system dynamics model developed by the CfWI to forecast the supply and demand of the pharmacist workforce in England against a set of stakeholder-generated scenarios. The steps involved in this work include horizon scanning, scenario generation and workforce modelling. Our modelling shows the likely impact of certain variables on both the supply and demand of the pharmacist workforce. We used MPharm student data, pre-registration year data, and registered pharmacist data to forecast supply and demand based on a set of plausible scenarios facing the pharmacy workforce up to 2040 (a list of all data sources used in this project can be found in Appendix D).

The factors that work together to affect supply include MPharm student numbers and evidence-based attrition rates. We also looked at other factors for pharmacists joining and leaving the profession, including retirement.

There is a complex set of factors affecting demand. Our work reviewed changes in population growth and ageing, combined with trends in participation rates, and modelling assumptions informed by a Delphi process[1] for each of our scenarios.

Stakeholders developed four plausible future scenarios describing the possible shape of the pharmacist workforce in 2040. These scenarios were chosen as they had the least predictability and the highest potential impact on the workforce. Whilst plausible, no single scenario is intended to be a direct prediction of the future. As a set of four scenarios, however, they produce a reasonable boundary within which the future is likely to unfold. Two scenarios describe a future where technological advances result in pharmacists assuming a broadened role in healthcare, and two describe a future where technological advances result in pharmacists assuming a narrowed role in healthcare.

Key findings

In all four scenarios, supply is forecast to exceed demand, regardless of the pharmacist's role in healthcare. Therefore it is likely that there will be a surplus supply of pharmacists in the future. The possible range of oversupply by 2040 across all the plausible possible futures is between 11,000 and 19,000.

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[1]Delphi is a systematic, interactive method to forecast and quantify unknowable variables.

Recommendations and options for change

The CfWI recommends intervention to bring the supply and demand of pharmacists into balance. Given the likely oversupply of pharmacists in the future, it would be prudent to implement changes to the system that will optimise the output from education and training, with a view to reducing any potential unemployment risks that may accompany oversupply in the workforce. If there is no active policy intervention, future pharmacist numbers will be driven by market forces. Given the current planned changes to the training programme overall, and the potential for pharmacists to play a crucial wider role in community-based healthcare in the future, it is important to consider the risks associated with no active policy intervention at this stage.

The CfWI recommends a staged approach to balancing supply and demand to secure high-quality pharmacy services into the future. A staged change applied across multiple years can be used as a flexible, adaptive tool to bring supply and demand into balance. This would provide the greatest flexibility to manage the balance of supply and demand and reduce the risk of undersupply

in the future. However, balance between the size and duration of the staged intervention is paramount.

This report considers a range of options, including initiating an active policy intervention aimed at optimising student numbers:

- at the entry point to university MPharm degrees
- at the entry to pre-registration.

The CfWI recommends ongoing monitoring and periodic review of supply and demand, with a continued drive to improve data around the pharmacy workforce. The broad range of forecasts for the long-term future of supply and demand suggests it would be sensible to continue to monitor and review supply and demand, and any system changes affecting their balance in the medium-to-long term. Additionally, the CfWI recommends a review of this work at least every five years with yearly monitoring, to ensure the impact of any intervention and emerging risks can be appropriately tracked. To improve the reliability of future modelling it would be advisable for a new pharmacy workforce census to be undertaken, as current modelling uses data from the most recent census in 2008.

1. Introduction

1.1 Why this review?

The Centre for Workforce Intelligence (CfWI) was commissioned by the Department of Health (DH) to undertake a review to forecast and analyse the future supply and demand for the English pharmacist workforce between 2012 and 2040. The report will support the DH, Health Education England (HEE) and wider Government in decision making to secure the pharmacist workforce of the future and the number of pre-registration trainees required.

This review was driven by the need to provide sustainable, high-quality pharmacy services in a complex and evolving environment. The evidence cited in this review is correct as of 5 July 2013 and any changes since then have not been considered. The work was set in the context of two important factors that are currently impacting on the education and training of the pharmacist workforce:

- Pharmacist student numbers have increased substantially over the last decade; more than doubling from 1999 to 2009 (MEE, 2011a).

- The Modernising Pharmacy Careers (MPC) Professional Board has recommended that the four-year pharmacy masters degree and pre-registration training year are integrated into a single five-year course, with two six-month placements, jointly signed off by the school and employers. Following ministerial consultation, it was agreed that this process should also consider the risks of an oversupply of MPharm graduates compared with the demand for qualified pharmacists and supply of pre-registration placements. (MEE, 2011b and DH 2012).

The purpose of the review is to consider how a complex set of factors interrelate to impact on the supply and demand of the future workforce. Short-term decisions may have a significant impact on the long-term availability of pharmacists in the workforce. Additionally, any immediate decisions by employers to reduce the number of funded training places could compound an imbalance between graduates and available training placements. Therefore, it is important that local workforce planning is undertaken to inform decisions that may affect variations in supply and demand. In the short term, the review will support the MPC

programme's wider review of pharmacy training. In the longer term, the CfWI's future pharmacist workforce review has a more strategic remit: to provide the evidence base for sustainable improvements in planning for the pharmacist workforce of the future, looking ahead to 2040.

The healthcare system has faced significant financial pressure in recent years, and public spending on health will remain flat in real terms until at least 2015 (NHS Confederation, 2013). Furthermore, the National Health Service (NHS) is facing growing demand, estimated at 2.2 per cent per year (NHS Confederation, 2013). This growth is driven by factors such as:

- increasing patient expectations
- an increase in the number of patients with multi-morbidities
- lifestyle choices such as smoking, excessive alcohol consumption and obesity (NHS Confederation, 2013).

Meeting these increasing challenges will require the appropriate number of pharmacists to be available to deliver care in the most efficient manner possible, as well as maximising medicines optimisation to improve patient outcomes, and delivering an increasing array of public health services.

1.1.2 An outline of our approach

The CfWI robust workforce planning process used a scenario-based approach (outlined in Figure 1) that recognises the complexity of factors influencing supply and demand, and the intrinsic uncertainty of the future. The steps involved in this work include horizon scanning, scenario generation and workforce modelling.

In horizon scanning we examine the potential challenges, opportunities and likely future developments that could influence the pharmacy workforce up to 2040. Using the driving forces identified during horizon scanning, stakeholders developed four plausible future scenarios describing the possible shape and boundaries of the pharmacist workforce in 2040. A Delphi process quantified this information to feed into a model to provide supply and demand forecasts.

The key benefits of this work were to:

- support longer-term planning, up to 2040
- support more robust decision making, taking into account the uncertainties of the future
- help decision makers be more alert to emerging risks as the future unfolds.

Figure 1: The CfWI workforce planning framework

Source: CfWI
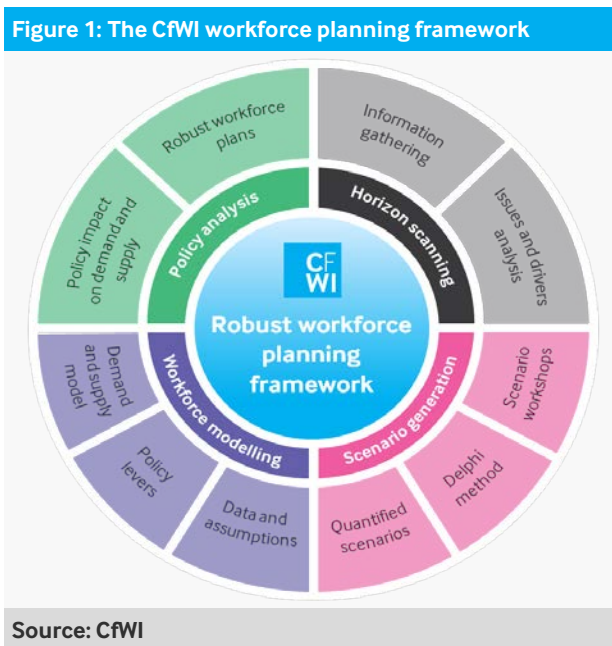
1.2   Stakeholder involvement

This work was completed with the support and collaboration of key professionals who understand the system and who have an interest in sustaining and improving the quality of pharmacist services for the future. The CfWI approach involved stakeholders, including professionals, employers, students and trainees, policymakers and advisory bodies both to improve the quality and credibility of its models and to improve the stakeholders' understanding of the intelligence contained in this review and its potential to support decision making. Throughout this project we engaged with a broad range of key stakeholders, including:

- employers and pharmacists across all sectors:
  - community pharmacy
  - hospital pharmacy
  - primary care pharmacy
  - industry
  - academia
- heads of pharmacy schools
- professional bodies
- representative student bodies
- trust chief pharmacists' networks education and training providers
- Health Education England regional offices and workforce planning leads.

For a full list of the stakeholders involved at each stage of this project, please refer to Appendix A.

1.3   Shape of the report

Our work is set out in this report to enable the reader to fully understand the purpose of the review, the project approach, the findings and the CfWI recommendations and options for change. The shape of the report covers:

- the make-up of the pharmacy workforce, the current supply and the education and training changes
- the workforce planning methodology
- the findings, including supply and demand forecasts, recommendations and options for change
- the CfWI conclusions.

2. The workforce

2.1   Pharmacy workforce

This work focuses on the pharmacist workforce, although we recognise the importance of the wider workforce, including pharmacy technicians, dispensing assistants and counter assistants in delivering the spectrum of pharmacy services[2]. According to the General Pharmaceutical Council (GPhC) there were approximately 47,391 registered pharmacists and 21,810 pharmacy technicians in Great Britain as of March 2013, of which there were 38,867 registered pharmacists and 18,165 pharmacy technicians in England (GPhC, 2013a). This data is further verified by the latest register analysis, performed by the Centre for Pharmacy Workforce Studies (CPWS), which identified 46, 310 registered pharmacists in 2011, of which approximately 82 per cent (37,887) were registered in England (Hassell, 2012).

Data from the Royal Pharmaceutical Society of Great Britain (RPSGB)/GPhC register[3] shows that the number of pharmacists on the register increased on average between 2003 and 2011, as shown by the blue line in Figure 2. The decrease in numbers between 2010 and 2011 is attributed to the removal of non-practising pharmacists from the register[4]. The number of practicing registered pharmacists domiciled in Great Britain increased from 39,378 in 2008 (recorded as practising) to 45,391 in 2013, as shown by the red line in Figure 2. The historical data and 2013 data indicate an increasing level of supply of pharmacists.

Figure 2 also shows that changes in the number of pharmacists in England have followed the same trends as changes in the number of pharmacists in Great Britain. This is not surprising, as more than 80 per cent of

registered pharmacists in Great Britain are domiciled in England (GPhC, 2013a).

Figure 2: Number of pharmacists in Great Britain on the RPSGB/GPhC register between 2003 and 2013

Historical and current RPSGB/GPhC register data indicates an increasing supply of pharmacists.
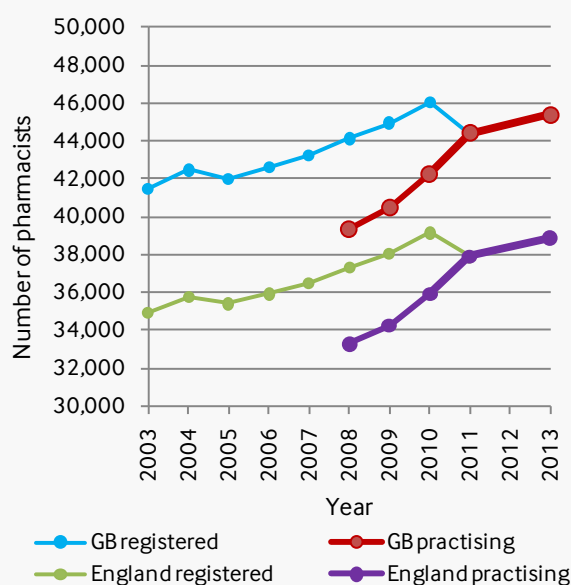
Source: Hassell, 2012., CPWS, 2010., and GPhC, 2013a.

Figure 3 shows the number of registered and practising pharmacists per 100,000 of the population for England. It shows that the number of registered pharmacists increased at a greater rate than the population increased between 2003 and 2013.

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[2] Please refer to the CfWI Workforce Risks and Opportunities report for more information about the wider pharmacy workforce (CfWI, 2011, 2012).

[3] 'The General Pharmaceutical Council (GPhC) took over the regulatory functions from the Royal Pharmaceutical Society of Great Britain (RPSGB) and formally became the independent statutory regulator for the pharmacy profession in Great Britain in September 2010.' (Hassell, 2012).

[4] Changes in Pharmacy regulation due to the Pharmacy Order (2010) meant the removal of the non-practising register (The Pharmacy Order 2010).

Figure 3: Number of registered pharmacists in England per 100,000 of the population between 2003 and 2013[5]

Historical and current RPSGB/GPhC register data indicates that the number of registered pharmacists has increased at a greater rate than the population has increased.
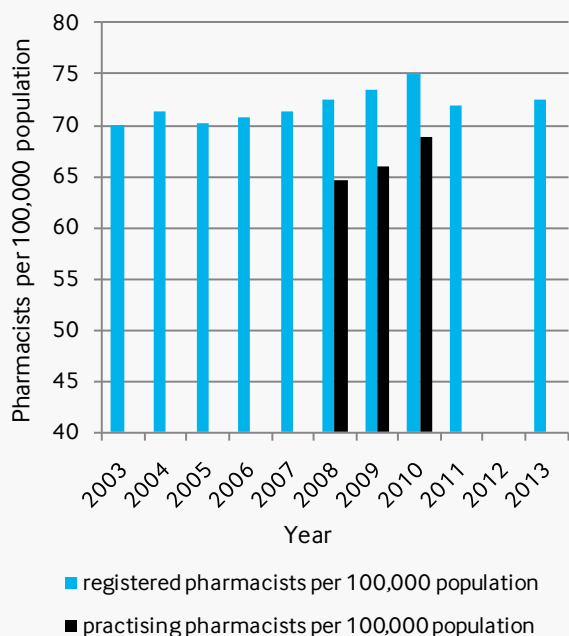
Source: Hassell, 2012., GPhC, 2013., and ONS, 2013

In Europe, the mean number of pharmacists per capita is approximately 60 per 100,000 population (FIP, 2012). The highest numbers of pharmacists per capita in the World are in Malta and Japan, both with rates of over 200 pharmacists per 100,000 population (FIP, 2012). The lowest is in Somalia with less than 1 pharmacist per 100,000 population (FIP, 2012).

The pharmacist workforce is employed across a number of sectors, and Table 1 shows the historical proportions of the workforce practising in each sector, based on findings from the Royal Pharmaceutical Society of Great Britain's Workforce Census, 2008 (RPSGB, 2009)[6].

Table 1: Proportion of GB pharmacist workforce by sector (2008)

Sector	Proportion of 2008 workforce[7]
Community	71%
Hospital	21%
Primary care	7%
Industry	4%
Academia	3%
Other	4%

Source: Pharmacy Workforce Census 2008 (RPSGB, 2009)

Furthermore, portfolio working is common in the pharmacist workforce, and the 2008 Census (RPSGB, 2009) shows that 11 per cent of actively employed pharmacists work across more than one sector and 17 per cent of actively employed pharmacists hold more than one job.

Part-time working is also a substantial trait in the current pharmacist workforce, with evidence from the 2008 Census (RPSGB, 2009) showing that 32 per cent of economically active pharmacists work part time[8]. However, while the levels of part-time working are substantial, participation rates have remained relatively stable over the last few years (CfWI, 2011) and part-time working levels only increased by 0.5 per cent between the 2005 and 2008 census findings.

The CfWI considers that the trends for flexible, part-time or portfolio working are linked to the increasing proportion of women in the pharmacist workforce shown by the latest CPWS analysis: in 2011 female pharmacists accounted for 59.4 per cent of the GPhC register, compared to 52.9 per cent of the RPSGB register in 2004 (Hassall, 2012).

Data from the GPhC register, displayed in Figure 4, shows that the workforce is relatively young: currently approximately 53 per cent of registered pharmacists are aged 39 or younger (GPhC, 2013a). The high proportion of young pharmacists in the workforce may be a

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[5] Data for 2012 not available

[6] Please note: much of the data available for the pharmacy workforce is published considering Great Britain and not England specifically.

[7] A pharmacist may have reported a position in two separate sectors, or two different jobs in one sector, therefore the total percentage exceeds 100%

[8] In the 2008 Workforce Census (RPSGB), part time is defined as working less than 32 hours per week

reflection of the increase in the number of pharmacy undergraduates joining the workforce in the last ten years. Figure 4 also shows that female pharmacists tend to be younger than male pharmacists, which reinforces the previous finding that there are increasing numbers of women in the workforce.

Figure 4: Age & gender of registered pharmacists in England in 2013

2013 register data suggests that the pharmacist workforce is relatively young and there is a higher proportion of women than men in the workforce.

note: no age data provided for 108 people
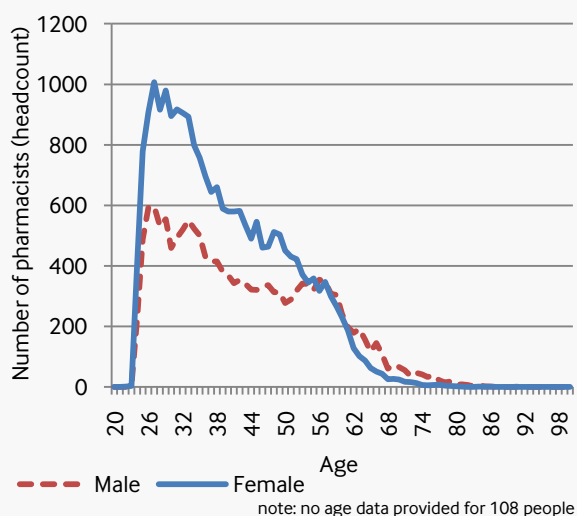
Source: GPhC, 2013a

The pharmacist workforce is also becoming an increasingly diverse workforce. The most recent GPhC register analysis from 2011 identified that the percentage of pharmacists of white ethnic origin decreased yearly from 73 per cent in 2006 to 61 per cent in 2011 (Hassell, 2012). Although beyond the scope of this report, future investigations may find it useful to consider the impact of changing patterns of participation associated with ethnic origin.

While not the focus of this report, it is also important to consider workforce migration, as changes in migration patterns could influence future supply and demand. According to the International Pharmaceutical Federation (2012) greater migration occurs from less-developed countries to more-developed ones for postulated reasons such as better remuneration, further training and qualifications and an improved quality of life.

Limited evidence is available on the migration of English pharmacists. However, data from the 2011 register

analysis (Hassell, 2012) broadly supports the argument that Great Britain[9] is largely a recipient country. For example, of the 46,310 pharmacists on the register in 2011, 5,460 (11.8 per cent) qualified overseas, of whom approximately half joined the register via the European route[10]. An increasing trend of overseas (EEA and non-EEA) new entrants is also evident, accounting for 22.4 per cent of new entrants in 2011, an increase from previous years. In contrast, the number and proportion of pharmacists with a registered address overseas has fallen in recent years, representing 4.1 per cent (1,919) of registered pharmacists in 2011, a fall of 5 per cent since 2010 (Hassell, 2012).

2.2   Education and training

2.2.1   Current training arrangements

At present, to register as a pharmacist a GPhC accredited four-year Master of Pharmacy degree (MPharm) must be undertaken, followed by a year of pre-registration training and successful completion of the GPhC registration assessment (GPhC, 2013b).

