CENTRE FOR WORKFORCE INTELLIGENCE

Public health scientist stocktake

A review of Public Health England's scientist workforce

March 2015

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Executive summary

The Centre for Workforce Intelligence (CfWI) was commissioned by Public Health England (PHE), the Department of Health (DH) and Health Education England (HEE) to undertake a review of the diverse range of scientists working within PHE. With rapid changes in technology and the new and broad remit of PHE, the roles and functions of science within the organisation are likely to look different over the coming years to what exists now. To support PHE, DH and HEE, in workforce planning, the CfWI has been commissioned to take a forward view of this workforce and estimate the likely size, shape and skills that will be required.

Context for this review

Public Health England (PHE) is an executive agency of the Department of Health that began operating on 1 April 2013 after a reorganisation of the National Health Service (NHS) in England, outlined in the Health and Social Care Act 2012 (UK). Employing a large number of scientists, researchers, data and intelligence specialists and public health professionals (PHE, 2013a), PHE's mission is 'to protect and improve the health and wellbeing of the population, and to reduce inequalities in health and wellbeing outcomes' (DH, 2011a).

While PHE is a relatively new organisation, many of its scientists have been employed in the same fields in previous organisations for a long time. In an era of budget austerity, enormous technological change, and transition to a new civil service organisation, it is timely to review the PHE scientist workforce with a view to assisting PHE with workforce planning. At the same time that the CfWI was undertaking this project, PHE was conducting its own strategic review, of the organisation as a whole, looking at the functions, services and potential efficiencies in PHE (PHE, 2014). The strategic review has not yet reported, but it may answer some of the questions and uncertainties raised by trying to model this workforce.

Project approach

There is a diverse and highly qualified scientist workforce in PHE. The public health scientist review looks at this workforce over the next 15 years, following the CfWI's stocktake methodology. Recognising the complex set of demand and supply factors that influence PHE scientists, our stocktake approach consists of horizon scanning, a clustering workshop, key informant interviews, and system dynamics modelling.

Our modelling is based on a single snapshot of PHE's human resources (HR) data, which limits our ability to make forecasts which draw on past trends. For future work, further snapshots might help us to identify trends in the size and composition of the workforce. The scientists are modelled as a single workforce, with specialties aligned to the Modernising Scientific Careers (MSC) programme, the education and training framework for healthcare science in the UK.

Key findings

Our horizon scanning and clustering workshop identified a high degree of uncertainty about the future demand for scientists for PHE. The large potential impact of government policy, in setting budgets, research and service delivery agenda, makes the future demand highly aligned to political influence. However, there are some factors that are more predictable, such as the increasing automation of diagnostic services, and the growth of genomics, proteomics and bioinformatics.

Our modelling suggests that if recruitment and attrition remain as they have been in recent years, the number of scientists in PHE is likely to remain relatively stable over the coming 15 years. However changes to recruitment patterns or retirement rates will change this outlook. Our supply forecasts take into account participation rate, estimated joiners, and leavers based on historical trends that could be extracted from the dataset, and on likely retirements. Likewise our demand analysis suggests that the demand for public health scientists is likely to remain relatively stable, with a variety of factors, including the health of the public and growth in big data likely to have an equalising effect on overall numbers. Our horizon scanning and key informant interviews indicate that within this workforce, the skill mix is likely to change, with possibly a

reduction in the number of senior posts in life sciences (as processes become more automated), and a growth in demand for scientists trained in informatics.

It is noted however, that future government policy, and its impact on this workforce is impossible to predict. Political influence was voted by scientists as having the greatest impact on the future of the workforce, while also having the greatest level of uncertainty.

Summary of suggestions for Public Health England

Based on our wide consultation with scientists in PHE, the CfWI makes the following suggestions for PHE's consideration with regards to workforce planning, development and support for scientists.

Short-term suggestions (next 1-2 years)

- **Continued support of scientific career development.** Continued support of education, training and continuing professional development (CPD) for scientists, including support to attend conferences, and creation of professional networks.
- **Increased secondment opportunities.** To enhance the flexibility of the workforce, the CfWI suggests that PHE considers a rotational programme for junior scientists, where appropriate, to give staff exposure to the wide range of public health issues and practices.
- **Increased profile of scientific functions in PHE**. Including the introduction of a scientific stream at the PHE annual conference, improved visibility of scientific functions on the PHE website and greater inclusion of science in PHE's internal and public messaging.
- **Review and update emergency response plans.** Review PHE's internal surge capacity in priority skill sets and response to national or international incidents.
- **Succession planning.** To maintain the level of expertise in senior scientific staff, investment needs to be made in training scientists to a high standard, and supporting staff through career development.
- **Review scientific representation on the PHE executive**. PHE may wish to review scientific representation on their executive to ensure there is a professional lead and advocate for the diverse scientists in the organisation. PHE's scientists are currently beyond the remit of the Chief Scientific Officer; however strong leadership and representation through a head of profession or equivalent is important for scientists in PHE.

Longer-term suggestions (next 3-5 years and beyond)

- **Expanding the skill set of microbiologists in genomics, computer science and bioinformatics.** PHE is expected to become increasingly dependent on its ability to analyse large quantities of data. There is an opportunity for PHE to develop its own informatics workforce with a deep understanding of infectious diseases, by training existing laboratory staff in informatics, through the MSC programme.
- **Modernising Scientific Careers.** There is scope for further consultation on, and promotion of, MSC. In particular in relation to development opportunities for the current workforce.