Currently, in England MPharm degrees are funded by student tuition fees and the Higher Education Funding Council for England (HEFCE), as pharmacy is classified as a 'science/laboratory based subject' (MEE, 2011a).

Pre-registration placements in NHS trusts are currently funded by Health Education England (HEE), which may be subsidised with contributions from individual trusts. Community pharmacy contractors who provide placements receive a grant as part of the community pharmacy contractual framework (MEE, 2011a). This is currently funded through NHS England.

2.2.2   Student numbers

There has been a substantial increase in pharmacy student numbers in the last 10-15 years in England. 'Between 1999 and 2009 the number of schools of pharmacy in England increased from 12 to 21 and the number of students more than doubled from 4,200 to 9,800.' (MEE, 2011a). This increase is explained by the change in the number of students entering MPharm

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[9] The GPhC register includes pharmacists registered in England, Scotland, Wales and Overseas.

[10] Pharmacists from the European Economic Area (EEA) who possess a European pharmacy qualification can apply to join the register, providing their paperwork is in order, and the majority will not need to undertake any further assessment or study.

programmes going from 1,450 in 1999 to 2,891 in 2009 (GPhC, 2011). This increase has continued with a further three universities in England due to be accredited (GPhC, 2013c). In the 2011/12 academic year there were 10,951 pharmacy students and 3,104 entered MPharm programmes in England (Bassey, 2012).

Currently, in England there is no link between MPharm student numbers accepted into schools of pharmacy and the commissioning of pre-registration trainee pharmacist placements. Historically, the growth in MPharm student numbers has kept pace with the number of pre-registration places. However, if the growth in student numbers continues there may be a risk of imbalance in the future. This is evidenced by analysis from the British Pharmaceutical Students' Association (BPSA), which suggests 'that in the future there will be a trend towards decreased numbers of pre-registration places, against a backdrop of increased student numbers' (BPSA, 2012).

The scope of this review is to consider supply and demand for the pharmacist workforce in England to 2040. Numbers of UK students, as well as EU students and overseas students have an impact on supply. In the academic year 2011/12, 16 per cent of students entering MPharm programmes were international fee-paying, non-EU students, with less than half completing their pre-registration training in England (GPhC, 2013d, Bassey, 2012).

Additionally, it is worth noting that in the UK the only country to currently manage pharmacist student numbers is Scotland, where there is a restriction on pre-registration places, currently 170. Northern Ireland has recently completed a consultation on proposals to manage pre-registration training places, the results of which are pending (BPSA, 2012).

2.2.3 Education and training reform proposals

In 2011, the MPC Professional Board made the case that there are weaknesses with current pharmacist training arrangements. One of the main weaknesses identified was the separation between undergraduate teaching and work-based learning, resulting in a lack of exposure to clinical practice and making the transition from academia to the workplace more difficult than it needs to be (MEE, 2011b).

Consequently, the MPC Professional Board made a number of proposals for reform, including the proposal that the four-year pharmacy masters degree and pre-registration training year should be integrated into a single five-year course, with two six-month placements, jointly signed off by the school and employers (MEE, 2011b). The MPC Professional Board reform proposals are currently subject to a full impact assessment and consideration of funding options by the DH, the Department for Business, Innovation and Skills (BIS) and the Higher Education Funding Council for England (HEFCE) (DH, 2012).
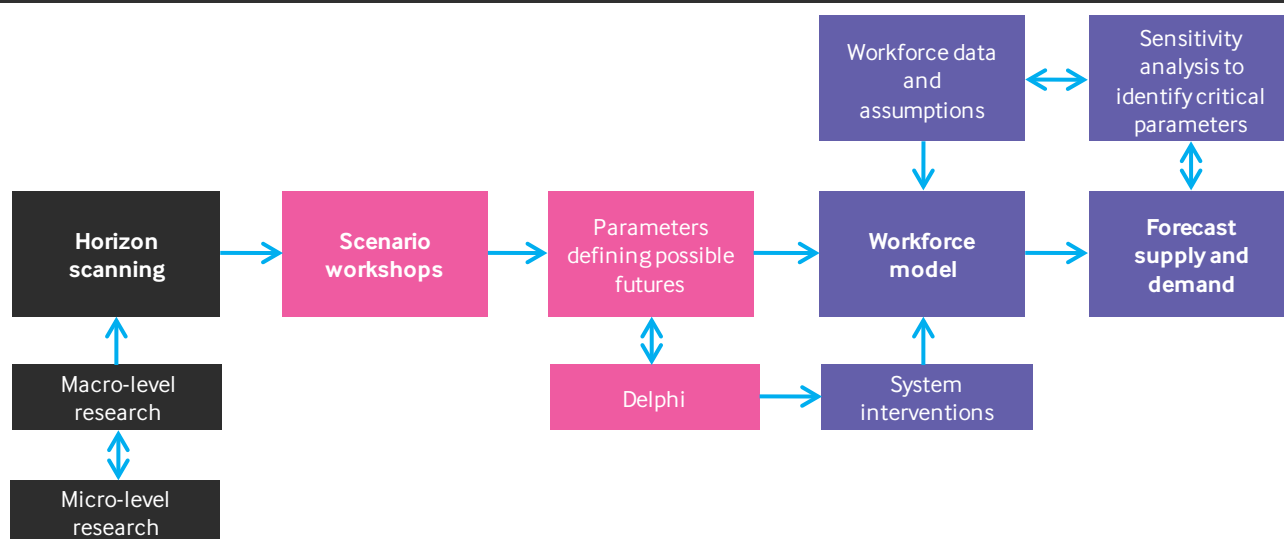
3. Workforce planning approach

3.1   Overview

In order to forecast and analyse future supply and demand for the pharmacist workforce between 2012 and 2040, the CfWI used its robust workforce planning approach, considering scenarios that outline the possible boundaries of the future to model the pharmacist workforce using the high-level activities of horizon scanning, scenario generation and workforce modelling.

- **Horizon scanning** – An examination of the potential challenges, opportunities, and likely future developments that could influence the pharmacy workforce up to 2040. Structured interviews with 53 expert stakeholders produced a broad range of 'driving forces' likely to impact on the pharmacist workforce in the future. Further details of these driving forces can be found in section 3.2 below and Appendix B.

- **Scenario generation** – An exploration of how the future may evolve and the implications for the pharmacist workforce up to 2040. Using all the driving forces identified during horizon scanning,

stakeholders developed four plausible future scenarios describing the possible shape of the pharmacist workforce in 2040. Whilst plausible, no single scenario is intended to be a direct prediction of the future. As a set of four scenarios, however, they produce a reasonable boundary within which the future is likely to unfold. A Delphi process was then used to quantify key variables in these scenarios. Further details of the scenarios and the Delphi can be found in section 3.3 below and Appendices C and E.

- **Workforce modelling** – A model was developed to provide supply and demand forecasts for pharmacists for the four future scenarios. The model uses existing data sources, values from the Delphi and modelling assumptions (see Appendix D for further details of modelling assumptions). As with the scenarios, these forecasts should not be read individually as direct predictions of the future. The forecasts set a reasonable boundary within which the future is likely to unfold and are intended to inform debate and decision making on policy options, to secure optimum workforce progression.

Figure 5: CfWI pharmacist workforce planning approach

Our **horizon scanning** work aligns with wider **scenario generation** and **workforce modelling**. Our outputs inform later research activities to produce options and recommendations.

Source: CfWI

3.2 Horizon scanning

The workforce planning approach started with horizon scanning. Horizon scanning is defined as 'the systematic examination of potential threats, opportunities and likely developments including but not restricted to those at the margins of current thinking and planning' (Chief Scientific Adviser's Committee, 2004).

In December 2012 the CfWI interviewed 49 pharmacy stakeholders by telephone and held a focus group with four participants to identify the factors that may impact the supply and demand for the future pharmacist workforce (known as driving forces). A breakdown of the stakeholders who participated in horizon scanning is in Appendix A.

For the purpose of horizon scanning, the CfWI asked stakeholders to consider the possible technological, economic, environmental, political, social and ethical (TEEPSE) influences on the following question:

Thinking up to the year 2040, what factors will influence:

- the requirements of the future pharmacist workforce?
- future pharmacist workforce numbers and deployment?

The most frequently suggested driving forces were:

Technological: remote technology, personalised medicines.

Economic: economic climate affecting the wider UK health economy; the continued drive for efficiency in the public and private sectors.

Environmental: the wider impact of climate change, potential development of health pandemics caused by new or re-emerging diseases.

Political: shifts towards person-centred care, the shift of care to the community.

Social: the ageing population, public health initiatives, increasing service user expectations.

Ethical: shared decision making with patients.

Full summaries of the driving forces identified during the horizon scanning process are in Appendix B.

3.3 Scenario generation

Following horizon scanning, the CfWI gathered 24 stakeholders to develop four challenging but plausible scenarios to 2040 for the pharmacist workforce. A

breakdown of the stakeholders who participated in scenario generation is in Appendix A.

A scenario is defined as 'an internally consistent view of what the future might turn out to be – not a forecast, but one possible future outcome' (Porter, 1985). The scenarios, therefore, are not intended to describe expected, exhaustive or preferred states. They represent a plausible range of ways the future could unfold, and boundaries are set, which can be used to test policy options for robustness.

Using all the driving forces identified during horizon scanning, participants were asked to look for causal and chronological relationships between the driving forces, and freely grouped these into 'clusters'. For example, a causal and chronological relationship can be identified between the following individual driving forces:

- an increase in the 'use of the internet and social media', could in turn cause
- an increase in the 'online supply of medicines', which could therefore result in
- reduced 'footfall to high street outlets'.

A line can therefore be drawn from each of the driving forces identified at interview, through a narrative describing a sequence of events as they unfold to 2040 – referred to here as a cluster.

The stakeholder group then evaluated each cluster, and rated the narratives for impact on the pharmacist workforce and predictability of the narrative to unfold. Rating future events according to impact and predictability is the cornerstone of risk management, and the same framework is adopted here. Scenario generation methodology maintains that we need to consider all feasible driving forces, but focus on those with the largest range of uncertainty and most significant consequences for the pharmacy workforce. Stakeholders therefore identified those clusters which are least predictable and potentially have the highest impact.

As a result of the iterative analysis process, two final clusters were evaluated as having the lowest predictability and highest impact. The stakeholders then combined these two clusters (Clusters A and B) to produce four final scenarios, each describing an extreme but plausible outcome for the pharmacist workforce in 2040. Table 2 shows the clusters of greatest uncertainty deemed by the participants to be of the highest impact, combined to create the final four scenarios.

Table 2: Four scenarios from the scenario generation process

		Cluster B	
		Broadened role for pharmacists in healthcare	Narrowed role for pharmacists in healthcare
Cluster A	Internet-driven supply of medicines	**Scenario 1**	**Scenario 2**
	Internet-driven medicines optimisation	**Scenario 3**	**Scenario 4**

Source: CfWI scenario generation workshop

Two of the scenarios (1 and 3) indicate a future where pharmacists take on a greater role in healthcare than at present, aided by technological advances and greater patient interaction. The other two scenarios (2 and 4) indicate a future where technological advances result in a lesser role for pharmacists in healthcare than at present, as patients choose to access drugs and healthcare information themselves in their own homes. A summary of each of the scenarios is in Figure 6, and the full scenarios are provided for reference in Appendix C. It should however be noted that these four scenarios represent a shared assessment by expert stakeholders of the most impactful and least predictable futures facing the pharmacist workforce. They are not intended to describe every possible future, nor to predict the most likely. They are there to set a reasonable boundary within which the system can make informed decisions and plan.

Some elements of these scenarios are beginning to come to fruition in the present day, particularly the exploration of a broadened role for pharmacists in healthcare. For example, in April 2013 the Royal Pharmaceutical Society established a Commission 'to develop practical ideas about how future models of care can be delivered through pharmacy' (RPS, 2013).

Figure 6: Summary of the scenarios

The drivers are coloured relating to the TEEPSE category they fall under:

Technological   Economic   Environmental   Political   Social   Ethical

Timeframe	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Short term (2012 to 2020)	▪ Drive for efficiency continues. ▪ Pharmacists granted access to e-health records.	▪ Economic pressures continue and health spending decreases. ▪ Privatisation becomes increasingly the norm. ▪ Online services grow.	▪ Public demands a more streamlined, personalised pharmacy service. ▪ Increasing use of technology. ▪ Drive for efficiency continues.	▪ Public demands healthcare information online. ▪ Technology starts to provide access to medicines and diagnosis online.
Medium term (2020 to 2030)	▪ Drive for efficiency continues further. ▪ Pharmacists become first point of contact for patients and take on wider prescribing role.	▪ Supply-only internet services proliferate. ▪ People shop for drugs online as they shop for food. ▪ Declassification of drugs.	▪ Policy move to prevention rather than cure leads to emergence of the 'healthy living pharmacist'. ▪ New medicines are made available to all providers under the 'Any Qualified Provider' policy.	▪ Wifi available nationwide. ▪ Liberalisation of drug regulation. ▪ Multiple community pharmacies distribute majority of medicines online.
Long term (2030 to 2040)	▪ New diagnostic and monitoring devices enable remote care. ▪ Patients order medicines online.	▪ Health of the nation is increasingly focused on managing complexity, co-morbidities and long-term conditions.	▪ Proliferation of telemedicine facilitates self-diagnostic testing.	▪ Patients can access medicines at home using 3D printers. ▪ Lifestyle drugs more widely accepted.
Key outcomes by 2040	▪ Pharmacists are utilised as a public health service provider. ▪ Opportunities for care in the community and at home increased. ▪ A flexible modern pharmacist workforce, with a growing need to support and serve where required.	▪ Not a single bricks-and-mortar pharmacy remains open. ▪ Total cost of healthcare has in fact increased. ▪ Move towards locally provided care begins to reverse, as more and more people are admitted to hospital to manage their conditions.	▪ General public regularly consults pharmacists, seeking expert advice in times of both good and poor health. ▪ Healthcare service provision is variable between face-to-face and remote service delivery. ▪ Patients' health is tracked from birth, and telemedicine facilitates self diagnostic testing.	▪ Majority of physical pharmacies closed. ▪ Only a few highly qualified pharmacists are necessary in order to meet patient needs. ▪ Emphasis on remote advice, or in-depth face-to-face consultations for individuals willing to pay for the service at boutique pharmacy advisory companies.

Source: CfWI scenario generation workshop

Please note that these driving forces and scenarios were developed via a tried-and-tested process by a diverse group of stakeholders. They do not, therefore, represent the views of any single organisation such as the CfWI, the DH, HEE or any professional body**.**

3.3.1 Delphi process

The final four scenarios were documented in narrative form which therefore needed to be quantified for the purpose of modelling.

Two approaches were taken for modelling. The first used existing data sources to quantify variables. The second used variables which were intrinsically uncertain and could not be determined using existing data or trends. To generate values for these variables, the CfWI used a Delphi process.

Delphi is a systematic, interactive method of forecasting and quantifying unknowable variables. 13 stakeholders representing a cross-section of the pharmacy workforce participated in two rounds of Delphi from February to March 2013. A breakdown of the stakeholders who participated in the Delphi process is in Appendix A.

The CfWI team used an online survey to administer the Delphi questionnaire, and during the first round participants were first asked to read the four scenarios. They were then asked to answer a series of questions asking them to make quantitative judgements about uncertain future variables. The team asked questions about variables needed for the model such as 'what will the future retirement age be?' for each scenario, by sector and gender, where appropriate. For each answer, participants were also asked to provide a rationale for their judgement. A full list of questions and quantified variables obtained from the Delphi process is in Appendix E.

Between the first and second rounds of Delphi, participants received an anonymised summary of other participants' answers to the questions, as well as the rationales for their judgements. During the second round, each participant had the opportunity to revise their initial predictions based on the reasoning of the others participants. Following the completion of the second round, the median scores were calculated along with the standard deviation for each question. Where it was clear that participants were unable to make a quantitative judgement, as determined by their rationales, these scores were removed before calculating the median values.

For each question, participants typically converged towards a consensus during the second Delphi round, and the median values were used as inputs to the workforce modelling process. The Delphi process offers a method in which intrinsically uncertain values can be systematically generated and tested. However, it should be noted that these values (such as future changes to retirement age and future changes in participation rate) remain uncertain by their very nature. It is best practice in modelling to quantify the uncertainty that is inherent in any forecast of the future. 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. It is not possible to predict the future with certainty, which is why the CfWI uses a scenario-based approach, to characterise this uncertainty and identify plausible future conditions. Further detail on analysis of the Delphi results is in section 3.4.3.

3.4 Workforce modelling

Once the Delphi process was complete, all of the inputs for the workforce model had been defined and quantified. The inputs were:

- **Facts we knew** – baseline data to populate the model, for example current training and workforce numbers.
- **Assumptions we made** – predictable trends and assumptions needed where data was not available or of poor quality.
- **Assumptions derived from Delphi** – intrinsically uncertain variables that may vary by scenario, and were quantified using the Delphi process.
- **Parameters we could control** – parameters that policymakers can use to adjust supply and demand so that they are in balance.

The purpose of the CfWI's workforce modelling is to project supply and demand for pharmacists for a range of plausible futures, as described by the four scenarios. CfWI demand modelling uses a framework from a Canadian research programme on health human resources (Birch, et al., 2011). The framework separates out four key elements of demand:

1. Population – the size of the population being served, by age and gender.
2. Level of need – the needs of the 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 ability of the workforce to deliver the necessary services, taking into account factors such as skill mix and technology.

The CfWI chose this framework because it provides a clear, logical separation of the key factors and allows the use of the Delphi process described above 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 and gender, where data exists. Figure

7 shows the main different stocks and flows of the pharmacy supply model.

The CfWI chose Vensim DSS© to model the complex flows of pharmacist training and workforce in order to forecast the future supply and demand of pharmacists. The chosen software was able to handle the complexity of modelling supply, including the ageing of the workforce, and also offered sophisticated sensitivity and uncertainty analysis functionality, an important feature given the variable quality of data and assumptions available. The CfWI formally tested and validated the model to ensure reliability.

Figure 7: Pharmacist workforce supply model stock and flow diagram

The main stocks of the pharmacist workforce are: university, pre-registration training and the registered workforce. It is important to note that proposed training reforms may change this by integrating university and pre-registration training.
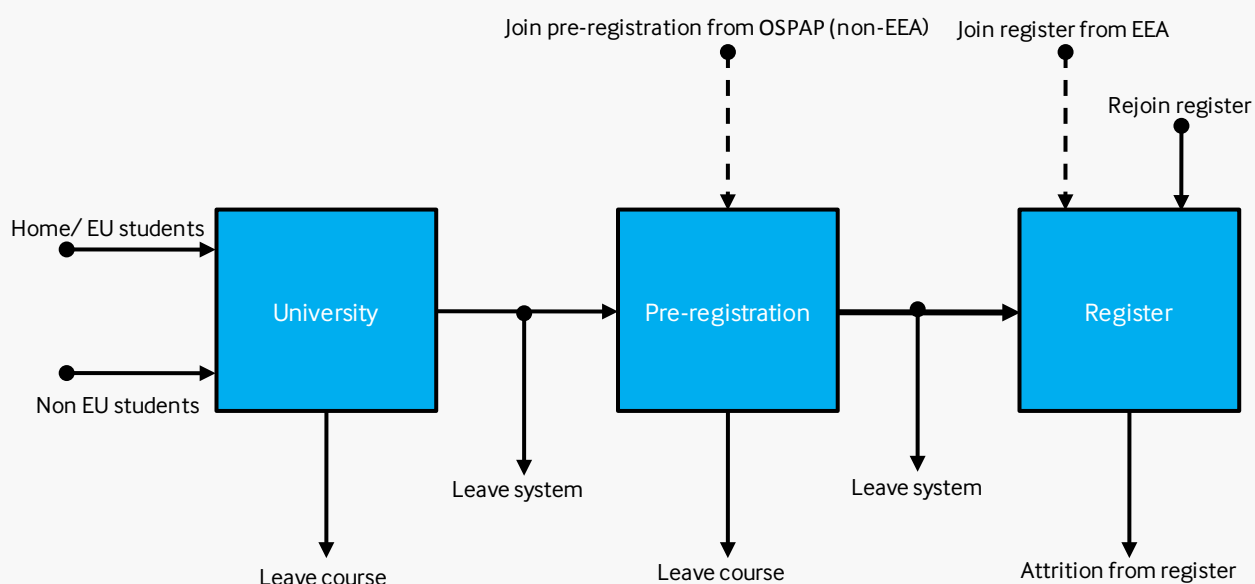
Note: To register as a pharmacist from outside the European Economic Area (EEA), you must pass a one year Overseas Pharmacists Assessment Programme (OSPAP) and complete 52 weeks of pre-registration training approved by the GPhC (GPhC, 2013d).

Source: CfWI

3.4.1 Data

The main data sources used in this project are outlined below. For a full list of data sources used, please refer to Appendix D.

- General Pharmaceutical Council (GPhC) register data, March 2013
- Royal Pharmaceutical Society of Great Britain (RPSGB) Workforce Census, 2008.

3.4.2 Assumptions

The workforce model used a series of calculated assumptions when data was not of the required quality or not available. These assumptions were tested with the CfWI's technical advisory group. For a full list of assumptions for the different scenarios, please refer to Appendix D.

3.4.3   Exclusions

The analysis and modelling in this work focused primarily on the pharmacist workforce. However, the scenarios generated by stakeholders implicitly considered skill mix and, by extension, ideas such as the impact of technicians on the service provided by pharmacists.

This work was commissioned as a review of the pharmacist workforce in England. Although the flows between England and the other three UK countries are important, they have not been explicitly modelled. However, the net flow of pharmacists into or out of England is implicit in the register data used from the GPhC. This means that more work is required to study the impact that a possible change in the flow of pharmacists between England and the other three UK countries might have on the supply and demand of pharmacists in England in the future.

There may be regional variations of supply and demand across England and, it is important that local workforce planning is undertaken to inform decisions that may affect variations in supply and demand. However, this work was commissioned to look at the national picture, so local variations have not been modelled.

3.4.4   Uncertainty analysis – testing the Delphi results

Forecasting up to 2040 involves a degree of uncertainty. Although a Delphi process was used to quantify intrinsically uncertain variables for modelling, and participants typically converged towards a consensus, the CfWI recognises that it is important to test the full range of answers obtained for each question. The team therefore undertook uncertainty analysis in order to calculate the impact of range of Delphi values attained.

Figure 8 shows the probability distribution of uncertainty for the total supply and demand for pharmacists for the four scenarios. It was determined that regardless of the actual value chosen from the range of answers obtained during the Delphi process, there was no significant overlap in supply and demand until 2039 .This means that until 2039 there is a clear oversupply, but that after 2039, due to the inherent uncertainty of the future, there is a very small probability of supply and demand overlapping. It should be noted that the level of uncertainty is expected to rise the further we look into the future.

Figure 8: Uncertainty analysis for supply and demand for the total number of pharmacists

The uncertainty analysis graphs shows that the variation in answers obtained during the Delphi process does not significantly change the supply and demand trends output from the model.
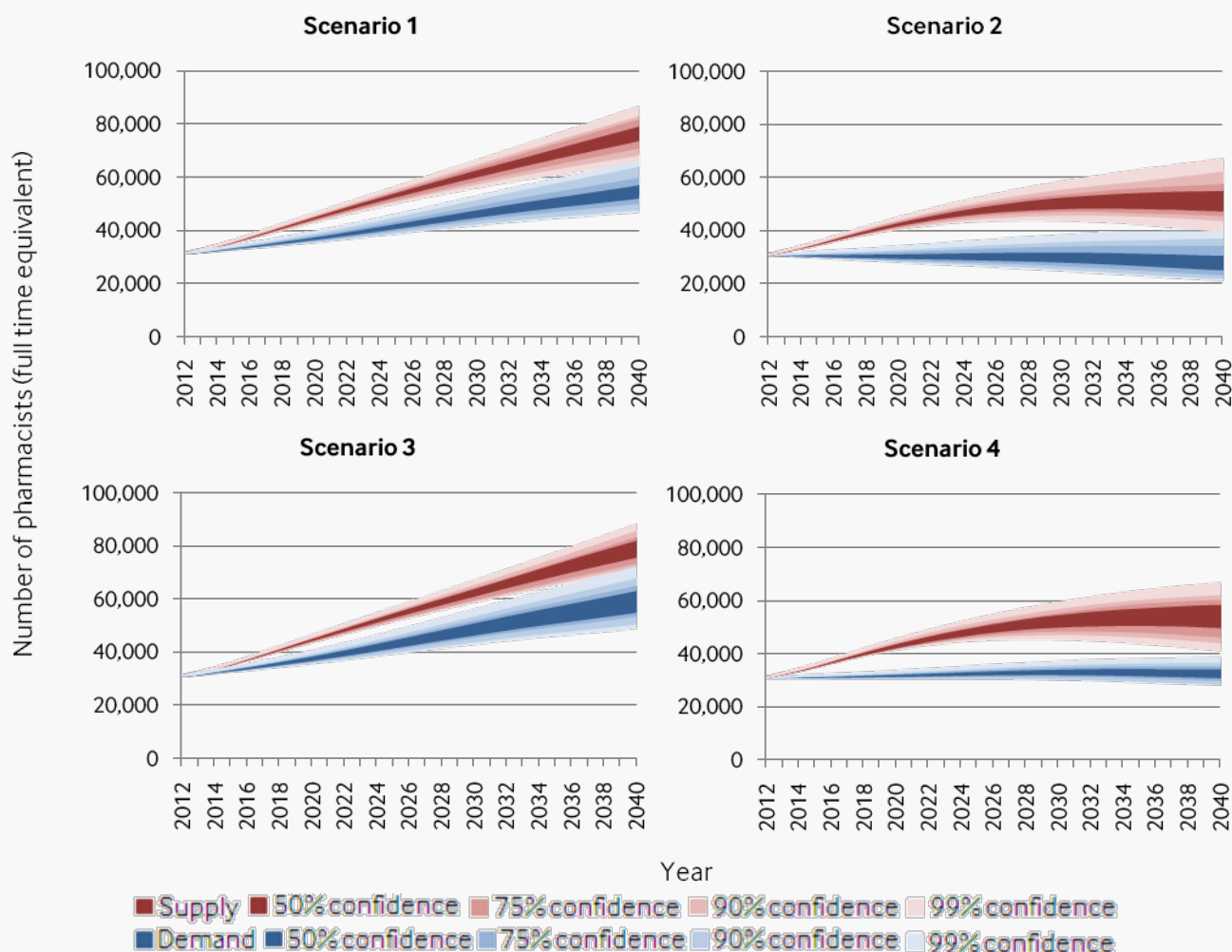
Source: CfWI system dynamics pharmacist workforce model for England – uncertainty analysis

3.4.5 Sensitivity analysis – priorities for data improvement

The CfWI conducted sensitivity analysis to ascertain which input variables (e.g. data, assumptions) have the greatest effect on the outputs from the model if the data or assumption is changed by a set amount. This identifies variables for which it is most important to seek better data.

The sensitivity analysis was undertaken by running the model and individually changing each model input data variable by 10 per cent (with a maximum value of 100 per cent allowed for data already in percentage form)

and for percentage profiles shifting and redistributing the data between the specific ranges.

The results of each of these runs were then compared to the baseline run (the original model outputs) for the chosen scenario to calculate the percentage change to the 2040 supply or demand value as a result of changing a single specific input by 10 per cent. This percentage change for each variable was defined as their impact on the model outputs.

The CfWI team also classified the data quality of each model input variable as defined in Table 3.

Table 3: Definitions of data quality

Level	Definition
Very high	Referenced pharmacy data source. Direct one-to-one mapping of data to input variable.
High	Referenced pharmacy data source, but not a direct one-to-one mapping to the variable.
Medium	Based on a data source with assumptions to map to model structure (may be older/incomplete data).
Low	Referenced to a similar data / CfWI judgement.
None	Value assigned but no confidence in the data value.

Source: CfWI system dynamics pharmacist workforce model for England – sensitivity analysis

Figures 9 and 10 are three-dimensional charts that summarise the findings from the sensitivity analysis of the pharmacy model for supply and demand. The coloured columns show the number of input variables in the 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.

For example, in Figure 10, the green column identified as 5+ impact and very high data quality refers to the
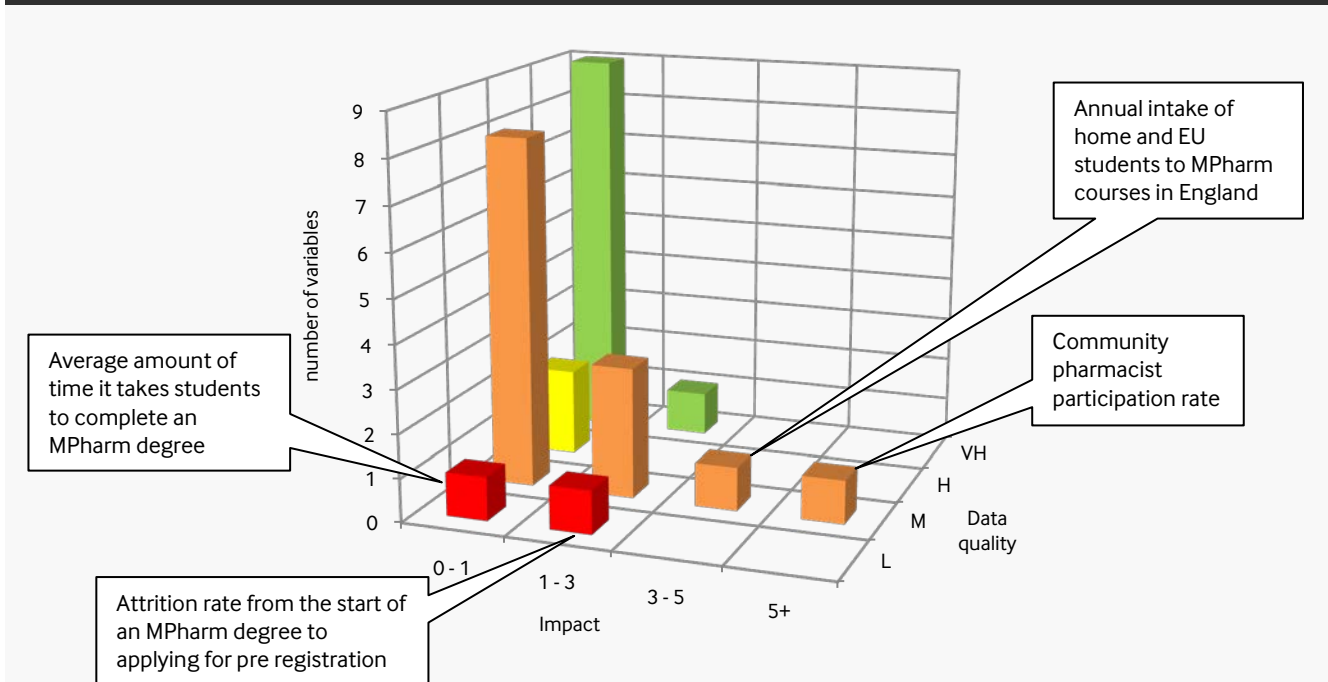
Initial Register of Pharmacists for England. Changes to this model input clearly have a major impact on the final outputs, as would be expected. However, as the data quality is very high, there need not be significant concern.

Those variables located in the bottom right four quadrants of the charts indicate variables with the greatest impact, and the lowest data quality. These are the variables which should be of most concern. For both supply and demand, these variables relate to the participation rate of community pharmacists. As the data quality here is of most concern, and the impact the greatest, it would be advisable to focus efforts on improving the quality of data for community pharmacists' participation rates for future work. Additionally, improved data regarding annual MPharm intake by nationality (in this case with particular regard to home and EU students) would improve the only other variable of concern.

It should be noted, however, that the presence of most variables in the low impact and/or medium-to-high data quality quadrants indicate that the model overall is stable.

Figure 9: Supply model sensitivity analysis

The sensitivity analysis graph shows that there are only two variables showing high impact with medium-to low-data quality.

Annual intake of home and EU students to MPharm courses in England

Community pharmacist participation rate

Average amount of time it takes students to complete an MPharm degree

Attrition rate from the start of an MPharm degree to applying for pre registration

Source: CfWI system dynamics pharmacist workforce model for England – sensitivity analysis

Figure 10: Demand model sensitivity analysis

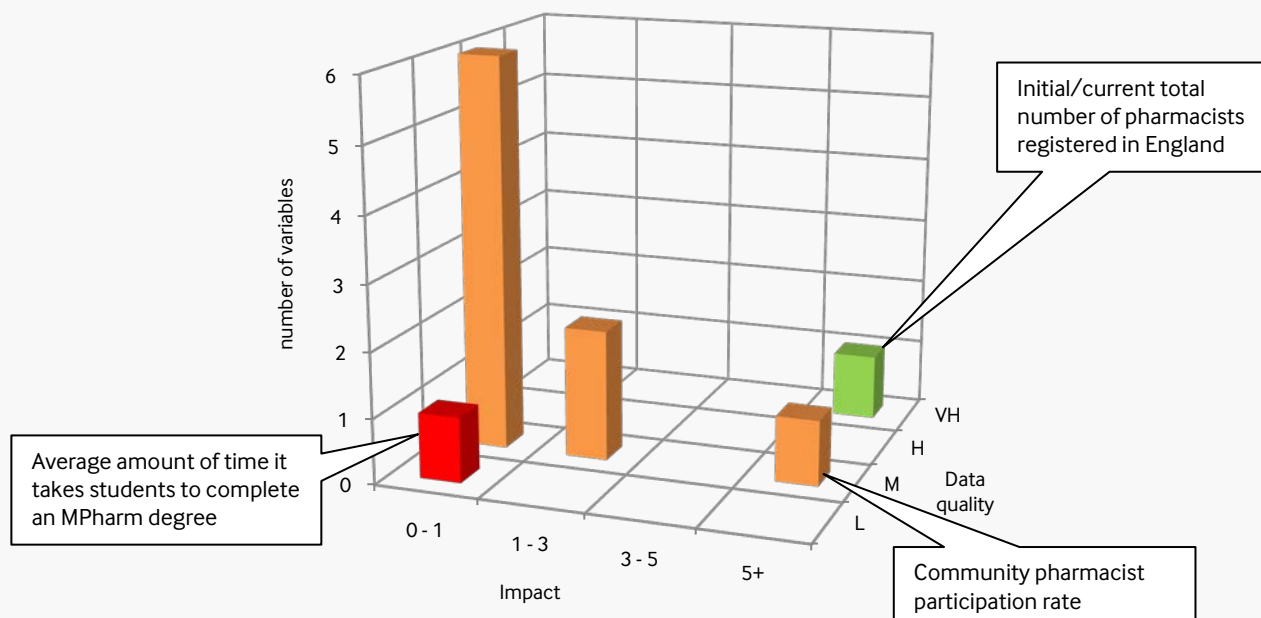The sensitivity analysis graph shows that there is only one variable showing high impact with medium-to-low data quality, with the other high impact variable having very reliable data.

Source: CfWI system dynamics pharmacist workforce model for England – sensitivity analysis

4. Pharmacist workforce forecasts and options for change

The aim of this project is to forecast and analyse the future supply and demand for the pharmacist workforce between 2012 and 2040. The further into the future a forecast is taken, the greater the uncertainty, but it is important to take a long-term view, particularly when investigating the impact that certain interventions might have on supply and demand. This section includes the supply and demand model outputs, analysis of these outputs and, importantly, options for change that the DH and HEE may wish to consider.

4.1 Total pharmacist workforce forecasts

The future supply and demand forecasts are based on the four scenarios outlined in Section 3.3.

Scenario 1 – combining the internet-driven supply of medicines with a broadened role for pharmacists in healthcare with the following outcomes by 2040:
- **Pharmacists are utilised as a public health service provider.**
- **Opportunities for care in the community and at home are increased.**
- **A flexible modern pharmacist workforce, with a growing need to support and serve where required.**

Scenario 2 – combining the internet-driven supply of medicines with a narrowed role for pharmacists in healthcare with the following outcomes by 2040:
- **Not a single bricks-and-mortar pharmacy remains open.**
- **Total cost of healthcare has in fact increased.**
- **Move towards locally provided care begins to reverse, as more and more people are admitted to hospital to manage their conditions.**

Scenario 3 – combining internet-driven medicines optimisation with a broadened role for pharmacists in healthcare with the following outcomes by 2040:
- **General public regularly consults pharmacists, seeking expert advice in times of both good and poor health.**
- **Healthcare service provision is variable between face-to-face and remote service delivery.**
- **Patients' health is tracked from birth, and telemedicine facilitates self-diagnostic testing.**

Scenario 4 – combining internet-driven medicines optimisation with a narrowed role for pharmacists in healthcare with the following outcomes by 2040:
- **Majority of physical pharmacies closed.**
- **Only a few highly qualified pharmacists are necessary in order to meet patient needs.**
- **Emphasis on remote advice, or in-depth face-to-face consultations for individuals willing to pay for the service at boutique pharmacy advisory companies.**

The four scenarios were developed to cover the broadest range of plausible and possible futures for which the system needs to plan. It is important to focus on this range of possible future supply and demand, as it provides a valuable and realistic insight into the difference between supply and demand which will allow effective workforce planning for the pharmacist workforce.

The modelling used to produce the future supply and demand forecasts required assumptions to be made, and these are outlined in Appendix D. The central assumptions were:

- Current service meets 100 per cent of current need across all sectors.
- The number of students entering the system, i.e. enrolling onto MPharm courses, is maintained at the 2011/12 level up to 2040.

The analysis of the model outputs uses the following timeframes:

- short term – 2012 to 2020
- medium term – 2020 to 2030
- long term – 2030 to 2040.