These initiatives may help PHE meet the challenges it faces in this time of budget austerity, enormous technological change, and transition to a new civil service organisation.

1. Introduction and context

1.1 Why this review?

The decisions we make today about skill mix, training places and operational models will all impact on whether the health, social care and public health workforces of the future are able to manage the key challenges of our changing society, particularly the rapidly ageing population coping with multiple long-term conditions. Strategic workforce planning is central to ensuring the system can meet these needs by reconfiguring the workforce to deliver better health and social care outcomes in the future.

The Centre for Workforce Intelligence (CfWI) supports long-term and strategic scenario planning for the whole health and social care workforce, based on research, evidence and analysis. The CfWI has been commissioned to undertake a review of the diverse range of scientists working within Public Health England (PHE). With rapid changes in technology and the new and broad remit of PHE, the roles and function of science within the organisation are likely to look different over the coming years to what exists now. To support PHE, Health Education England (HEE) and the Department of Health (DH) in workforce planning, the CfWI has been commissioned to take a five-year view of this workforce and estimate the likely size, shape and skills that will be required.

Our objectives are to:

1. Document the existing PHE scientific workforce, encompassing those working at all levels, with reference to frameworks including the *Public Health Skills and Knowledge Framework* and the *NHS Knowledge and Skills Frameworks.*
2. Describe existing training and career pathways for scientists in PHE.
3. Identify drivers of demand and supply of scientists within PHE, looking ahead 15 years to 2029 focusing on high impact, high uncertainty, drivers.
4. Model current and forecast demand and supply for PHE's scientist workforce.
5. Make recommendations for workforce planning, including training numbers needed to ensure an appropriate supply of adequately trained public health scientists in the medium term.

The purpose of the Public Health Scientists Review is to provide information to support evidence-based planning for the scientist workforce at PHE over the medium term.

1.2 Shape of the report

The review has two distinct components: the documentation of the existing workforce; and forecasting future workforce demand and supply.

Section 1, this **Introduction and context** sets out the policy and technological context under which the CfWI was commissioned to conduct this project. We describe the formation of PHE as the executive agency with responsibility for health protection, health improvement and addressing inequalities in health. This section also outlines some of the technological changes that are set to change the shape of service delivery and research in public health science, and the introduction of the Modernising Scientific Careers (MSC) programme for healthcare science training and career progression in the NHS.

In Section 2, **Current workforce**, sets out the existing scientist workforce in PHE, describing some of the vast variety of functions undertaken by scientists within the organisation. We discuss education and training, alignment to the MSC programme, and current registration requirements.

Section 3 describes the CfWI's **Workforce planning approach** as applied to the PHE scientist workforce. This includes horizon scanning, cluster workshop, key informant interviews and system dynamic modelling.

Finally, in Section 4, **Scientist workforce projections** sets out the project findings, conclusions and discussion of the implications and suggestions for PHE's consideration.

1.3 Formation of Public Health England

Public Health England (PHE) began operating on 1 April 2013, as an executive agency of the Department of Health with the mission to 'to protect and improve the nation's health and to address inequalities' (PHE, 2013a). The *Health and Social Care Act 2012* (UK) outlined the reorganisation of the National Health Service (NHS) in England, including the formation of PHE, a national agency to provide leadership in health protection and health promotion, and Health Education England (HEE) with oversight and leadership in professional education and training in the health sector (DH, 2012a).

PHE consolidated scientists, researchers, public health professionals and administrators from more than 130 organisations – the largest being the Health Protection Agency (HPA) (PHE, 2013b). The research and reference functions of the HPA, including infectious disease surveillance, control and response, environmental hazards such as chemicals and radiation; and biological medicines and vaccine development; were transferred to PHE together with expertise in non-communicable diseases, health and wellbeing (HPA, 2013).

PHE is responsible for:

- making the public healthier by encouraging discussions, advising government and supporting action by local government, the NHS and other people and organisations,
- supporting the public so they can protect and improve their own health,
- protecting the nation's health through the national health protection service, and preparing for public health emergencies,
- sharing information and expertise with local authorities, industry and the NHS, to help them make improvements in the public's health,
- researching, collecting and analysing data to improve understanding of health and come up with answers to public health problems, and
- reporting on improvements in the public's health so everyone can understand the challenge and the next steps.

The enormity of the functions of PHE can be demonstrated through the diversity of the divisions that span its eight directorates (DH, 2012b):

Health protection directorate:

Emergency response
Field epidemiology
Infectious disease surveillance and control
Public health strategy
Centre for Radiation, Chemical and Environmental hazards (CRCE)

Strategy directorate

Strategy unit
Communications
Corporate governance
Advisory board secretariat and planning
Legal services
Security, quality and sustainability

Health improvement and population health directorate:

Health and wellbeing improvement programmes
Wellbeing and inequalities
Drugs and alcohol
Social marketing
Healthcare services
English screening programmes
National cancer screening programmes
Business and planning

Knowledge and intelligence directorate:

National Cancer Intelligence Network
Drug treatment monitoring
Disease registration
Evidence and intelligence service
Research and development office
Business and planning

Operations directorate:

Four regional centres: London, South of England, Midlands and East of England, North of England
Operational delivery
Health and safety
Microbiology services
- Reference microbiology services
- Microbiology research services
- Microbiology development and production
- Specialist microbiology services
- Microbiology operations

Chrysalis programme

Programmes directorate

Finance and corporate services directorate

Finance
Corporate services programmes
Information technology services
Estates and facilities
Business development
Internal audit

Human resources directorate

Strategic human resources
Human resources services to directorates
Transactional and medical HR services
Occupational health
Professional workforce planning and development

Many of the directorates and divisions employ scientists, several of whom were performing the same function in a different organisation prior to the formation of PHE in 2013 (the breakdown of scientists by directorate as included in this report is at **Appendix B**). In addition to the large number of microbiologists working in diagnostic functions in regional laboratories, reference facilities, or research and development positions, there are scientists working across PHE to deliver best-practice, evidence-based service delivery and policy advice. Some examples include: championing behavioural science research and application in the health improvement and population health directorate; monitoring infectious disease or environmental hazards in the health protection directorate; or leading in the interpretation of scientific evidence and expert advice to inform government policy (DH, 2012b).