Figure 11: Total supply and demand of pharmacists

The scenario forecasts display a surplus supply of pharmacists in all four scenarios, and indicate that there is a range of possibilities for the long-term future supply and demand for pharmacists.
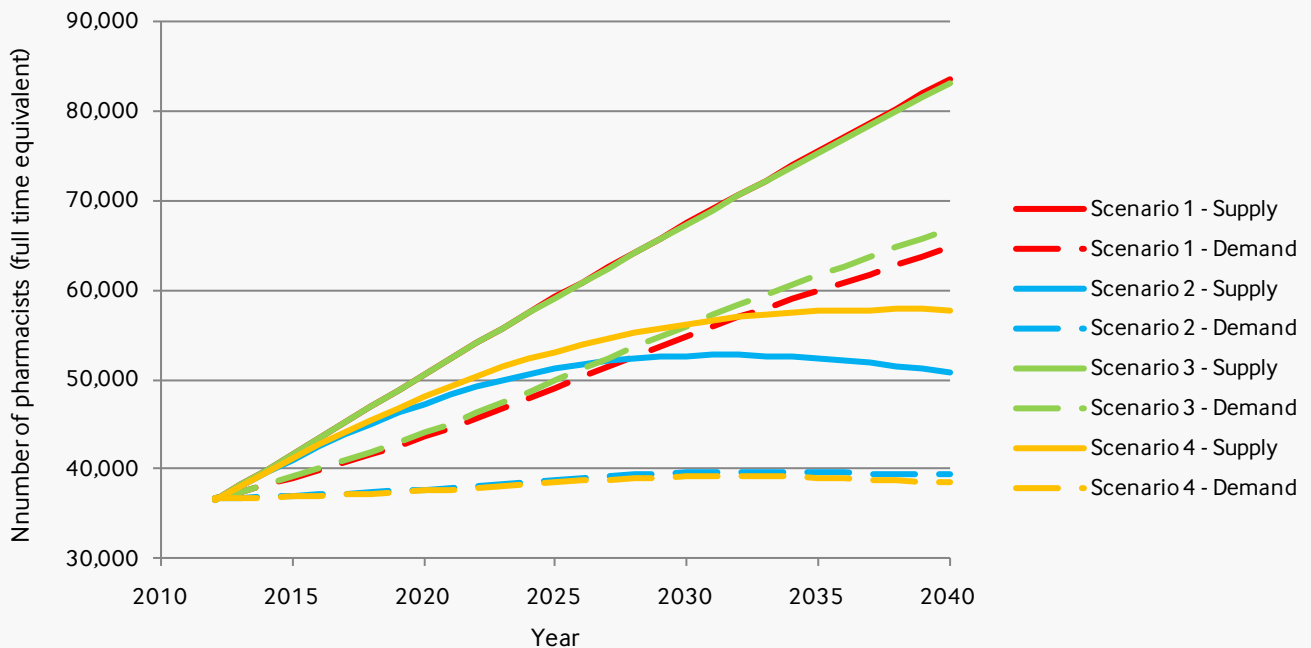
Source: CfWI system dynamics pharmacist workforce model for England

Figure 11 shows the CfWI's forecasts of supply (solid lines) and demand (dashed lines) for pharmacists for the four future scenarios.

> The number of students (3104) enrolling onto MPharm courses is maintained at the 2011/12 level up to 2040. This number does not include an expected increase of students due to a further three universities awaiting accreditation for their MPharm courses.

For scenario 1, supply and demand increase continuously to 2040, with supply increasing at a greater rate than demand. For scenario 3, supply and demand increase continuously at a very similar rate to scenario 1, and supply again increases at a greater rate than demand.

> Both scenarios 1 and 3, which describe a broadened role for pharmacists, suggest that participation rates increase and attrition from the profession decreases, leading to a continued increase of supply. The increasing demand forecasts for scenarios 1 and 3 are due to the increased need for pharmacists in addition to the need due to the increasing and ageing population.

For scenario 2, supply and demand both increase in the short term but supply reaches a plateau in the medium term, then decreases to 2040, and there is only a minor

increase in demand from 2012 to 2040. For scenario 4, supply and demand both increase in the short term but supply also reaches a plateau in the medium-to-long term and starts to decrease by 2040, and there is also only a minor increase in demand from 2012 to 2040.

> Both scenarios 2 and 4, which describe a reduced role for pharmacists, suggest that participation rates decrease and attrition from the profession increases, leading to the eventual flattening (scenario 4) and decrease (scenario 2) of supply. The almost flat demand forecasts for scenarios 2 and 4 can be explained by the reduced need for pharmacists due to factors such as technology implementation almost cancelling out the increased need due to the increasing and ageing population. The statements: 'not a single bricks-and-mortar pharmacy remains open' and 'the majority of physical pharmacies are closed but boutique pharmacy adviser companies exist for face-to-face services' best describe the situation that leads to the trends for supply and demand in scenarios 2 and 4 respectively.

4.1.1 Key findings on supply and demand forecasts

The supply modelling used a central assumption that the number of students enrolling on MPharm courses is maintained at the 2011/12 student numbers up to 2040. Given that there has been a substantial increase in pharmacy student numbers over the last ten years, and with more universities planning MPharm courses, there is likely to be a continued increase in pharmacy student numbers, at least in the short-to-medium term. This means that the CfWI forecast of future supply of pharmacists is likely to be an underestimate if the current trends continue.

> The CfWI forecast of future supply of pharmacists is likely to be an underestimate if the current trends continue.

In the four scenarios, two describe a future where technological advances result in pharmacists assuming a broadened role in healthcare, and two describe a future where technological advances result in pharmacists assuming a narrowed role. Therefore, given that supply is forecast to exceed demand in all four scenarios, regardless of the pharmacists' role in healthcare, there is likely to be a surplus supply of pharmacists in the future.

> The possible range of oversupply by 2040 across the plausible possible futures is between 11,000 and 19,000.

4.2 Recommendations

Given the likely oversupply of pharmacists in the future, it would be prudent to implement changes to the system that will optimise the output from education and training, with a view to reducing any potential unemployment risks that may accompany oversupply in the workforce. The CfWI has considered a number of options for change, outlined below.

> Recommendation 1
> Intervention to bring the supply and demand of pharmacists into balance.

The broad range of forecasts for the long-term future of supply and demand suggests it would be sensible to continue to monitor and review supply and demand, and any system changes affecting their balance in the medium-to-long term. The CfWI recommends a review of this work at least every five years, with ongoing yearly monitoring to ensure the impact of any intervention and emerging risks can be appropriately tracked. To improve the reliability of future modelling it would be advisable for a new pharmacy workforce census to be undertaken, as current modelling uses data from the most recent Census in 2008.

> Recommendation 2
> Ongoing monitoring and periodic review of supply and demand, with a continued drive to improve data around the pharmacy workforce.

4.3 Options for change

In this section we provide decision makers with further details on options they may wish to consider to balance supply and demand.

To bring the future supply and demand of the pharmacy workforce into balance there are two different approaches:

- allow the system to rebalance itself over time, with market forces operating on demand for training places
- initiate an active policy intervention aimed at optimising student numbers.

4.3.1 Option 1 – No active policy intervention

CfWI modelling indicates that this option will almost certainly lead to unemployment of qualified and registered pharmacists in the short-to-medium term. There is also a risk that an increasing mismatch between graduate numbers and available training places could develop if employers make reductions in the number of available training places in the short term. The high levels of unemployment are likely to lead to a drop in the popularity of pharmacy as a profession, which may lead to an eventual undersupply in the medium-to-long term. This trend of peaks and troughs describes an inefficient future supply of the pharmacy workforce and poses a significant risk to the security of future supply.

Whilst no active policy intervention remains an option, it places the control of future pharmacist numbers under market forces. Given the current planned changes to the training programme overall, and the potential for pharmacists to play a crucial wider role in community-based healthcare in the future, it is important to consider the risks associated with no active policy intervention at this stage.

4.3.2   Option 2 – Active policy intervention

This option can be broken down into two more specific interventions:

Option 2A – Initiate an active policy intervention aimed at optimising student numbers at the entry point to university MPharm degrees.

Option 2B – Initiate an active policy intervention aimed at optimising student numbers at the entry to pre-registration.

The CfWI has modelled the impact of several possible options of implementing an intervention at the start of the MPharm course, which can be categorised into two main approaches:

- Option 2A1 – a one-off change in a specific year
- Option 2A2 – a staged approach across multiple years.

4.3.2.1   Option 2A1 – A one-off change

To test the impact of a one-off change to the number of students entering MPharm courses on the supply of pharmacists, the CfWI modelled reductions of between 20 and 50 per cent of the number of students entering MPharm courses from the academic year 2015/16. The changed number of students entering MPharm courses was then held at that level until 2040.

Figure 12 shows how the supply of pharmacists changes when this type of intervention is applied. As expected, any changes made in 2015/16 will only be noticeable after 2019/20, as the length of education and training is

five years. The analysis indicates that across all scenarios a change of 50 per cent or more is required to bring supply and demand into balance. It is only after 2030 that supply and demand become more closely aligned at the higher intervention levels (i.e. close to the 30-50 per cent reduction). However, at the lower intervention levels (i.e. below 30 per cent) supply does not align with demand, even by 2040.
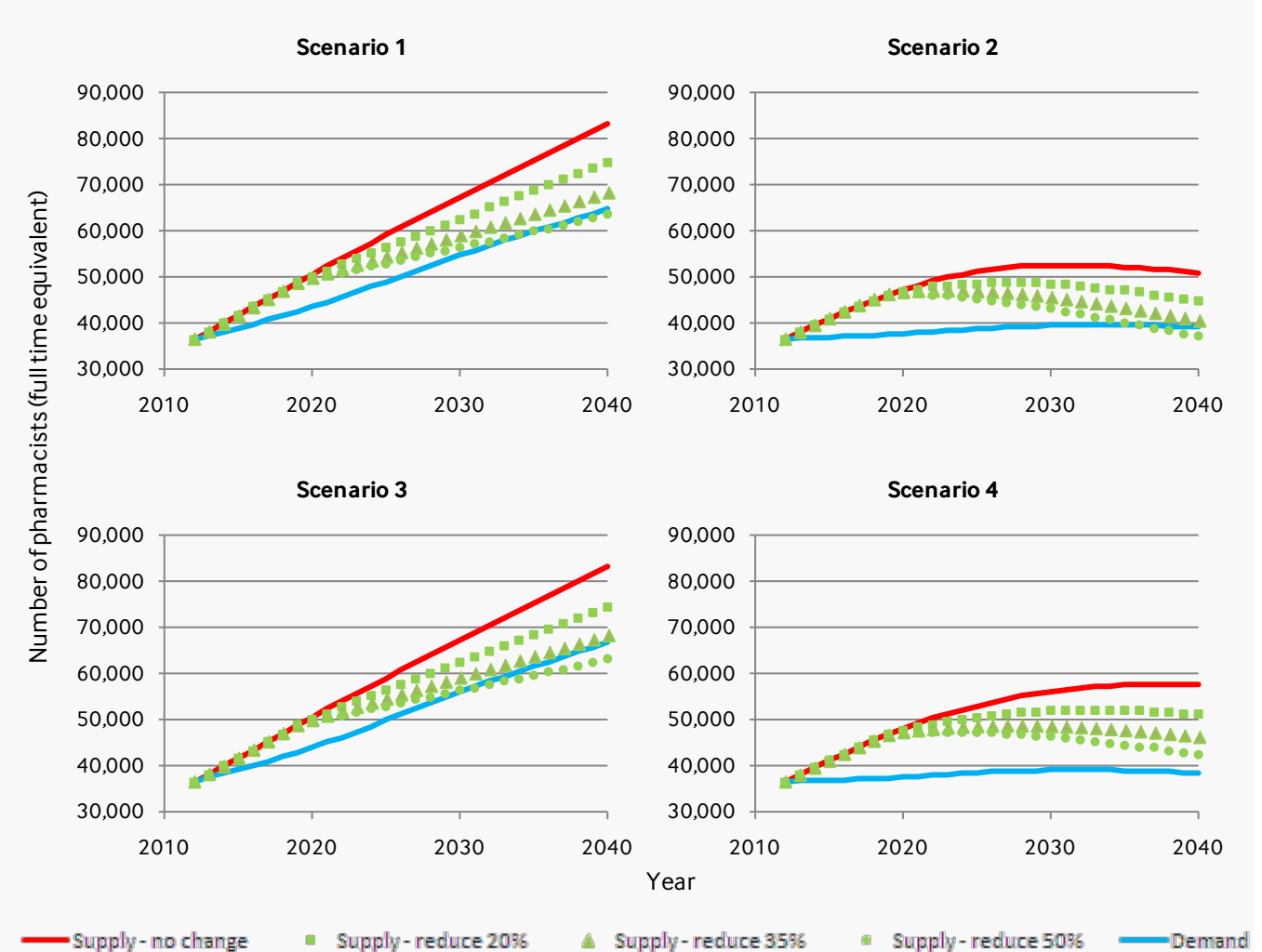
> Changes made to the number of students entering MPharm courses will only be noticeable in the pharmacist workforce after five years, as the length of education and training is five years.

This analysis reveals that due to future uncertainty about how pharmacy will adapt and change, as suggested by the scenarios, a single one-off change, depending on the magnitude of that change, may bring supply and demand into balance in the long term (after 2030). It could, however, also lead to an eventual undersupply. If a one-off change is made with the intent to bring supply and demand into balance, then it will be important to monitor closely how both supply and demand are changing on a yearly basis, so that any unintended consequences can be captured as soon as possible and addressed quickly. This is particularly important with large changes, which are likely to impact on how and where education and training are delivered in the country, thereby reducing the flexibility of the system to cope with future interventions.

> A large change imposed on any system can lead to unintended consequences.

Figure 12: A one-off change applied in a single year

These graphs show how the supply of pharmacists would change if the number of students entering MPharm courses from 2015/16 was reduced by between 20 and 50 per cent and held at that level until 2040.

Source: CfWI system dynamics pharmacist workforce model for England – intervention analysis

4.3.2.2 Option 2A2 – A staged change

Figure 13 shows how the supply of pharmacists changes when the number of students entering MPharm courses is reduced by 5, 10 and 15 per cent yearly from 2015/16 to 2019/20 with a yearly increase of 3 per cent between 2020/21 and 2030/31. The 3 per cent increase helps keep supply in line with demand by allowing supply to increase at close to the same rate as demand after the initial balance is achieved. The analysis indicates that across all scenarios a change of about 10 per cent is required to bring supply and demand into balance. It is only after 2030 that supply and demand become more closely aligned at the 10 per cent intervention level. However, at the lower intervention levels (below 10 per cent) supply does not align with demand, even by 2040. Additionally, at the higher intervention levels (above 10 per cent) there is a greater risk of an undersupply in the long term.

Figure 13: A staged change applied across several years

These graphs show how the supply of pharmacists would change if the number of students entering MPharm courses from 2015/16 to 2019/20 was reduced by 5, 10 and 15 per cent between 2015/16 and 2019/20 with a 3 per cent yearly increase between 2020/21 and 2030/31. (All percentages are based on the total number of students entering MPharm courses in England in 2011/12.)
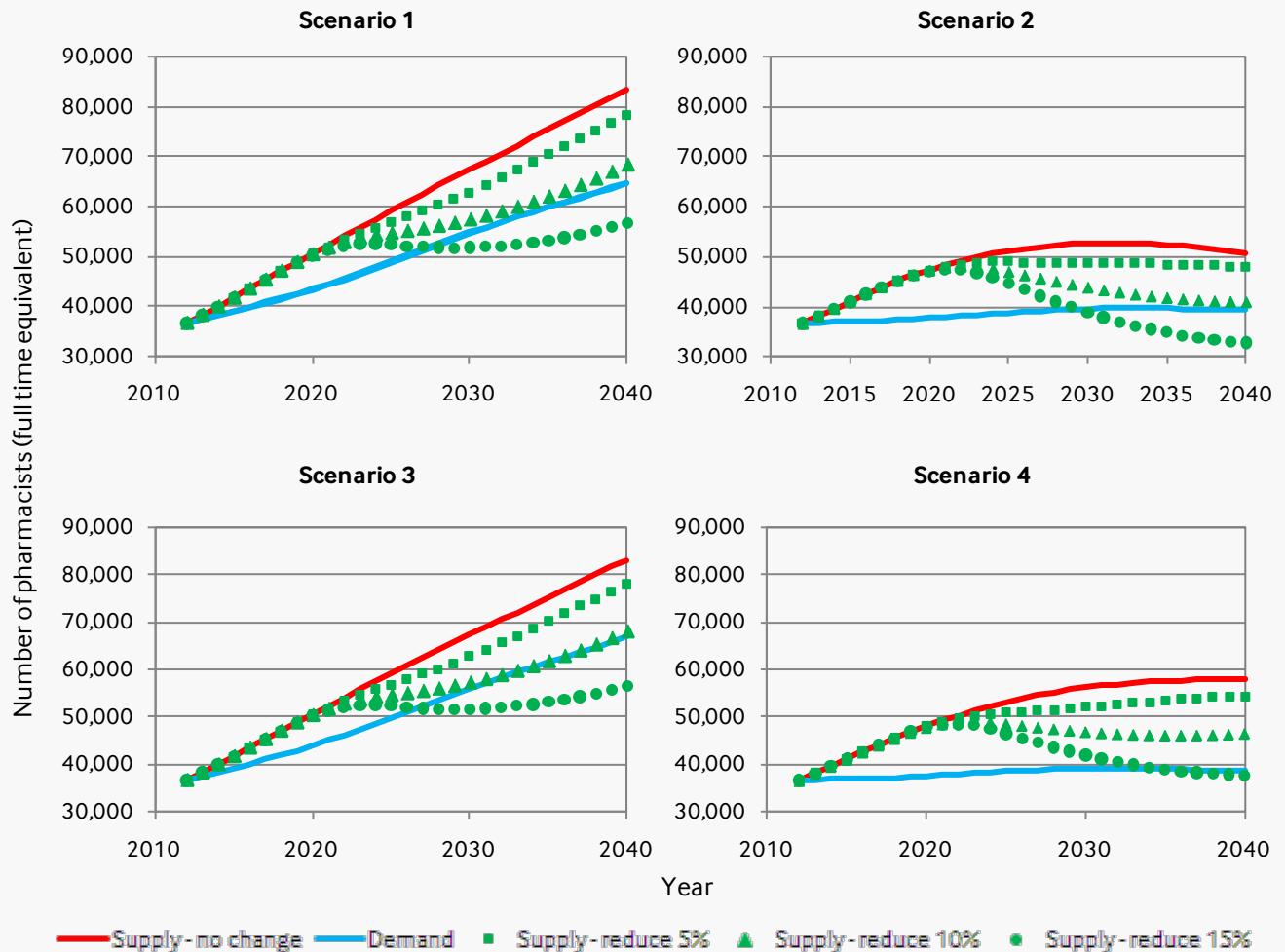
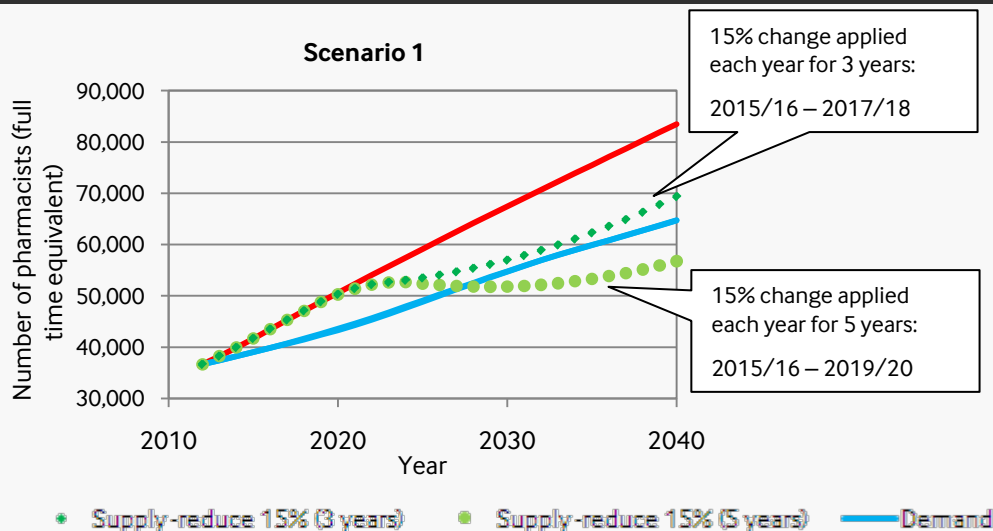**Source: CfWI system dynamics pharmacist workforce model for England – intervention analysis**

This analysis reveals that due to future uncertainty about how pharmacy will adapt and change, as suggested by the scenarios, a staged change, depending on the magnitude and duration of that change, may bring supply and demand into balance in the medium term (2021-2030) or long term (after 2030). It could also lead to an eventual undersupply in the medium term. The review period of the supply-demand situation should be established depending on the size and duration of the intervention. Unless the size of the staged change is large (greater than 10 per cent), flexibility in the system will be maintained. However, a balance between size and duration of the staged intervention is paramount.

Figure 14 shows two similar staged interventions which compare the same yearly size of the change but with different durations. The staged reduction in intervention 1 lasts five years, whereas in intervention 2 it lasts three years. This shows that changing the duration over which any reductions are implemented can be used as a flexible tool to bring supply and demand into balance and reduce the risk of undersupply in the future. Changing the size of the intervention can be used in a similar way. Combining these two levers provides greater flexibility to manage the balance of supply and demand.

Figure 14: A staged intervention applied across several years with different durations

These graphs show how the supply of pharmacists would change if the number of students entering MPharm courses from 2015/16 to 2019/20 was reduced by 15 per cent between 2 different time periods with a 3 per cent yearly increase after that until 2030/31. (All percentages are based on the total number of students entering MPharm courses in England in 2011/12.)

Source: CfWI system dynamics pharmacist workforce model for England – intervention analysis

A staged change approach provides greater flexibility in managing the balancing of supply and demand.

Table 4 summarises the advantages and disadvantages of the two types of interventions outlined above. Given this analysis, the CfWI recommends that if an active policy intervention aimed at optimising student numbers at the entry point to MPharm university degrees was chosen, a staged approach would be the better option.

Table 4: The advantages and disadvantages of the type of intervention

	Advantages	Disadvantages
A one-off change	• **Simple** • **May bring supply and demand into balance quickly**	• **Inflexible, which may lead to difficulties if future adjustments are needed** • **Large changes can destabilise the system and lead to unintended consequences, but if change is too small it may not bring supply and demand into balance** • **May significantly affect the viability of several university MPharm courses**
A staged approach	• **Flexible, which will allow any needed future adjustments to be implemented with ease** • **Provides a clear and reasonable path for implementation which will help maintain a stable supply** • **Reduces the impact on the viability of affected university MPharm courses**	• **May require a greater degree of management of the staged process**

Source: CfWI analysis

> The CfWI recommends a staged approach to balancing supply and demand if intervening at the point of entry to university.

4.3.2.3   Option 2B – Pre-registration placement numbers

The current education and training system for pharmacists is four years of university education plus one year of pre-registration training. Historically, there has been a one-to-one matching of the number of MPharm graduates who are eligible to apply for pre-registration training to the number of pre-registration places provided. If the supply-demand imbalance was addressed at this point in the education and training pathway of the current four-plus-one-year system, a mismatch would be created between number of MPharm graduates eligible to apply for pre-registration training and the number of pre-registration places provided. This mismatch would lead to the risk of MPharm degree holders who may not be able to become registered pharmacists and therefore unable to work as qualified pharmacists.

> There is an increased risk of future MPharm holders unable to register and practice as a pharmacist.

To bring supply and demand into balance at entry to pre-registration, either of the approaches outlined in option 2A could be used in the same ways as described. The analysis would be identical to that already described, the only difference being that the size of the reductions implemented would also be the size of the potential unemployed MPharm degree holders who could not get a pre-registration placement.

If the proposed integrated five-year MPharm degree replaces the current four-plus-one-year system, then by default the number of training placements would equal the number of students enrolled on the five-year course. In such a case the analysis would then be identical to that described in option 2A.

The CfWI recommends that policymakers consider the analysis and impact of the above options. It is worth noting that adjusting the number of students entering MPharm courses will not only have a direct impact on the total future supply of pharmacists, but may also have related consequences, such as impacting on the viability of some university MPharm courses. It is important to understand any indirect impact on any areas of education and training to ensure a continued robust supply of pharmacists. Additionally, it is worth noting that large changes, given the regional spread of universities offering MPharm courses with differing cohort sizes, could lead to regional imbalances.

5. Conclusions

The forecasts in this review indicate a future oversupply of pharmacists. In the four stakeholder-generated scenarios, two describe a future where technological advances result in pharmacists assuming a broadened role in healthcare, and two describe a future where technological advances result in pharmacists assuming a narrowed role. Supply is forecast to exceed demand in all four scenarios, regardless of the pharmacist's future role, so oversupply is likely no matter how the pharmacist's role develops, if the current number of students entering MPharm degree courses continues.

Whilst a 'no active intervention' policy is always an option, CfWI modelling indicates that this option will almost certainly lead to unemployment of qualified and registered pharmacists in the short-to-medium term. There is also a risk that an increasing mismatch between graduate numbers and available training places could develop if employers make reductions in the number of available training places in the short term. The high levels of unemployment are likely to lead to a drop in the popularity of pharmacy as a profession, which may lead to an eventual undersupply in the medium-to-long term. Given the real possibility that NHS healthcare spending may not increase in the coming decades at the rapid pace seen over the past fifty or sixty years, addressing any oversupply becomes a priority (IFS, 2012). However, this must be balanced with the potential for an essential wider role in community-based healthcare for the future pharmacist. The CfWI has appraised a range of viable interventions and recommends a staged approach with

careful routine monitoring and review. Any intervention will ultimately impact on all universities currently offering MPharm courses, or planning to offer these in the future, so decisions on the size and duration of intervention should also take this into account.

During the course of this work, the CfWI has identified data areas that, if improved, could strengthen future analysis and review of the pharmacy workforce (for example, community pharmacist participation rates, and sector-by-sector proportions of the workforce). The CfWI recommends that focus on improving this data across all sectors of the workforce and an updated census be made a priority.

Whilst the CfWI has followed a tried-and-tested approach to produce this report, and every stage of the process has been shaped and validated by a broad range of pharmacy stakeholders, the range of options for the future of the pharmacist workforce is great. The future pharmacist workforce is particularly (and in many cases uniquely) affected by changes in technology, lifestyle behaviours and changes in the wider commercial environment. The essential broader role pharmacists may play in contributing to the delivery of community-based healthcare and public health, combined with the many complex factors shaping the profession, signify the importance of adopting a flexible approach, combined with careful monitoring and review.

Appendix A: Stakeholder involvement

The CfWI sought input from a wide range of health professionals as part of this project. The following individuals participated in one or more of the following: horizon scanning interviews (December 2012), the scenario generation workshop (January 2013), and the Delphi process (February-March 2013). We would like to thank them for their time and contributions.

Steve Acres	Dr Elizabeth Foot
Dr Catherine Duggan	Clare Howard
Gail Fleming	Nick Lowen
Professor Larry Goodyer	Ash Soni
Richard Hey	Hugh Simpson
Sue Ladds	Sandra Hutchinson
Derek Marshall	Lauren Rose
Dr Norman Morrow	Tess Fenn
Susan Sanders	Professor John Smart
Professor Bill Scott	Tony West
Richard Seal	Trevor Beswick
Raminder Sihota	James Davies
Marc Donovan	Andrea Livingston
Adrian Price	Karen Rice
Philip Banks	Rosalyne Cheeseman
David Webb	Ryan Hamilton
Stephen Brown	Helen Howe
Cathryn Brown	Fin McCaul
Mark Pitt	Manjit Nahal
Andy Hutchinson	Khilna Shah
Clive Jolliffe	John Stock
Sabina Khanom	Alastair Buxton
Professor Kay Marshall	Gary Dakin
Professor Rae Morgan	Rob Darracott
Dr Keith Ridge	Paul Newell
Professor Roger Walker	Christopher John
Steve Howard	Anna Prygodzicz
Mike Holden	Caroline Waterfield
David Miller	Dr Angela Alexander
John Murphy	Taryn Harding
Professor Helen Osborn	Alison Sampson

We would also like to thank Dr Sue Ambler (HEE), our technical advisory group of Dr Simon Peck, Professor David Guest and Professor Karen Hassell, and our technical advisor Christopher John.

Project stages stakeholder involvement

The following graphs show a breakdown of the stakeholders who participated in each stage of the project: horizon scanning, scenario generation and the Delphi process. The graphs display the number of stakeholders from each group.

The different stakeholder groups are defined as shown in Table A1.

Table A1: Stakeholder groups

Stakeholder group	Stakeholders from
Community	Large multiples, independent pharmacies and active locum pharmacists
Hospital	Hospital pharmacists
Industry	Pharmaceutical companies
Academic	Schools of pharmacy
Workforce planning	Local education and training boards, workforce planners and NHS employers.
Representative and advisory bodies	Membership bodies (e.g. Royal Pharmaceutical Society), advisory bodies (e.g. NICE) and regulatory bodies (e.g. General Pharmaceutical Council)
Government	Department of Health and devolved administrations
Student	British Pharmaceutical Students Association and active students
Pharmacy technician	Association of Pharmacy Technicians and active pharmacy technicians

Figure A1 shows a breakdown of the 53 stakeholders that participated in horizon scanning. The graph shows that a broad range of healthcare and pharmacy stakeholders participated in the horizon scanning process.

Figure A1: Horizon scanning stakeholder participation
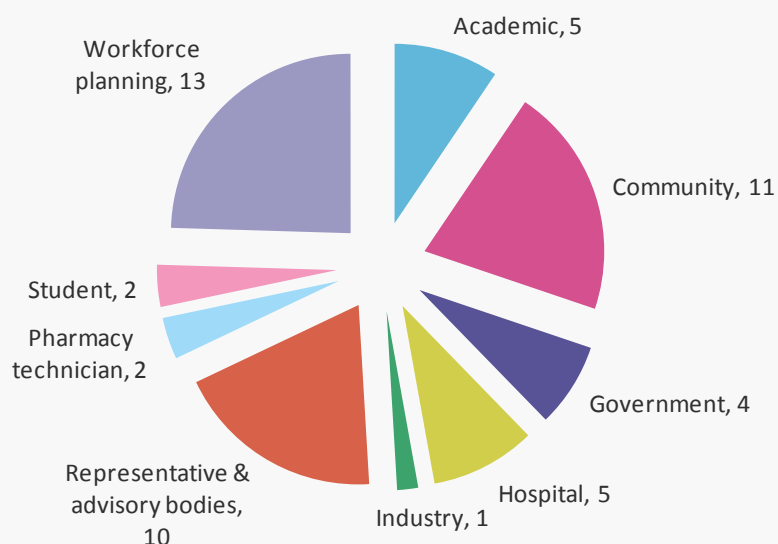
Source: CfWI

Figure A2 shows a breakdown of the 24 stakeholders who participated in scenario generation. To ensure continuity and understanding throughout the project, of the 24 stakeholders, 63 per cent (15) had also participated in the horizon scanning process. The graph has a very similar percentage breakdown to the horizon scanning graph, and shows that a broad range of healthcare and pharmacy stakeholders participated in the scenario generation process.
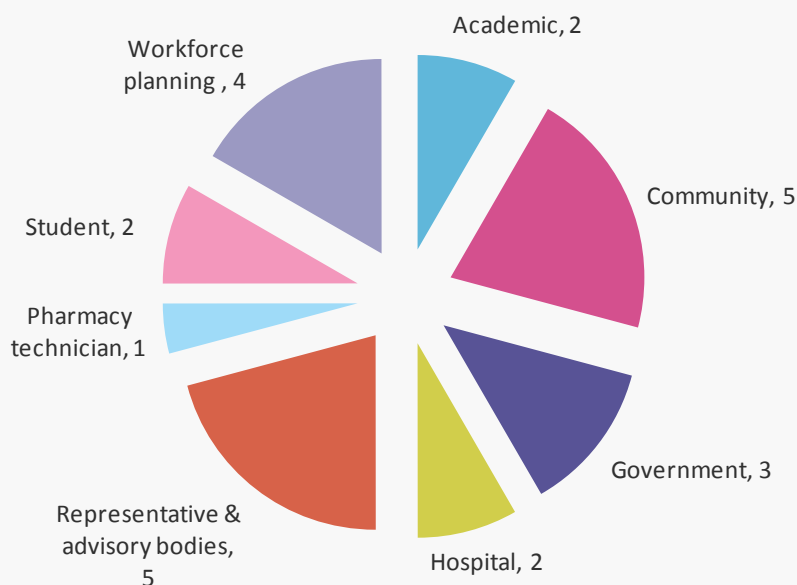
FigureA2: Scenario generation stakeholder participation

Source: CfWI

Figure A3 shows a breakdown of the 13 stakeholders who participated in the Delphi process. To ensure continuity and understanding throughout the project, of the 13 stakeholders who participated in the full Delphi process, 100 per cent (all 13) had contributed to the horizon scanning process and 22 per cent (5) had attended the scenario generation workshop. The Delphi process was complex for this project due to the breakdown of the questions by sector and gender in several cases. Feedback from participants indicated that although the questions were understood, the process was challenging and time consuming, which led to a drop in participants from 23 in round one to 13 in round two. Only those participants who completed both rounds were included in the final data, with those participants who only completed round 1 excluded from all further calculations. Figure A3 shows the range of backgrounds of participants, representing a cross section of the major groups relevant to the project, with a slight over-representation of academic pharmacists in the final participants.

FigureA3: Delphi stakeholder participation
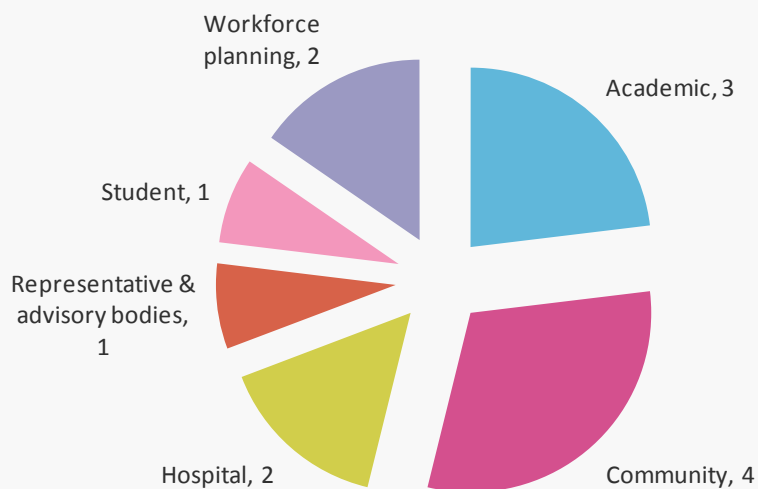
Source: CfWI

Appendix B: Horizon scanning

The drivers identified during the horizon scanning process were organised into high-level categories: technological, economic, environmental, political, social and ethical (TEEPSE).

This report contains the summaries of the drivers for each TEEPSE category.

Technological

Technology was recognised as playing a core role in shaping the pharmacy workforce of the future, and the drivers suggested by stakeholders went beyond the common themes of improved connectivity and integration of systems, to encompass remote technology and the personalisation of medicine, driven not only by technological advancements, but also by consumer demand.

Stakeholders identified that in the future, patients will increasingly expect care to be delivered closer to home, with accessibility and convenience playing a central role, whether achieved through e-dispensing or home testing kits. To support this, online technologies such as web conferencing will enable pharmacists to supervise the dispensing and checking of medicines remotely, whilst en route to conduct domiciliary visits to those less able or less willing to use centralised services.

In particular, stakeholders anticipated that fundamental changes in skill mix for pharmacists and pharmacy technicians alike will emerge, as the increasing implementation of technology necessitates a workforce specially trained to operate new devices and systems. However, the ability of the workforce to adopt this technology was tempered with caution by a significant number of stakeholders, who expressed concern about the impact the current financial climate would have on the rate of uptake across the profession.

Economic

Stakeholders highlighted the impact of the economic climate on the wider UK health economy and the continued drive for efficiency in the public and private sectors. The workforce impact of these drivers will require pharmacists in both the private and public sectors to adopt a more commercial approach to their work, achieving more with less. Rising costs for raw materials and technology may trigger geographical variances in the levels of pharmaceutical services

delivered. If pharmacies cannot afford to install new devices or supply expensive drugs, pockets of health inequalities may emerge, or patients may have to travel further to access the level of service they expect.

Stakeholders expect that the recent 'Any Qualified Provider' legislation will lead to the privatisation of some pharmacy services. Should salary inequalities between the public and private sectors continue, stakeholders suggested that the combination of these two drivers may further reduce the number of pharmacists seeking NHS-based posts.

Students' perception of a career in pharmacy will also change according to stakeholders, as roles and responsibilities expand, whilst remuneration remains static. Combined with rising tuition fees, this could result in a reduced supply pool of newly qualified pharmacists. Moreover, the increasing retirement age and reduction in posts could similarly reduce job availability at the junior level.

Environmental

The environmental drivers fall into two main categories: environmental changes affecting the healthcare requirements of the population, and medicinal waste.

The environmental issues considered by stakeholders include the wider impact of climate change and the potential development of health pandemics caused by new or re-emerging diseases. Both of these changes are highly uncertain. However, the general expectation is that pharmacists will increasingly assume more strategic roles in guiding policy and management decisions.

The medicinal waste drivers identified by stakeholders focus on the potential surplus of medicines generated by online dispensing and the step-up and step-down from medicine pathways. Stakeholders anticipated that both of these changes will result in an increased workload for pharmacists, with related changes enacted in the education and training curriculum.

Political

The political drivers identified by stakeholders span a wide set of issues including policy shifts, education and labour migration.

Person-centred care and the shift of care to the community were the most commonly expressed political factors likely to impact on the future pharmacist workforce. Fundamental changes in the way that healthcare services are delivered were considered likely to increase the demand for community pharmacists, as treatment regimes move away from hospitals and rising numbers of complex cases are treated in the primary care setting. Stakeholders considered that pharmacists would be expected to assume a more central role in achieving improved patient outcomes through the delivery of pharmacy-run clinics, for example smoking cessation clinics, as well as diagnostic and treatment services.

Interviewed stakeholders also raised issues about the supply of students and workforce planning, which they expect will affect the future pharmacist workforce. They suggested that workforce planning is typically conducted in organisational silos as opposed to across the profession as a whole, and that this situation is further exacerbated by ongoing shifting career patterns.

Social

The social drivers identified by stakeholders focus largely on three areas of increasing demand and role development for pharmacists: increasing expectations of patients and service users with regard to the services they receive, the ageing population, and public health initiatives.

Greater patient choice and involvement in decision making are just two of the consumer-style expectations that stakeholders suggested will have a large impact on the pharmacy workforce in the future. Pharmacists will increasingly need to deliver 24/7 care to keep pace with market competition, as well as assuming more patient-facing roles, necessitating a balance between scientific knowledge and social skills, which will in turn impact on curriculum and training requirements.

As the ratio of older to younger people changes, the number of patients living with chronic conditions and co-morbidities is expected to rise, and stakeholders identified that pharmacists will adopt a supporting role in ensuring adherence to drug pathways and maximising medicines optimisation. The public health policy drive will also lead to a reconciliation of medicines and patient awareness, leading to multi-professional working and improved health outcomes for the general population, particularly in areas of low socioeconomic status.

Conversely, a reduction in supply was envisaged by stakeholders through an increasing proportion of women in the pharmacy workforce and the work-life balance demanded by generation Z. The reduced hours and part-time working associated with both of these drivers could be further accentuated by pharmacists who leave the profession voluntarily as constant system changes gather pace.