The formation of a new agency in PHE happened at a time of rapid change to the delivery of many of the scientific functions that PHE assumed from its predecessor organisations. Some of these changes are described below, and discussed further in section 4.1.

1.4 Changes in service delivery

In recent years, there has been a significant change in the pattern of service delivery – particularly in clinical microbiology – driven by financial austerity and advances in IT, molecular diagnostics and laboratory automation (RAND Europe, 2013). Consolidation of laboratories providing clinical diagnostic services has meant that instead of each hospital trust having its own microbiology laboratory, the trend is towards clusters of trusts sharing one laboratory. This has had an impact on the relative numbers of staff in various workforce categories (e.g. medical, clinical scientist, biomedical scientist). PHE is also responsible for monitoring national infectious disease outbreaks in England (e.g. influenza, noroviruses, TB) and providing reference laboratories alongside cutting edge research.

1.5 Technological change: genomics, automation

Molecular diagnostic methods, automation and advances in IT are likely to facilitate changes in service delivery in the future. Advances in genomic technology and a reduction in the costs associated with genome sequencing has revolutionised microbial identification and outbreak investigation, and we expect this trend to continue (McCartney, 2014). Automation has not only facilitated the consolidation of laboratory services but also ensured increasing accuracy of patient results, with automated diagnostic machines being interfaced with hospital patient IT systems. These changes have impacted, and will increasingly impact in the future, on the training and the skills mix required for medical, clinical scientists and biomedical staff who provide diagnostic, reference laboratory and outbreak investigation services. These changes have required a new approach to staff training, which resulted in the Modernising Scientific Careers programme.

1.6 Modernising Scientific Careers

The Modernising Scientific Careers (MSC) programme is a UK-wide government initiative to address the training and education needs of the whole healthcare science workforce in the NHS (DH, 2011b). This aims to provide flexibility, sustainability and modern career pathways for healthcare scientists, so that the workforce meets the current and future needs of the health system. MSC is a joint initiative of the four health departments of the UK providing a training structure for the 50,000 plus individuals working in healthcare science in the NHS and a coherent framework across all healthcare science disciplines.

MSC is designed to simplify career structures for those in healthcare science, providing greater alignment with the career pathways of other professions in healthcare. It provides a new simplified healthcare science career pathway at all stages of the career framework and new training and education programmes, incorporating both academic and workplace-based training. MSC includes principles of a balance between broad-based and specialist skills and knowledge. In the early training there is less emphasis on developing expertise in a single specialism, with greater specialisation developing in more advanced, post-graduate programmes. The intent is to develop a skilled yet flexible workforce (DH, 2010a and 2010b).

While MSC education and training programmes were initially focused on those working in healthcare science in the NHS, PHE is currently working with the HEE MSC team to develop or adapt curricula to implement the programme for scientists within PHE (DH, 2014).

The new MSC career pathway has four stages (NHS Employers, 2014):

- Assistant and associate training – vocational qualifications to provide the necessary skills for **scientific support roles**
- Practitioner Training Programme (PTP) – a three year undergraduate Bachelor of Science degree (BSc Hons), with eligibility to apply to join the Professional Standards Authority (PSA) accredited register held by the Academy for Healthcare Science (AHCS) and subsequently apply for healthcare **science practitioner** positions
- Scientist Training Programme (STP) – a three year postgraduate Master of Clinical Science degree (MSc), leading to registration with the Health and Care Professions Council (HCPC) as a **clinical scientist**
- Higher Specialist Scientific Training (HSST) – a five year doctoral level training programme leading to eligibility for **consultant clinical scientist** positions, following registration on the AHCS's Higher Specialist Scientist register.

In addition, there is a formal Continuing Personal and Professional Development (CPPD) programme emerging – **Accredited Scientific Practice (ASP)** – which allows those in the workforce to develop new and often very specialised/expert skills to address specific workforce needs. This will operate at all levels of the career framework.

2. Current workforce

This review includes all scientists working in PHE, regardless of where they sit on the *Public Health Skills and Knowledge Framework* (Skills for Health, 2008 and PHORCaST, 2013). The data for this project is from PHE's HR systems and is a snapshot of the scientists in PHE on 31 January 2014. Time-series data is not available as PHE is a relatively new organisation.

2.1 Definition of scientist used in this report

PHE staff were **classified as scientists** if they met the following criteria:

- employed at *Agenda for Change* (AfC) Band 5 and above (or equivalent civil service pay scale)

  and either

- staff group, job role, or position title contains the word 'scientist', 'technician', 'research', or a scientific discipline, including but not limited to laboratories, microbiologist, epidemiology, technologist, toxicologist, virologist, radiation, statistics

  or

- their occupation code was a 'T classification' (note that the electronic staff record (ESR) codes have been updated and T classifications are now out of date).