The changing healthcare landscape may necessitate the pharmacist workforce to identify key areas of work which cannot be appropriately delivered by other healthcare practitioners or automated by technology, such as prescribing and medicines optimisation.

Ethical

The ethical drivers identified by stakeholders raise a number of key issues such as euthanasia, the rise of lifestyle drugs and patient safety, each of which focuses on pharmacists working in greater partnership with patients. As a result, stakeholders expected the demand for qualified pharmacists in non-traditional roles to increase, as formerly divisive topics gain greater societal acceptance.

Appendix C: Scenarios

Scenarios

The CfWI held a scenario generation workshop on 10 January 2013 with 24 expert stakeholders to develop four plausible future scenarios to 2040, focusing on high-impact, high-uncertainty drivers of the future pharmacist workforce.

The outcome was:

- scenario 1, combining the internet-driven supply of medicines with a broadened role for pharmacists in healthcare
- scenario 2, combining the internet-driven supply of medicines with a narrowed role for pharmacists in healthcare
- scenario 3, combining internet-driven medicines optimisation with a broadened role for pharmacists in healthcare
- scenario 4, combining internet-driven medicines optimisation with a narrowed role for pharmacists in healthcare.

The four scenarios are outlined below. The scenarios are described as though it is 2040, and we are looking back at what happened from 2013-2040. The scenarios are not intended to be exhaustive descriptions of all potential futures, nor do they describe expected, likely or preferred states. They represent the collected judgement of CfWI stakeholders of the least predictable and most impactful futures, and therefore set a reasonable boundary within which the system can focus when planning.

Scenario 1

During the second decade of the twenty-first century, the drive for efficiency gains – coupled with the drive to achieve improved patient outcomes and safer patient care – continued to be the dominant issue in health policy. In an attempt to address this, an aim for more seamless integration between community and secondary care materialised. As a result, an increasing number of pharmacist-patient interactions developed and legislation was passed to grant pharmacists greater access to e-health records, providing them with more information about patients' health than they had previously been exposed to.

Shortly into the third decade of the century, graduates from the five-year pharmacist degree began to enter the workforce. Due to the new training aims and structure at university level, these pharmacists had developed both traditional pharmacy skills as well as the newer skills based around more interaction with the patient. The skill mix of the entire pharmacy team had shifted to allow more direct and greater patient care to become the chief concern of the pharmacist, with the hope that this would lead to a more personally unique service.

New policies continued to be implemented in the attempt to achieve further efficiency gains detailed under the Nicholson challenge of the previous decade. As a result, the role of the pharmacist was shifted even further in the direction of patient contact, and by 2025 pharmacists were made the first point of contact for patients. There was a hope that this would free up GP time to focus on acute interventions and other such roles. The role of prescribing was taken from the GP and given to the pharmacist, and a more personalised service developed as care shifted further into the community. As the provision of personalised medicine structures allowed for greater support of longer-term medical conditions for the patient, hospital admissions decreased, reducing iatrogenic disease and medicine wastage and subsequently the demand for pharmacists in secondary care settings.

Coinciding with pharmacists leading on prescribing, a series of technological advances allowed both patients and pharmacists to access new diagnostic and monitoring devices that enabled remote care. By the early 2030s, patients began to order their own medication online, with treatment delivered straight to their door. Whilst some patients still considered their local pharmacist to be the central hub of healthcare service and information, many adjusted to the concept of self-diagnosis, relying on the internet as an accurate source of information. These patients primarily sought generic healthcare help, visiting their local pharmacist only as and when more complex issues emerged.

In 2040, self ownership of one's health led to a split between those who were content to rely on their own methods of care, and those who relied on their local pharmacist. In either case, opportunities for care in the community, and in particular at home, increased. For those who utilised pharmacy services, the pharmacist's role no longer revolved around the supply of medicine, but as a public health service provider. However, as services were increasingly delivered through technological devices and the internet, fears began to emerge that a two-tier pharmacy model was arising, divided by both the affordability and usability of this technology. Despite the split in the way medicine and drug usage was initiated, the role of the modern pharmacist workforce was developed to be flexible, acknowledging a growing need to support and serve where required.

Scenario 2

From the second decade of the twenty-first century onwards, the pressure on public sector budgets continued and the funding available for healthcare decreased. The impact worsened as the decade progressed, leaving private provision a reality in many cases – and increasingly the norm. Early in the decade, the new Commissioning Board reviewed the funding arrangements and the contract for community pharmacy, resulting in provider changes and, over time, a gradual decline in regulation. The decline in regulation was matched at a European level, and other (cheaper) providers began to take over more and more aspects of the pharmacist's role. As a result, the trend for online services grew, and from 2013, the public increasingly chose 'clicks over bricks' and shopped for all services online rather than visiting their local town centre.

Although initially the levels of pharmacists required remained steady, by early 2020 the changes in access and in service started to impact on demand. Students became wary of the cost of degree programmes overall, and were increasingly uncertain about the viability of long-term employment in a pharmacist role. As fewer pharmacists found employment in the profession and fewer students chose to enrol on the undergraduate degree, schools of pharmacy subsequently reduced the number of placements on courses.

The increase in online service provision brought with it an increase in remote healthcare from 2015 onwards, which covered all aspects of the pharmacist's role, from consultation, diagnosis and advice, to supply. The second decade of the twenty-first century, and the early part of the third decade saw supply-only internet services proliferate. Pharmacists were increasingly restricted to advice-only services. People shopped for drugs online as they shopped for food, and the declassification of drugs necessarily accompanied the demand for easy access and self-management. Initially, this trend led to a rise in health ownership, as people not only researched their own conditions, but accessed diagnosis and monitoring online and self-managed. However, patient risk inevitably rose through ineffective monitoring, the decline in fully supported interventions, and further drops in adherence to medicine pathways.

Meanwhile, as the image of the profession continued to suffer, the health of the nation was increasingly focused on managing complexity, co-morbidities and long-term conditions. Demand for healthcare continued to increase throughout the third decade of the twenty-first century, as the supply of effective advice and support decreased. After a decade of remote healthcare, deregulation and self management, the tide began to turn and public outrage at the lack of available services began to build.

By 2040, not one single bricks-and-mortar pharmacy remained open for the public to visit. The total cost of healthcare had in fact increased, and the move towards locally provided care delivered closer to home began to reverse, as pressure on acute services increased and more and more people were admitted to hospital to manage their conditions.

Scenario 3

From the second decade of the twenty-first century onwards, patients and service users increasingly viewed themselves as 'consumers' of the healthcare system. Combined with the rising use of technology and the incessant demands of 24/7 lifestyles, a demand for a more streamlined, personalised pharmacy service emerged. In direct contrast, efficiency drives in healthcare continued, and GP surgeries continued to be overwhelmed by patients with chronic illness and disease. In an attempt to cut costs and reduce waiting times, pharmacists were increasingly assigned as the first point of contact for patients with short-term and minor conditions.

As pharmacists increasingly assumed greater levels of responsibility, the relationship between the pharmacist and the patient, as well as between the pharmacist and other health professionals, grew in both breadth and depth. The increased number of interactions that resulted placed pharmacists at the centre of healthcare, and enabled them to utilise their increased contact time with patients to provide a wider and much improved range of services beyond traditional supply roles, such as prescribing, titration, medicines optimisation, monitoring and review. The policy move to prevention rather than cure also strengthened, and the concept of the 'healthy living pharmacist' emerged across primary and secondary care, with the majority of service providers offering lifestyle interventions and drop-in clinics such as smoking cessation.

Meanwhile, the flexibility of service provision was furthered through the development of multiple points of access such as walk-in centres, national call centres, online services and telemedicine. Intellectual property rights (IPR) for drugs were also devalued and new medicines were made available to all providers operating under the 'Any Qualified Provider' policy, which retained a level of regulation. The combination of improved accessibility, increased availability of information and the shift to prevention resulted in a general public that assumed greater interest in their health and well-being, and shared decision making between the pharmacist and the patient became commonplace. As a result, the safety and quality of medicine-based decisions improved, adherence to medicine pathways increased, and the quantity of medicinal waste reduced.

As pharmacists became fully integrated in the professional healthcare team, the demand for qualified pharmacists in the workforce increased. Healthy living pharmacists were commonly recruited to local health and well-being boards, and improved outcomes for patients stimulated a rise in the number of other healthcare professions, such as health visitors and nurses, undertaking prescribing courses, blurring traditional role boundaries.

As a result of the above changes, the skill mix for pharmacists broadened, and changes in continued professional development and undergraduate training were enacted in order to facilitate a flexible workforce, trained in competencies such as interpersonal skills and motivational interviewing. Both the current and prospective workforce benefited from well-defined career structures, and the attraction of pharmacy as a profession was enhanced.

Meanwhile, in the third decade of the twenty-first century, the proliferation of telemedicine continued, increasing patient care opportunities in the home and moving away from a fixed point of delivery. Pharmacists were able to interact with patients, diagnose conditions and prescribe courses of treatment from remote locations, beyond traditional community and secondary care settings. Medicines arrived on the patients' doorstep, allowing them to receive treatment without stepping outside their homes, and 24/7 service delivery was facilitated not only by a growing UK pharmacist workforce, but by the increasing number of online pharmacists based around the globe, transcending international boundaries.

In 2040, access to healthcare service provision was variable between face-to-face and remote service delivery, depending on patient need. Patients' health was tracked from birth, and telemedicine further empowered patients by facilitating self-diagnostic testing such as taking blood. The general public consulted pharmacists all year round, seeking expert advice in times of both good and poor health, and the trajectory of responsibility for personal health again shifted, this time from self-care to ownership of care.

Scenario 4

In 2013, the increasing use of portable computers, along with social factors such as demanding lifestyles and the increased use of social media, led to an increasing number of people demanding health information and advice over the internet, either from websites or through remote advisers. At this time, there were also increasing examples of technology providing easier access to the supply of medicines, for instance the ability to buy a limited number of drugs over the internet, or from vending machines and walk-in dispensing booths, though this was not common in the UK at the time.

An increasing number of patients were being diagnosed remotely in the second decade of the twenty-first century. However, the majority of online diagnoses were fairly basic, and patients favoured being diagnosed in person, either by a GP or a specialist clinician. Although there was a growing trend for patients to use the internet to find more information about illness after diagnosis, this applied far less to their medicines.

By approximately 2020, the technology-savvy generation Z had matured and wifi was available nationwide. This led to a significant increase in public demand for online supply and advice services. In order to meet this demand, the multiple community pharmacies set up large-scale distribution centres to provide the majority of their medicines online in a cost-effective manner, and many smaller community pharmacies were wiped out, leading to a concentration in the marketplace. More generally, the pharmacy industry became increasingly diverse: an increasing amount of home care was delivered remotely via technology, community pharmacies began to adopt a mixed model of 'bricks and clicks', and a small number of bespoke concierge and boutique pharmacy adviser start-ups were formed.

A few years later, growing public demand for the online provision of drugs led to the liberalisation of drugs regulation, enabling companies to supply more freely. The unregulated supply of drugs — combined with patient advice services that were purely optional — caused long-term conditions to become increasingly badly managed, and the risk of drug-related harm to patients increased.

By 2030, technology had advanced further, completely taking over the supply of medicines and enabling patients to gain access to drugs directly in their homes via 3D printers. The majority of physical pharmacies closed as the evolution of technology removed any real reason for patients to visit a bricks-and-mortar pharmacy, other than the minority who wanted a more personalised, face-to-face service.

Those who did wish for a personalised service were able to achieve this by becoming a customer of a boutique pharmacy advisory company, or via remote consultations over the internet. With the increasing availability of genomic profiles, pharmacists were able to interpret genetic information on a case-by-case basis to assist patients in managing their conditions, as well as prescribing lifestyle drugs, which had become more widely accepted. However, it is important to note that these profiles were not freely available: it was the individual's choice to share their information, not that of the NHS. By 2040, only a few highly qualified pharmacists were necessary in order to meet patient needs, with the emphasis on the provision of remote advice, or via in-depth face-to-face consultations for those individuals who were willing to pay for the service.

Note:

These plausible scenarios were developed via a tried-and-tested scenario generation process by a diverse group of stakeholders, including but not limited to pharmacists. They do not, therefore, represent the views of any single organisation such as the CfWI, the DH, HEE or any professional body. The scenarios are not intended to describe expected, likely or preferred states — they represent a plausible range of futures the system should plan for.

Appendix D: Modelling data

Data sources for the model

Centre for Pharmacy Workforce Studies, School of Pharmacy, University of Manchester (2012), *CPWS Briefing Paper - GPhC Register Analysis 2011*. Accessed online, May 2013 - Available at:
http://www.pharmacyregulation.org/sites/default/files/Analysis%20of%20GPhC%20Pharmacist%20Register%202011.pdf

Centre for Pharmacy Workforce Studies, School of Pharmacy, University of Manchester, *CPWS Briefing Paper - GPhC Register Analysis 2010*. Accessed online, May 2013 - Available at:
http://www.pharmacy.manchester.ac.uk/cpws/publications/Reports/reganalyses/

Centre for Pharmacy Workforce Studies, School of Pharmacy, University of Manchester, *CPWS Briefing Paper - GPhC Register Analysis 2009*. Accessed online, May 2013 - Available at:
http://www.pharmacy.manchester.ac.uk/cpws/publications/Reports/reganalyses/

General Pharmaceutical Council (2011), *Pharmacy Student Analysis 2009/2010*. [email] (Personal communication, 25 March 2013)

General Pharmaceutical Council (2013), *Re:GPhC data sharing. (Register data)* [email] (Personal communication, 25 March 2013)

General Pharmaceutical Council (2013), *Re:Data for CfWI. (Pre-registration data)* [email] (Personal communication, 27 March 2013)

Health & Social Care Information Centre (2012), *Prescriptions Dispensed in the Community, Statistics for England – 2001-2011*, Accessed online, March 2013 - Available at: http://www.hscic.gov.uk/catalogue/PUB06941

Health & Social Care Information Centre (2012), *Hospital Episode Statistics for England. Inpatient statistics, 2011-12 Accessed online, Apr 2013 – Available at http://www.hscic.gov.uk/hes*

Higher Education Statistics Agency (2013), *Data request - Higher Education Statistics Agency [email] (Personal communication, 5 March 2013)*

Pharmaceutical Journal data acquired via FoI request for article: 'Student trends may have implications for the future of the profession' (Bassey, 2012) *Student nos PJ article*. [email] (Personal communication, 4 April 2013)

Royal Pharmaceutical Society (2009), *Pharmacy Workforce Census 2008: Main findings*, Accessed online, May 2013 - Available at: http://www.rpharms.com/about-pharmacy-pdfs/census08.pdf

The Department of Health (2011), *Table 6: 2011-12 Primary medical services component, PCT recurrent revenue allocations exposition book A*. Accessed online, March 2013 - Available at:
http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_124949

The Department of Health (2013), *FW: HESA data. (MPC pharmacy model) [email] (Personal communication, 19 December 2012)*

The NHS Pharmacy Education and Development Committee (2013), *National NHS Pharmacy Staffing Establishment and Vacancy Survey 2012 – October 2012*. Accessed online, May 2013 - Available at:
http://www.nhspedc.nhs.uk/surveys.htm

The Office for National Statistics (2011), *National Population Projections, 2010-Based Projections*. Accessed online, March 2012 - Available at: http://www.ons.gov.uk/ons/rel/npp/national-population-projections/2010-based-projections/index.html

The Office for National Statistics (2013), *Population Estimates (pre-2011 methodology)*. Accessed online, March 2013 - Available at: http://www.ons.gov.uk/ons/publications/all-releases.html?definition=tcm:77-22371

Table D1: Supply modelling data and assumptions

Variable	Data quality	Source	Notes
Annual intake of home and EU students to MPharm courses in England	M	GPhC Pharmacy Student Analysis 2009/10 Pharmaceutical Journal data acquired via Freedom of Information (FoI) request for article: 'Student trends may have implications for the future of the profession' (Bassey, 2012)	The Pharmacy Student Analysis 2009/10 report provided the 2009/10 MPharm intake to English schools of pharmacy split between home/EU and non EU, as well as male and female. It also provides the intake prior to this but not split by domicile or gender. The CfWI has assumed the same gender split and domicile split going back to 2005 in order to initialise the pharmacy model developed. Data used in an article for the Pharmaceutical Journal (Bassey, 2012) containing the intake to English schools of pharmacy in 2011/12. The same domicile and gender splits were used as previously. For 2010/11 values, the CfWI trended between the two sources and took the midpoint.
Annual intake of home and EU students to MPharm courses in England age profile	VH	HESA student data	As total MPharm intake numbers from other sources did not provide the ages of students, the age profile was calculated from HESA student data.
Annual intake of non-EU students to MPharm courses in England	M	GPhC Pharmacy Student Analysis 2009/10 Pharmaceutical Journal data acquired via FoI request for article: 'Student trends may have implications for the future of the profession' (Bassey, 2012)	The Pharmacy Student Analysis 2009/10 report provided the 2009/10 MPharm intake to English schools of pharmacy split between home/EU and non EU, as well as male and female. It also provides the intake prior to this but not split by domicile or gender. The CfWI has assumed the same gender split and domicile split going back to 2005 in order to initialise the pharmacy model developed. Data used in an article for the Pharmaceutical Journal (Bassey, 2012) containing the intake to English schools of pharmacy in 2011/12. The same domicile and gender splits were used as previously. For 2010/11 values, the CfWI trended between the two sources and took the midpoint.
Annual intake of non-EU students to MPharm courses in England age profile	VH	HESA student data	As total MPharm intake numbers from other sources did not provide the ages of students, the age profile was calculated from HESA student data.
Annual intake to pre registration training in England from OSPAP	VH	GPhC pre registration data acquired via email	
Annual intake to pre registration training in England from OSPAP age profile	VH	GPhC pre registration data acquired via email	

Variable	Data quality	Source	Notes
Annual intake directly to the register in England from abroad	M	assumption	The CfWI took the assumption used by Medical Education England that the register will grow by an additional 1.1per cent each year due to foreign joiners. The CfWI took 1.1per cent of the initial register size and used this figure going forward, not 1.1per cent of the register at each year.
Annual intake directly to the register in England from abroad age profile	H	assumption	The CfWI calculated an age profile for European MPharm students and increased this by 5 years.
Attrition rate from the register in England	M	CPWS Briefing Paper - GPhC Register Analysis 2010 CPWS Briefing Paper - GPhC Register Analysis 2009	The CfWI calculated an age-based attrition value by comparing the leavers at 2010 to the register at 2009.
Initial/current total number of pharmacists registered in England	VH	GPhC pharmacy register data acquired via email	
Initial/current total number of pharmacists registered in England age profile	VH	GPhC pharmacy register data acquired via email	
Initial/current total number of trainees in pre registration training in England	VH	GPhC pre registration data acquired via email	
Initial/current total number of trainees in pre registration training in England age profile	VH	GPhC pre registration data acquired via email	
Average amount of time it takes students to complete an MPharm degree	L	assumption	The CfWI assumed that 5 per cent of students complete their degree in 3 years, 90 per cent in 4 years and 5 per cent in 5 years.
Percentage of MPharm students who will drop out prior to successful completion of their degree	L	assumption	Please refer to assumption below.
Percentage of MPharm graduates who leave the English system after gaining their degree	L	assumption	The CfWI was unable to source data to enable calculation of an attrition rate from university or following university. The CfWI instead had access to the 2008 intake number to university (GPhC Student Analysis) as well as the 2012 intake to pre registration (GPhC data provided via email). From this, the CfWI calculated the attrition between starting an MPharm degree and starting pre registration training.
Percentage of the register in England who are active	VH	GPhC pharmacy register data acquired via email	The CfWI calculated an estimate from GPhC data of 99.4 per cent. The CfWI counted the number of unregistered, not-fit-to-practice and suspended individuals from the register to determine the number on the register who are not active.
Percentage of the register in England who work in community pharmacy	M	The Royal Pharmaceutical Society Pharmacy Workforce Census 2008	
Percentage of the register in England who work in hospital	M	The Royal Pharmaceutical Society Pharmacy Workforce	