There were approximately 10 staff who did not meet the above criteria for staff group, job role, position title or occupation code, but who were known by PHE to be in a technical or scientific role, generally in management or research and managing scientific teams, where their scientific expertise was key to successful delivery of work objectives. These were included on an ad hoc basis where identified by PHE to create a dataset as complete as possible.

2.2 Data elements for workforce description

There were 1,613 scientists' records extracted from the PHE HR database, provided to CfWI for analysis and modelling in this report.

The table below outlines the data elements identified in the model specification for the descriptive analysis of PHE scientists, as well as the existing numbers in PHE.

Table 1: Data elements identified in the model specification

Data element	Description	Modifications	PHE scientist workforce	
Age	Age in years at 31 January 2014, created by PHE from date of birth recorded in HR system	Grouped in 5 year age bands	**Age (years)**	**Number**
			20-24	42
			25-29	194
			30-34	329
			35-39	258
			40-44	213
			45-49	183
			50-54	187
			55-59	137
			60-64	60
			65+	10
Gender	Male or female	-	**Gender**	**Number**
			Male	619
			Female	994
FTE	Full time equivalent (FTE) based on contracted hours provided by PHE from HR system	Grouped to nearest 0.1 FTE	FTE	Number
			0.1	0
			0.2	4
			0.3	0
			0.4	13
			0.5	24
			0.6	53
			0.7	23
			0.8	67
			0.9	24
			1.0	1,405
Grade	Non- *Agenda for Change* (AfC) terms and conditions, legacy from sender organisations, converted to AfC equivalent by PHE	Grouped Band 8 into A/B and C/D	Band 5	269
			Band 6	426
			Band 7	466
			Band 8 A/B	315
			Band 8 C/D	123
			Band 9	14
Specialism	Not specified	See discussion below		
Length of service	Calculated by CfWI based on earliest date: Start date in position Latest hire date Date of joining NHS	Grouped	**Length of service**	**Number**
			<3 months	63
			3-12 months	99
			1-3 years	102
			3-5 years	214
			5-10 years	399
			10-15 years	309
			15-20 years	101
			20+ years	326
Assignment category	Permanent or fixed term	-	**Assignment**	**Number**
			Permanent	1,452
			Fixed term	161

Source: CfWI analysis of PHE HR data

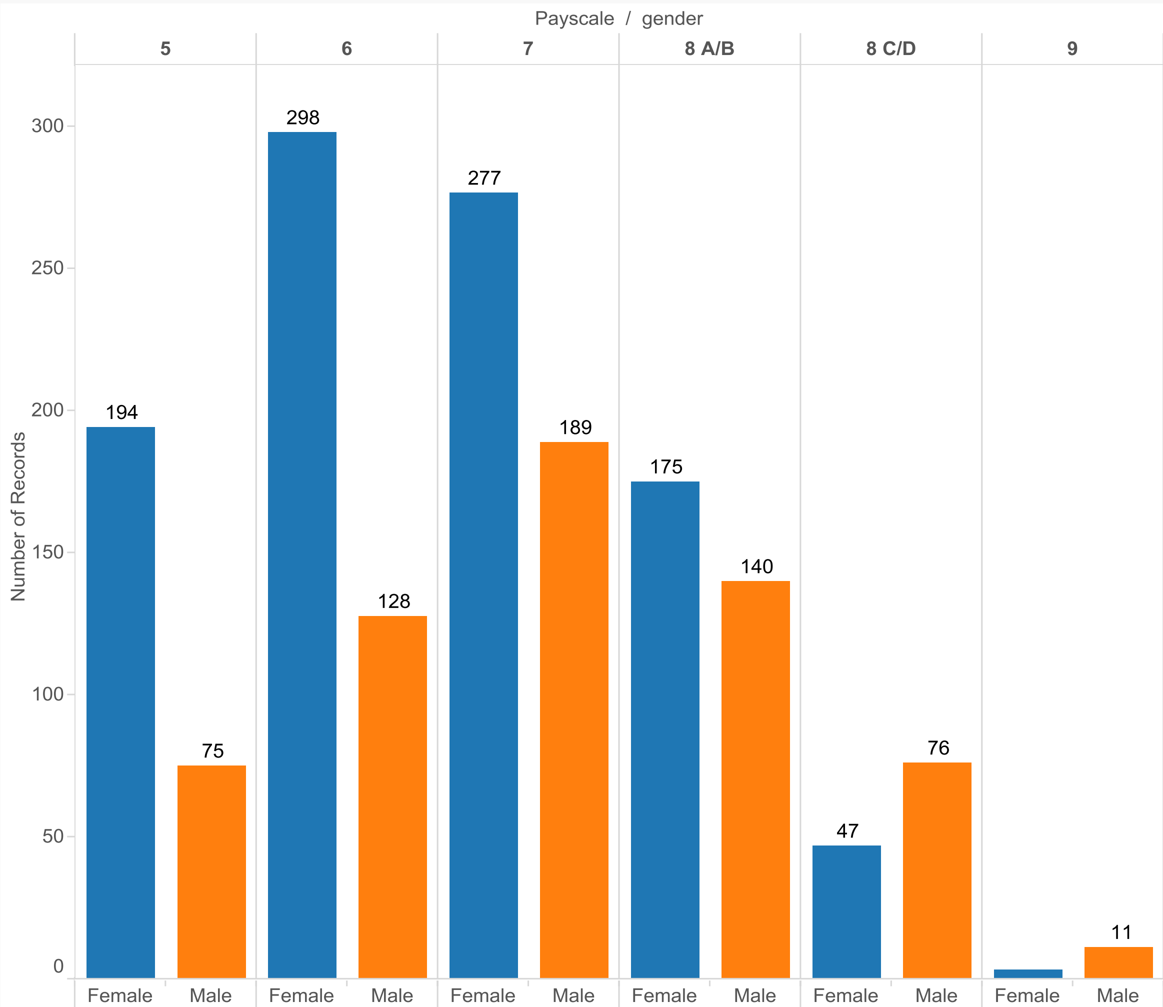
2.3 Summary description of the PHE scientist workforce:

- Approximately 60 per cent of PHE's scientist staff are women.
- Most of PHE's scientists are relatively young with 75 per cent aged younger than 50 years.
- Four per cent of PHE's scientists are aged 60 years or older.
- Most scientists are AfC bands 5-7 (over 70 per cent).
- PHE's scientists are predominately full time (87 per cent) and predominantly permanent (90 per cent).

Figure 1 shows the current scientist workforce at PHE by gender and by pay grade.

Figure 1: PHE scientist workforce by AfC pay grade and sex

Number of scientist staff in PHE on 31 January 2014, by sex and Agenda for Change (AfC) or equivalent pay grade

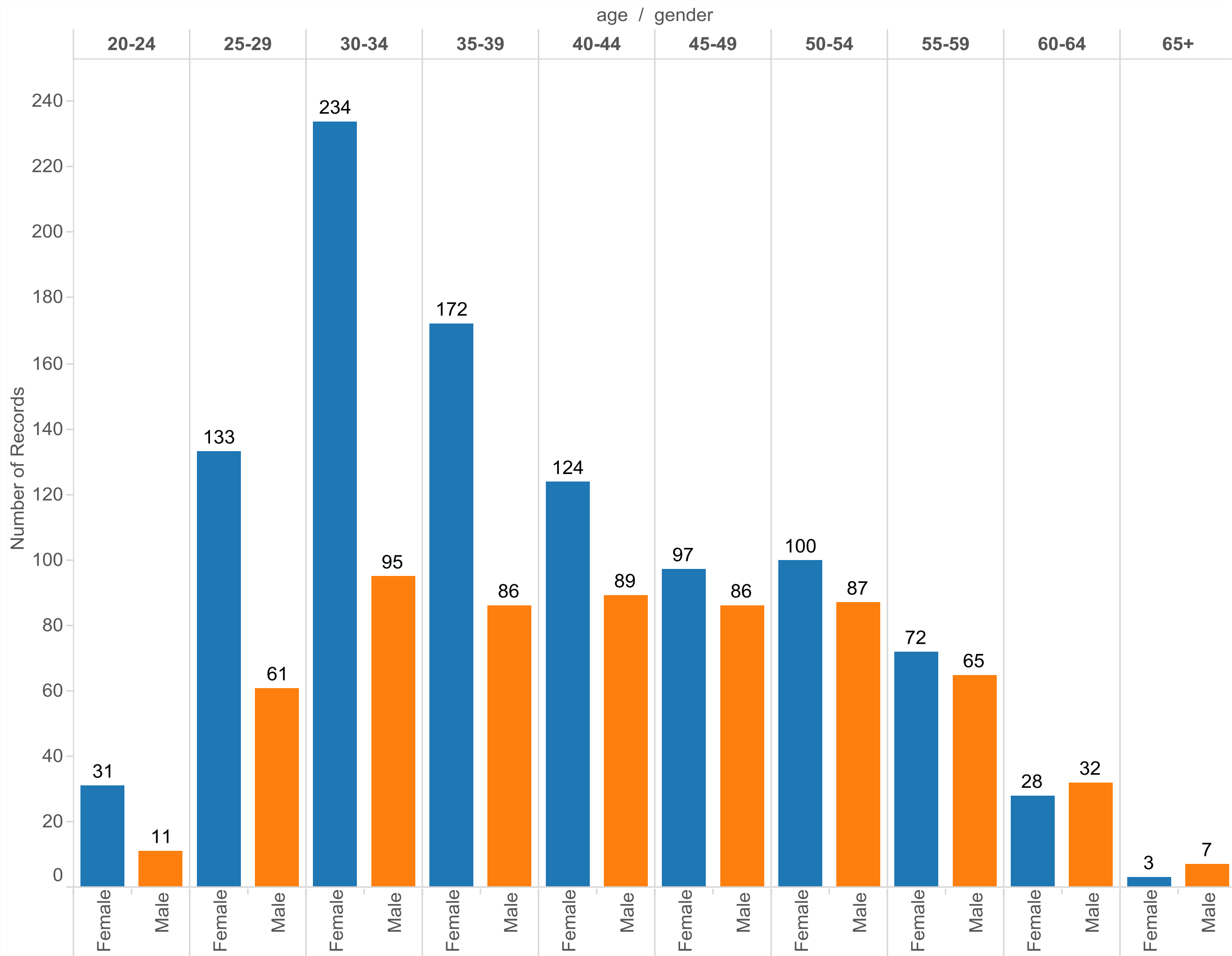


Source: CfWI analysis of PHE HR data

Women appear to be over represented at the lower pay grades (5 and 6) compared to the overall workforce gender balance. Likewise, men, who make up 40 per cent of the PHE scientists, fill more of the senior scientist positions in PHE. This may be explained by the large proportion of younger women scientist staff in PHE as demonstrated in the next chart, Figure 2.

Figure 2: PHE scientist workforce by age and sex

Number of scientist staff in PHE 31 January 2014, by age and sex



Source: CfWI analysis of PHE HR data

There are similar numbers of men and women at older age brackets in the PHE scientist workforce. Of the younger scientists in PHE, many more are women than men.

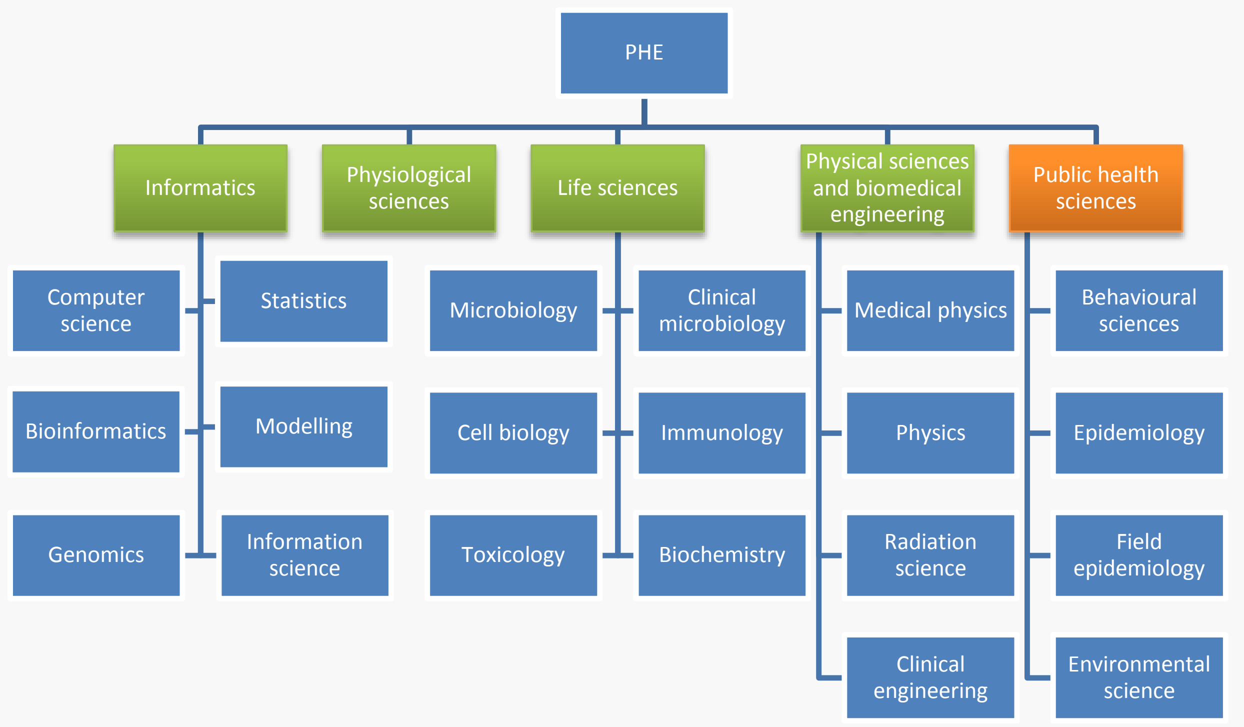
2.4 Categorisation by specialism

We modelled the PHE scientist workforce as a single workforce, taking into account identified trends that will impact the various segments of this workforce at different rates. We classified scientists by discipline with the intention of creating categories where scientists have broadly similar skills and would enter through comparable training pathways. This classification was an iterative process in consultation with PHE scientists, HEE and other experts.

Figure 3 demonstrates the identified specialisms and how the CfWI mapped them to MSC higher knowledge/skills categories.

Figure 3: PHE scientific specialties mapped to MSC

PHE scientific disciplines mapped to the Modernising Scientific Careers (MSC) structure. Public health science is a CfWI construct for specialties that did not neatly fit into the MSC divisions.



Source: CfWI

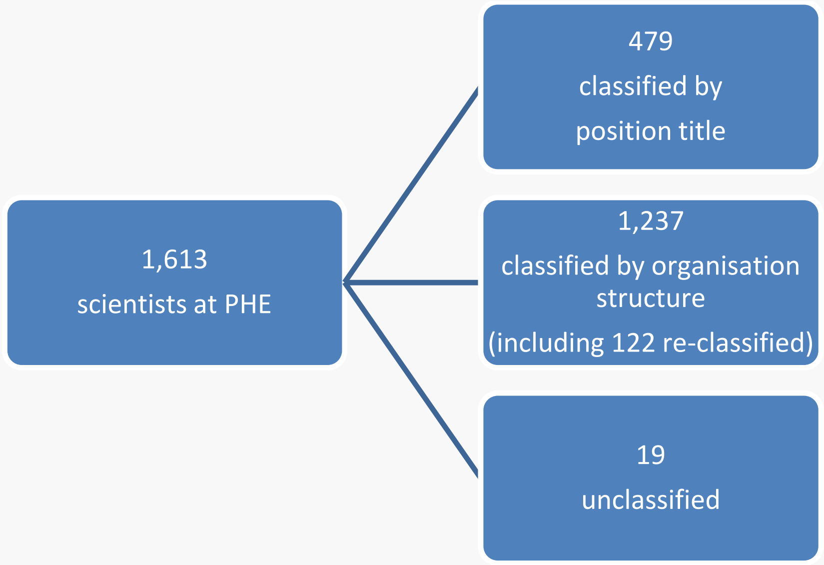
Following the general principles outlined above, job titles provided in the PHE HR dataset were mapped to a specialty, where the position title was descriptive enough to be able to identify the type of science. The types of position titles and their allocation to scientific discipline are listed in **Appendix C**. Where the position title was generic and a specialty could not be assigned, the CfWI examined the organisational structure to assess the specialty that a person was likely to be working in.