Variable	Data quality	Source	Notes
pharmacy		Census 2008	
Percentage of the register in England who work in primary care pharmacy	M	The Royal Pharmaceutical Society Pharmacy Workforce Census 2008	
Percentage of the register in England who work in industry pharmacy	M	The Royal Pharmaceutical Society Pharmacy Workforce Census 2008	
Percentage of the register in England who work in academic pharmacy	M	The Royal Pharmaceutical Society Pharmacy Workforce Census 2008	
Percentage of the register in England who work in other pharmacy sectors/roles	M	The Royal Pharmaceutical Society Pharmacy Workforce Census 2008	
Community pharmacists participation rate	M	The Royal Pharmaceutical Society Pharmacy Workforce Census 2008 MEE pharmacist workforce model	The CfWI used the average hours worked by an average sector employee (census) divided by the average contract hours stated (MEE MODEL).
Hospital pharmacists participation rate	M	National NHS Pharmacy Staffing Establishment and Vacancy Survey 2012 – October 2012	The CfWI divided the FTE provided for hospital pharmacists by the headcount provided.
Primary care pharmacists participation rate	M	Pharmacy Workforce Census 2008 MEE pharmacist workforce model	The CfWI used the average hours worked by an average sector employee (census) divided by the average contract hours stated (MEE MODEL).
Industry pharmacists participation rate	M	The Royal Pharmaceutical Society Pharmacy Workforce Census 2008 MEE pharmacist workforce model	The CfWI used the average hours worked by an average sector employee (census) divided by the average contract hours stated (MEE MODEL).
Academic pharmacists participation rate	M	The Royal Pharmaceutical Society Pharmacy Workforce Census 2008 MEE pharmacist workforce model	The CfWI used the average hours worked by an average sector employee (census) divided by the average contract hours stated (MEE MODEL).
Other sector/roles pharmacists participation rate	M	The Royal Pharmaceutical Society Pharmacy Workforce Census 2008 MEE pharmacist workforce model	The CfWI used the average hours worked by an average sector employee (census) divided by the average contract hours stated (MEE MODEL).
Percentage of pre registration trainees who undertake the	VH	GPhC pre registration data acquired via email	

Variable	Data quality	Source	Notes
summer or winter registration assessment			
Registration assessment pass rate	VH	GPhC pre registration data acquired via email	
Annual number of pharmacists rejoining the register each year	M	assumptions CPWS Briefing Paper - GPhC Register Analysis 2011	The number of pharmacists rejoining the register given in the paper is fairly irregular. Therefore, the CfWI took an average of the past 5 years and used this figure.
Annual number of pharmacists rejoining the register each year age profile	M	assumption	The CfWI was unable to source data to enable the ages of pharmacists rejoining the register to be calculated. In its place the CfWI used the assumption that the age profile of pharmacists rejoining the register matches that of the register.
Percentage of trainees who do not complete pre-registration or pass the registration assessment	H	GPhC pre registration data acquired via email	The CfWI calculated an estimate from GPhC data of 1.5% and confirmed this with GPhC. The calculated estimate used the number of withdrawals.

Demand data and assumptions

Table D2 shows the data used to forecast future demand for pharmacists in different sectors due to demographic changes. This accounts for both the increased size of the population and also the changing age and gender balances (particularly a higher proportion of older people) to 2040.

Please note that these demographic factors were combined with demand assumptions for the four scenarios which were forecast using a Delphi process, as shown in Appendix E.

Table D2: Demand modelling data and assumptions

Variable	Data quality	Source	Notes
Future population projections	VH	Office for National Statistics (ONS) National Population Projections, 2010-Based Projections.	The CfWI used the ONS population projections to help estimate the change in demand for pharmacists due to the changing population size.
FCE data	H	The Health and Social Care Information Centre, Hospital Episode Statistics for England. Inpatient statistics, 2011-12.	Finished consultant episodes data was used to help weight the demand for pharmacists' services in the hospital setting.
NHS primary care weightings	H	The Department of Health (2011), Table 6: 2011-12 Primary medical services component, PCT recurrent revenue allocations exposition book A.	The primary care medical services component of the weighted capitation allocations was used to help weight the demand of the population by age band for pharmacists' services in the primary care setting.
Prescriptions dispensed in the community	M	Prescriptions Dispensed in the Community: England, Statistics for 2001 to 2011.	The number of prescriptions dispensed in the community was used to help weight the demand for pharmacists' services in the community setting.

Please note: much of the data available for the pharmacy workforce is published considering Great Britain and not England specifically. As the CfWI was commissioned to consider the pharmacist workforce in England only, the CfWI has made some assumptions to ensure the data used is appropriate. Table D3 shows the proportion of the total registered pharmacists each year based in England.

Table D3: Proportion of the register in England 2003-2013

Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Proportion of RPSGB/GPhC register in England (%)	75.3	75.1	76.3	76.3	76	76.4	76.6	77.3	81.8	-	82

Source: Hassell, 2012

Where only complete Great Britain values were given, the CfWI took only the percentage of these values based on the proportion of registered pharmacists in England displayed in Table D3. Where considering patterns and percentages, the CfWI assumed that the values across Great Britain are reflective of the patterns across England only. For example in 2008 71 per cent of Great British pharmacists worked in the community sector (RPSGB, 2009). As the CfWI was unable to access the source data that provided this value, the CfWI assumed that 71 per cent of England based pharmacists worked in the community sector.

Appendix E: Delphi questions and modelling assumptions

A Delphi process was used to quantify variables for modelling the future supply and demand of pharmacists in each of the four scenarios. Please refer to Section 3.3.1 for information about the Delphi process. The questions below were asked about each of the four scenarios, and the majority were asked for each sector. Tables E1 and E2 show the average (median) values obtained from the Delphi process.

Delphi questions – supply assumptions

The following questions were asked to help inform the supply side of the modelling:
- What do you think would be the change to the average participation rate of pharmacists in 2040?
- What do you think would be the percentage of pharmacists leaving the workforce for reasons other than retirement in 2040?
- What do you think would be the change to the average retirement age for pharmacists in 2040?

Table E1: Median values obtained from Delphi questions – supply

Scenario	Sector	Change to participation rate in 2040		Percentage leaving the workforce other than retirement in 2040	Change to the average retirement age in 2040/years	
		Male	Female		Male	Female
Scenario 1	Community	0.10	0.00	1.00%	5.0	7.0
	Hospital	0.00	0.00	1.40%	5.0	5.0
	Primary care	0.00	0.00	1.10%	5.0	5.0
	Industry	0.00	0.00	1.80%	5.0	5.0
	Academic	0.00	0.00	1.00%	5.0	5.0
Scenario 2	Community	-0.04	-0.08	7.00%	5.0	3.0
	Hospital	0.07	0.05	2.50%	3.0	5.0
	Primary care	0.00	0.00	2.50%	5.0	5.0
	Industry	0.00	0.00	1.00%	5.0	5.0
	Academic	0.00	0.00	2.40%	5.0	3.0
Scenario 3	Community	0.00	0.07	1.00%	5.0	7.0
	Hospital	0.00	0.00	1.50%	5.0	6.0
	Primary care	0.00	0.00	1.35%	5.0	5.0
	Industry	0.00	0.00	1.65%	5.0	3.5
	Academic	0.00	0.00	1.00%	5.0	6.0
Scenario 4	Community	-0.05	-0.04	5.00%	3.0	3.0
	Hospital	0.00	0.05	2.40%	5.0	5.0
	Primary care	0.00	0.00	2.50%	5.0	5.0
	Industry	0.00	0.00	1.00%	4.0	5.0
	Academic	0.00	0.00	1.80%	5.0	5.0

Delphi questions – demand assumptions

The following questions were asked to help inform the demand side of the modelling:

- What do you think would be the percentage change in the overall need of patients and the population for pharmacists in 2040?
- What do you think would be the percentage change in the overall level of service provided by pharmacists in 2040?

Demographic data (refer to Appendix D) was used for modelling demand in addition to the need and service factors, as Delphi participants were asked not to take account of demographic factors when forecasting changes in the future need for pharmacists.

Table E2: Median values obtained from Delphi questions – demand

Scenario	Sector	Percentage change in the overall need of patients and the population for pharmacists in 2040	Percentage change in the overall level of service provided by pharmacists in 2040
Scenario 1	Community	15.0%	20.0%
	Hospital	10.0%	8.0%
	Primary care	10.0%	10.0%
	Industry	0.0%	0.0%
	Academic	0.0%	10.0%
Scenario 2	Community	-20.0%	-20.0%
	Hospital	10.0%	10.0%
	Primary care	0.0%	-5.0%
	Industry	0.0%	0.0%
	Academic	0.0%	-10.0%
Scenario 3	Community	15.0%	25.0%
	Hospital	10.0%	10.0%
	Primary care	10.0%	10.0%
	Industry	0.0%	0.0%
	Academic	5.0%	7.5%
Scenario 4	Community	-20.0%	-20.0%
	Hospital	0.0%	10.0%
	Primary care	0.0%	0.0%
	Industry	0.0%	0.0%
	Academic	0.0%	0.0%

Appendix F: Sector-based workforce trends

The pharmacy workforce is employed across a number of sectors, so modelling and analysis was undertaken for the four scenarios by sector to investigate the pharmacist workforce and determine if there could be any potential issues with future supply and demand in any particular sectors. **The sectors that were modelled were:**

- Community
- Hospital
- Primary care
- Industry
- Academic.

The modelling used to produce the future supply and demand forecasts required assumptions to be made, and these are outlined in Appendix D. The central modelling assumptions were that:

- current service meets 100 per cent of current need across all sectors
- the number of students entering the system, i.e. enrolling onto MPharm courses, is maintained at the 2011/12 level up to 2040.

The CfWI appreciates that portfolio working is common in the pharmacist workforce and that pharmacists can hold a number of roles across more than one sector. Combined with a lack of data about migration between sectors, this meant that **the modelling used to produce the future sector supply and demand forecasts required additional assumptions to be made. The additional assumptions for modelling per sector were as follows.**

1. The sector supply breakdown was calculated based on the sector demand breakdown, i.e. demand for each sector was modelled, the sum of which produced the total demand. The percentage of the total demand for each sector was then calculated. This demand sector breakdown was then applied to the total supply model output to give a breakdown of supply for each sector, for example if community pharmacy demand was 60 per cent of the total demand for pharmacists, then 60 per cent of the total supply of pharmacists would be allocated to the community sector.

2. Attrition rate was calculated for the total pharmacist workforce using the attrition rate for each sector, i.e. a weighted average of the attrition rates for each sector was used as the attrition rate value for the total pharmacist workforce. The total supply of pharmacists was calculated using this attrition rate, and then the sector supply break down was calculated as described in the assumption above.

The CfWI recognises the limitations of calculating sector supply based on the proportions of sector demand (assumption 1). Due to distributing sector supply this way, the sector supply values are indicative, and it is important to focus on the trends that the sector modelling indicates, rather than specific workforce numbers for each sector.
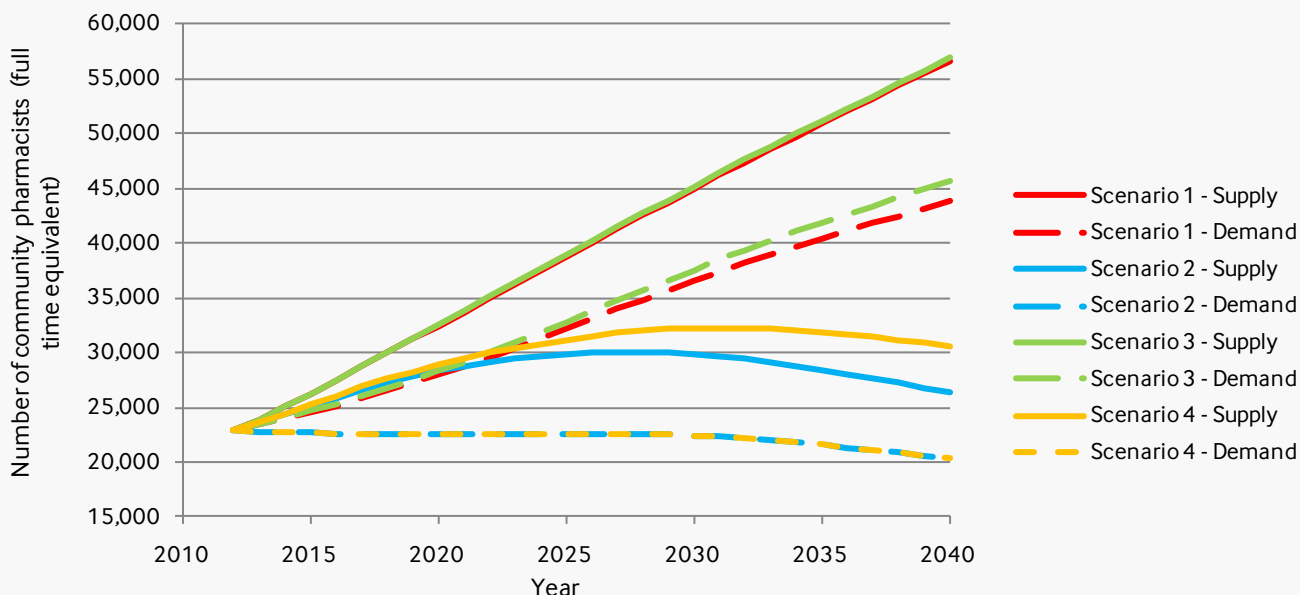
It is important to note that the CfWI forecasts for the total supply of pharmacists do not use these assumptions.

The analysis of the sector model outputs uses the following timeframes:

- short term – 2012 to 2020
- medium term – 2020 to 2030
- long term – 2030 to 2040.

Community pharmacists

Figure F1: Supply and demand of community pharmacists

Source: CfWI system dynamics pharmacist workforce model for England

Figure F1 shows the CfWI's forecasts of supply (solid lines) and demand (dashed lines) for community pharmacists for the four future scenarios.

The trends are similar to the total pharmacist workforce, and for scenario 1 supply and demand increase continuously to 2040, with supply increasing at a greater rate than demand. For scenario 3, supply and demand increase continuously at very similar rates to scenario 1, and supply again increases at a greater rate than demand. For scenario 2, supply increases in the short term but reaches a plateau in the medium term, then decreases to 2040, and demand slightly decreases continuously to 2040. For scenario 4, supply increases in the short term but reaches a plateau in the medium-to-long term, then also decreases to 2040, and demand decreases continuously to 2040 at a very similar rate to scenario 2.

Demand increases continuously for scenarios 1 and 3 as both scenarios describe an increase in care in the community. Combined with a broadened role for pharmacists in the future healthcare system, this results in an increase in the demand for community pharmacists. Demand continuously decreases slightly for scenarios 2 and 4 as these scenarios describe an increase in patients self-managing their own care. Combined with a narrowed role for pharmacists in the future healthcare system, this leads to all or the majority of physical pharmacies being closed by 2040. The decrease in demand is limited, however, by the projected population growth bringing about a greater demand for healthcare by 2040.

Supply increases continuously for scenarios 1 and 3 due to the number of students entering the profession, and the increasing demand for community pharmacists in these two scenarios. Supply increases in the short term then reaches a plateau and decreases in the long term for scenarios 2 and 4, as they both describe a decrease in the demand for community pharmacists which, after a period of time, results in more part-time working and pharmacists moving out of this sector in the long term. The initial increasing supply of community pharmacists in the short term is caused by the number of pharmacy students currently in training.

Conclusions for community pharmacists

For community pharmacists, supply and demand follow very similar trends to the total number of pharmacists, in that supply is above demand in all scenarios. This indicates that there is likely to be a surplus supply of community pharmacists in the future. In two scenarios, demand for community pharmacists continues to increase. However, in two it decreases

below the existing level of demand by 2040. This indicates that there is a considerable range of possibilities for the future demand of community pharmacists. Furthermore, the supply of community pharmacists increases by 2040 in all scenarios, which indicates that it is reasonable to forecast that the supply of community pharmacists will increase in the future. However there is also a broad range of possibilities for the level of likely increase in the future supply.

Hospital pharmacists

Figure F2: Supply and demand of hospital pharmacists
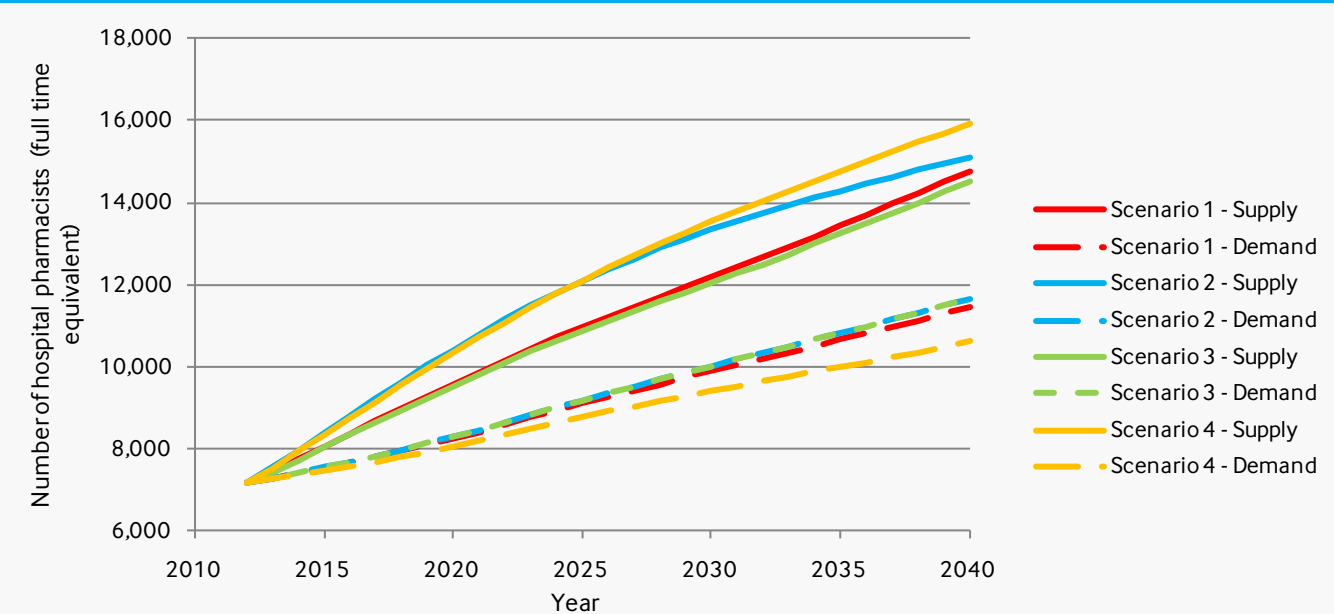
Source: CfWI system dynamics pharmacist workforce model for England

Figure F2 shows the CfWI's forecasts of supply (solid lines) and demand (dashed lines) for hospital pharmacists for the four future scenarios.