2.4.1 Classification process

The first iteration of classification examined the position title of each scientist to allocate them to a scientific specialty. A total of 479 of the 1,613 scientists at PHE were allocated to a specialty in this way. The majority of the remaining scientists were classified in the second phase, using organisational structure information, with 19 remaining unclassified (Figure 4).

Figure 4: Classifiying PHE scientists

The CfWI classified scientists at PHE based on HR data, using position title in the first instance, or organisation structure.



Source: CfWI

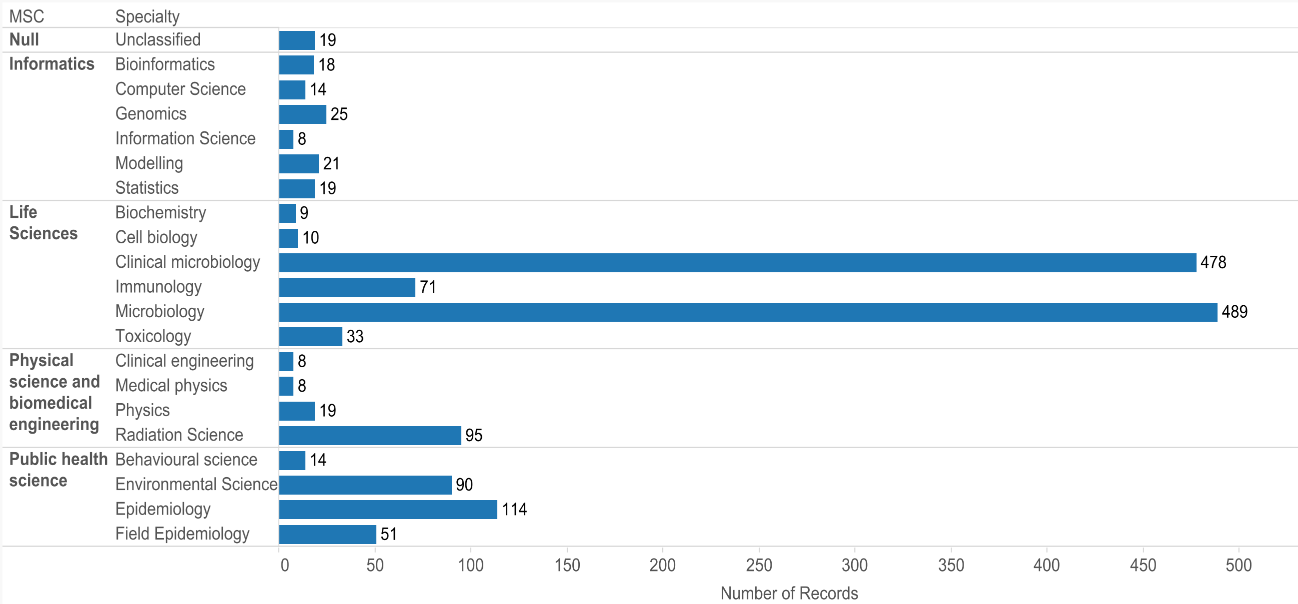
There were 490 unique position titles recorded in the HR system data, and this process was able to allocate 290 position titles (representing 479 scientists) to a specialty. Of the PHE scientists who were not allocated to a specialism based on their position title, the second stage was to assess the likely area of science they worked in based on organisational structure information. The CfWI worked with members of the PHE Science Forum to test the assumptions made in mapping scientists to specialty areas, and to ensure that the allocation was broadly sensible. The assumptions made in mapping position titles and organisational level information to specialty is at **Appendix C**.

2.5 Summary of existing workforce

The following chart shows the preliminary results of the classification process described above. The majority of PHE scientists specialise in life sciences (1,100 – of which approximately 900 work in the field of microbiology/reference microbiology).

Figure 5: PHE scientist workforce by specialism

The CfWI classified scientists at PHE based on a snapshot of PHE's HR data, 31 January 2014. Specialties are grouped by Modernising Scientific Careers (MSC) divisions.



Source: CfWI analysis of PHE HR data

There are still a number (19) of scientists that we are unable to classify using this process, however given the nature of the dataset (being an organisational HR dataset), and the wide range of skills employed in public health and at PHE, it is unlikely that this process will be able to accurately code every scientist. While the coding process outlined above is unlikely to have resulted in an exact allocation to specialty, the CfWI is confident following consultation of scientific managers within PHE, we have a classification system that approximates the workforce.

2.5.1 Microbiology services in PHE

The majority of PHE scientists are microbiologists. PHE provides three main types of microbiology services:

- **Regional public health laboratories** – are based in large NHS trusts, where specialist clinical departments require specialist microbiology support. They provide clinical diagnostic microbiology, virology and molecular services alongside specialist advice and support for the investigation of outbreaks and incidents. They provide support for bioterrorism incidents and serious epidemics (e.g. pandemic influenza). They also perform research and development work to support the continual improvement of diagnostic services and disease research both locally and in collaboration with other parts of PHE and academic institutions.
- **Specialist and reference microbiology laboratories** – mostly based in Colindale, are world-class centres of expertise, with cutting edge technologies providing expert specialist clinical diagnostic services and outbreak investigation support as well as cutting edge scientific research, development and innovation. They provide specialist laboratory diagnostic services for low incidence, high risk infections (e.g. the Ebola virus), including antimicrobial resistance. They also detect epidemiological

shifts, newly emerging pathogens and antimicrobial resistance through horizon scanning and specialist investigative science.