For scenario 1, supply and demand increase continuously to 2040 with supply increasing at a greater rate than demand. For scenario 3, supply and demand also increase continuously at very similar rates to scenario 1. For scenario 2, supply increases at a greater rate in the short term but increases at a lower rate in the medium term, and converges with scenario 1 and 3 by 2040, and demand increases continuously at a very similar rate to scenario 1 and 3. For scenario 4, supply also increases at a greater rate in the short term and increases at a lower rate in the medium term, so converges with all of the other scenarios by 2040. However, demand increases continuously at a slightly lesser rate than the other scenarios to 2040.

Demand increases continuously for all four scenarios, which is likely to be due to an increasingly ageing population in the future with an increasing prevalence of long-term conditions resulting in an increase in demand for hospital services. Not all of the scenarios explicitly state this trend. However, throughout the horizon scanning and scenario generation stages of the project, stakeholders frequently expressed confidence that this trend will occur.

Supply increases continuously in all four scenarios due to the number of students entering the profession, and the increasing demand for hospital pharmacists in the four scenarios.

Conclusions for hospital pharmacists

For hospital pharmacists, supply and demand are both forecast to increase and supply is greater than demand in all scenarios, which indicates that there is likely to be a surplus supply of hospital pharmacists in the future.

Primary care pharmacists

Figure F3: Supply and demand of primary care pharmacists
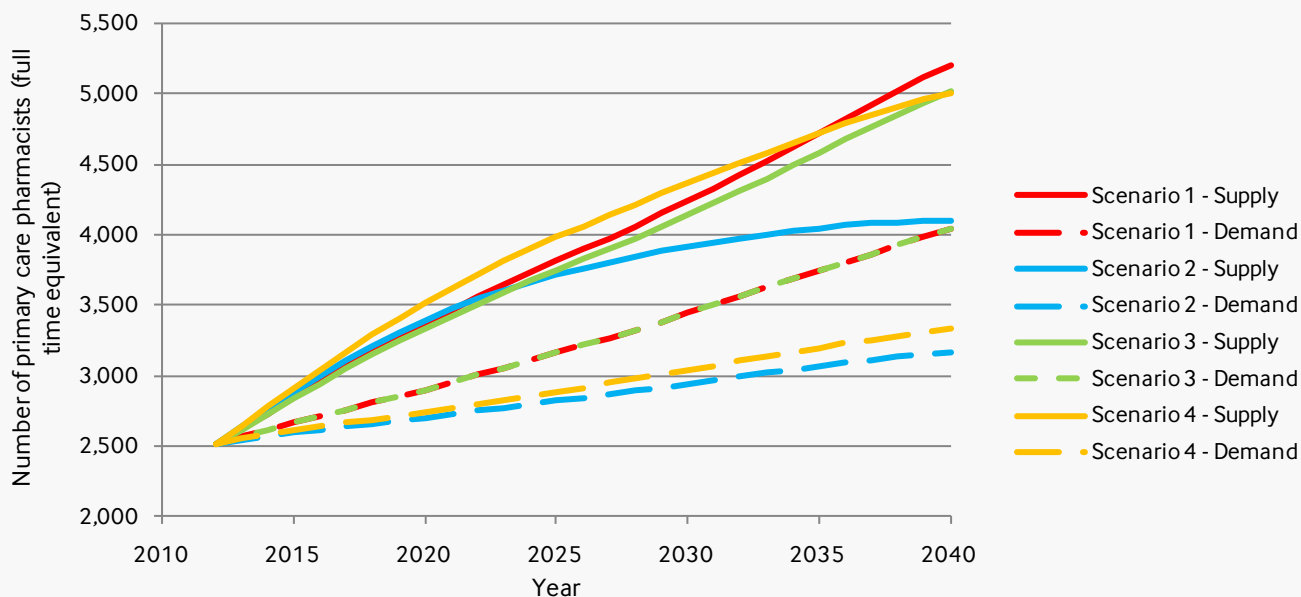
Source: CfWI system dynamics pharmacist workforce model for England

Figure F3 shows the CfWI's forecasts of supply (solid lines) and demand (dashed lines) for primary care pharmacists for the four future scenarios.

For scenario 1, supply and demand increase continuously to 2040 with supply increasing at a greater rate than demand. For scenario 3, supply and demand also increase continuously at very similar rates to scenario 1. For scenario 2, supply increases but reaches a plateau in the long term and becomes constant at 2040, and demand increases continuously at a lesser rate. For scenario 4, supply increases at a quicker rate in the short term then increases at a slightly lower rate in the medium and long term, and demand continuously increases at a similar rate to scenario 2 to 2040.

Demand increases continuously for scenarios 1 and 3, as they both describe an increase in care in the community and pharmacists undertaking public health roles, which is combined with an increase in demand for healthcare caused by the projected population growth. Demand increases continuously but to a lesser extent in scenarios 2 and 4 as the increase in demand caused by the projected population growth is negated to an extent by the decrease in demand caused by trends for remote and self-care.

Supply increases in all four scenarios due to the number of students entering the profession, and the increasing demand for primary care pharmacists in the four scenarios.

Conclusions for primary care pharmacists

For primary care pharmacists, supply and demand are both forecast to increase, and supply is greater than demand in all scenarios, which indicates that there is likely to be a surplus supply of primary care pharmacists in the future. Supply and demand increase in all four scenarios, but there is a range of possibilities for the future supply and demand of primary care pharmacists.

Industry pharmacists

Figure F4: Supply and demand of industry pharmacists
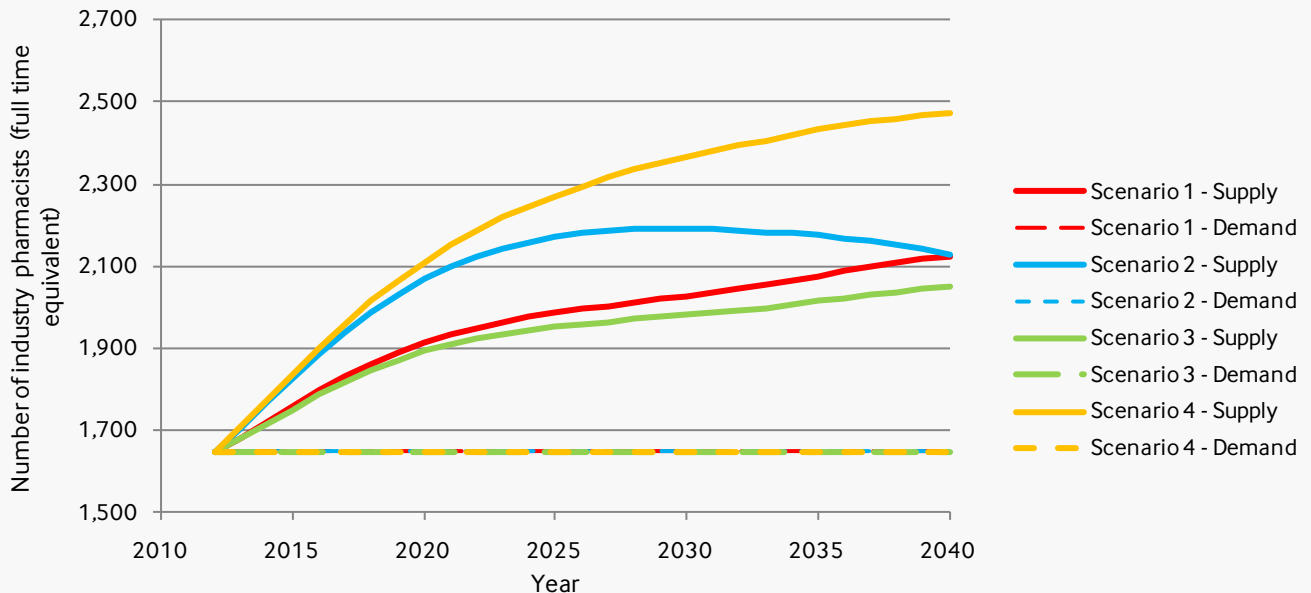
Source: CfWI system dynamics pharmacist workforce model for England

Figure F4 shows the CfWI's forecasts of supply (solid lines) and demand (dashed lines) for industry pharmacists for the four future scenarios.

For scenario 1, supply increases continuously in the short term and increases continuously at a lesser rate in the medium term to 2040, and demand remains constant from 2012 to 2040. For scenario 3, supply also increases at similar rates to scenario 1 and demand also remains constant from 2012 to 2040. For scenario 2, supply increases at a faster rate in the short term, then reaches a plateau in the medium term and decreases in the long term to 2040, and demand remains constant from 2012 to 2040. For scenario 4, supply also increases rapidly in the short term, but continues to increase in the medium term, then reaches a plateau in the long term and becomes constant at 2040, and demand also remains constant from 2012 to 2040.

Supply of industry pharmacists increases in all four scenarios due to the number of students entering the profession.

Conclusions for industry pharmacists

For industry pharmacists, supply is forecast to increase whilst demand is forecast to remain constant from 2012 to 2040 in all scenarios. Data from The Association of the British Pharmaceutical Industry supports this forecast of constant demand as it shows that numbers of UK pharmaceutical industry employees and employees in research and development have remained fairly constant over the last decade (ABPI, 2010). In addition, supply is greater than demand in all scenarios, which indicates that there is likely to be a surplus supply of industry pharmacists in the future. The CfWI recognises that the pharmaceutical industry is a global commercial industry and as such, growth or decline will correlate to economic factors in addition to healthcare need.

Academic pharmacists

Figure F5: Supply and demand of academic pharmacists
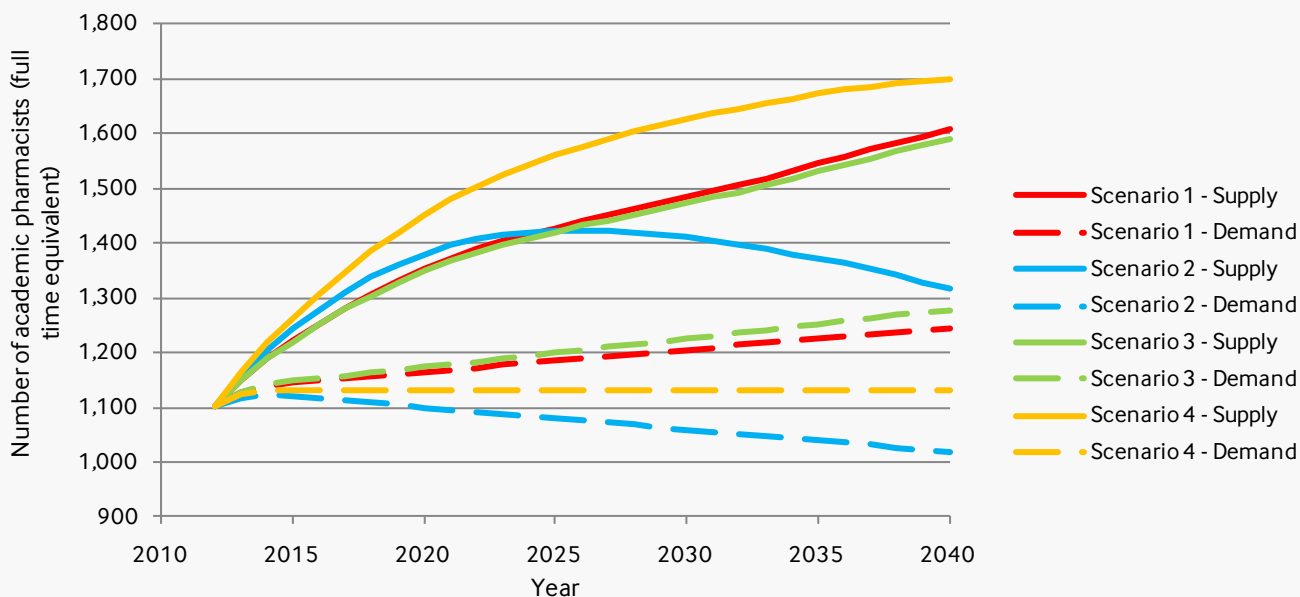
Source: CfWI system dynamics pharmacist workforce model for England

Figure F5 shows the CfWI's forecasts of supply (solid lines) and demand (dashed lines) for academic pharmacists for the four future scenarios.

For scenario 1, supply and demand increase continuously to 2040, with supply increasing at a greater rate than demand. For scenario 3, supply and demand also increase continuously at very similar rates to scenario 1. For scenario 2, supply increases in the short term then decreases to 2040, and demand decreases continuously to 2040. For scenario 4, supply increases in the short term but also reaches a plateau in the medium term and becomes constant to 2040, and demand remains constant from 2012 to 2040.

Demand increases continuously for scenarios 1 and 3 as they both describe a broadened role for pharmacists in the future healthcare system, which subsequently attracts more students to the profession. Demand decreases slightly and remains constant for scenarios 2 and 4 respectively as they both describe a narrowed role for pharmacists in the future healthcare system ,which subsequently decreasing the number of students attracted to the profession. Demand is lowest in scenario 2, as in addition to the narrowed role in healthcare for pharmacists, this scenario also describes a future where fewer students find employment in the profession, so fewer choose to enrol on degree programmes.

Supply increases continuously for scenarios 1 and 3 due to the number of students entering the profession, and the continuously increasing demand for academic pharmacists in these two scenarios. Supply increases in the short term then reaches a plateau and decreases in the long term for scenarios 2, as it describes a decrease in the demand for academic pharmacists which, after a period of time, results in more pharmacists moving out of this sector in the long term. Supply increases in the short term then reaches a plateau in the long term for scenario 4, as it describes a constant demand for academic pharmacists from 2012 to 2040, which in the long term causes the initial increase in short- and medium-term supply to slow. The initial increasing supply of community pharmacists in the short term for all four scenarios is caused by the number of pharmacy students currently in training.

Conclusions for academic pharmacists

For academic pharmacists, supply is above demand in all scenarios, which indicates that there is likely to be a surplus supply of academic pharmacists in the future. In two scenarios, demand for academic pharmacists continues to increase,

but in two it continues to decrease, which indicates that there is a considerable range of possibilities for the future demand for academic pharmacists. In addition, in three scenarios supply increases by 2040, but in one it increases then decreases back to the 2012 level by 2040, which indicates that there is also a considerable range of possibilities for the likely increase in the future supply of academic pharmacists. The CfWI acknowledges that whilst its modelling for academic pharmacists is mainly dependent upon the number of pharmacy students in training, the supply of academic pharmacists also depends upon the number of postgraduate pharmacy students, of which 'there is a supply-side shortage in pharmacists qualified to enter full-time academic roles' due to a 'lack of doctoral (PhD) and postdoctoral opportunities' (MEE, 2012). The CfWI therefore recommends referring to the second work stream of the Modernising Pharmacy Careers Programme regarding this issue.

References

Bassey, R. (2012) Student trends may have implications for the future of the profession, *The Pharmaceutical Journal* [online] Available at: http://www.pjonline.com/tomorrows-pharmacist/students_corner [secure access]

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

British Pharmaceutical Students' Association. (2012) *The imbalance between pre-registration training and undergraduate pharmacy student numbers – A BPSA discussion paper.* Accessed online, February 2013 – available at: http://www.bpsa.co.uk/index.php?option=com_content&task=blogcategory&id=97&Itemid=154

Centre for Workforce Intelligence. (2011) *Pharmacy – Workforce risks and opportunities.* Accessed online, May 2013 – available at www.cfwi.org.uk

Centre for Workforce Intelligence. (2012) *Pharmacy workforce – Education commissioning risks summary from 2012.* Accessed online, May 2013 – available at www.cfwi.org.uk

Centre for Pharmacy Workforce Studies. (2010) *RPSGB Register Analyses (Briefing Papers) 2004-2010.* Accessed online, May 2013 – available at: http://www.pharmacy.manchester.ac.uk/cpws/publications/Reports/reganalyses/

Chief Scientific Adviser's Committee. (2004) Office of Science and Technology (OST)

Department of Health. (2012) *Pharmacist student numbers and reform of undergraduate education and pre-registration training in England – Progress update for MPC Professional Board members.* Accessed online, February 2013 – available at: http://www.hee.nhs.uk/work-programmes/pharmacy/pharmacist-education-and-training/

General Pharmaceutical Council. (2011) *Pharmacy student analysis 2009-2010* [not published] Available through: General Pharmaceutical Council

General Pharmaceutical Council. (2013a) *GPhC data sharing* [email] (Personal communication, 25th March 2013)

General Pharmaceutical Council. (2013b) *Pharmacist education.* Accessed online, February 2013 – available at: http://www.pharmacyregulation.org/education/pharmacist-education

General Pharmaceutical Council. (2013c) *Accredited universities for MPharm* [email] (Personal communication, 27th March 2013)

General Pharmaceutical Council. (2013d) *Registering as a pharmacist.* Accessed online, May 2013 – available at: http://www.pharmacyregulation.org/registration/registering-pharmacist

Hassell, K. (2012) *CPWS Briefing paper – GPhC Register Analysis 2011.* Accessed online, February 2013 – available at: http://www.pharmacyregulation.org/sites/default/files/Analysis%20of%20GPhC%20Pharmacist%20Register%202011.pdf

International Pharmaceutical Federation. (2012) *2012 FIP Global Pharmacy Workforce Report.* Accessed online, May 2013 – available at: http://www.fip.org/humanresources

Medical Education England. (2011a) *Modernising Pharmacy Careers Programme – Review of pharmacist undergraduate education and pre-registration training and proposals for reform – Discussion paper.* Accessed online, January 2013 – available at: https://www.wp.dh.gov.uk/healtheducationengland/files/2012/10/MPC_WSI_Discussion_Paper.pdf

Medical Education England. (2011b) *Modernising Pharmacy Careers Programme – Review of pharmacist undergraduate education and pre-registration training and proposals for reform – Report to Medical Education England Board.* Accessed online, February 2013 – available at: http://www.hee.nhs.uk/work-programmes/pharmacy/pharmacist-education-and-training/

Medical Education England. (2012) *Modernising Pharmacy Careers Programme – Review of post-registration career development of pharmacists and pharmacy technicians – Background paper.* Accessed online, May 2013 – available at: http://hee.nhs.uk/work-programmes/pharmacy/pharmacy-careers/

Porter, M. E. (1985) *Competitive Advantage: Creating and Sustaining Superior Performance,* New York: First Free Press Edition.

Royal Pharmaceutical Society of Great Britain. (2009) *Pharmacy Workforce Census 2008.* Accessed online, March 2013 – available at: http://www.rpharms.com/about-pharmacy-pdfs/census08.pdf

Royal Pharmaceutical Society. (2013) *Commission on Future Models of Care Delivered through pharmacy.* Accessed online, April 2013 – available at:

http://www.rpharms.com/models-of-care/about-the-commission.asp

The Association of the British Pharmaceutical Industry. (2010) *Employment in the pharmaceutical industry in the UK.* Accessed online, April 2012 – available at: http://www.abpi.org.uk/industry-info/knowledge-hub/uk-economy/Pages/uk-pharmaceutical-employment.aspx

The Office for National Statistics. (2013), *Population Estimates (pre-2011 methodology).* Accessed online, March 2013 – available at: http://www.ons.gov.uk/ons/publications/all-releases.html?definition=tcm:77-22371

The Pharmacy Order 2010. London: HMSO. Accessed online, March 2013 – available at: http://www.legislation.gov.uk/uksi/2010/231/made

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