- **Microbiology manufacturing capabilities** – largely based in Porton, Wiltshire, PHE has facilities to develop and manufacture biopharmaceutical products. Most of these are for commercial partners such as biotechnology and pharmaceutical companies in Europe and the USA. Translational development services are also provided to the UK pharmaceutical industry and to the USA and French governments on a commercial basis.

2.5.2 Education and training

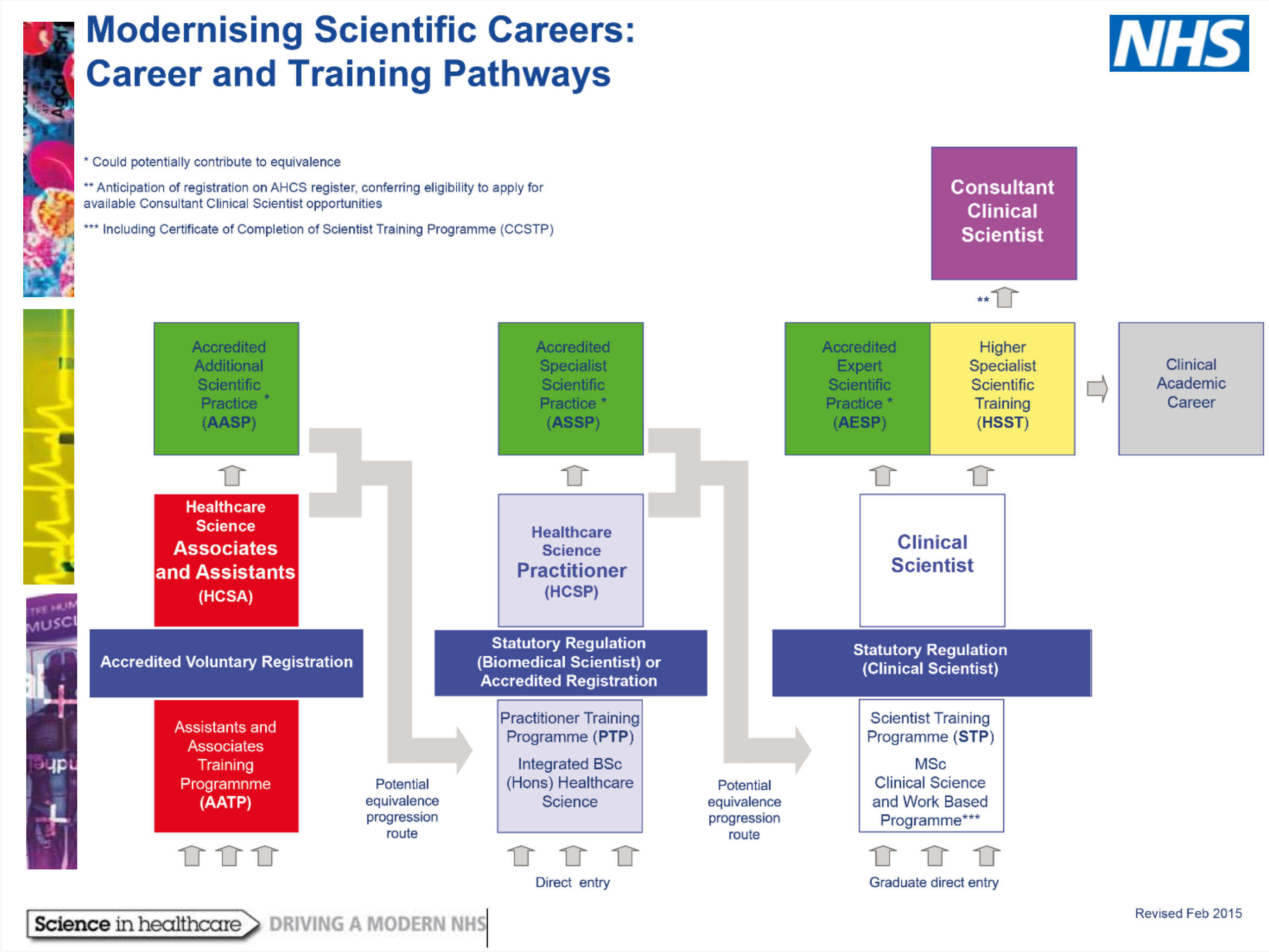
Education and training for scientific staff working in PHE is complex, because there are many different types of staff, often working in specialist areas, requiring specialist training. Historically, scientists have joined PHE and its legacy organisations from diverse academic and career backgrounds. Of the scientists who took part in the key informant interviews for this project, approximately a third joined PHE with post-doctoral experience.

While there are some specialised areas of PHE that will continue to need to recruit highly qualified staff from academia or industry, the new **Modernising Scientific Careers** (MSC) programme provides a training and career pathway for most of the scientists working in PHE.

MSC training programmes are available at all stages and it is potentially possible for a member of staff to progress from Assistant or Associate grade to a Consultant Clinical Scientist role, provided they are successful in the four stages of training and their career progression supports PHE's operational requirements. Figure 6 shows the MSC career and training pathways (HEE, 2014).

Figure 6: Modernising Scientific Careers framework

This diagram demonstrates training and career pathways for the Modernising Scientific Careers programme, from Healthcare Science Associate and Assistant, to Consultant Clinical Scientist.



Source: HEE, 2014

Biomedical Scientists (BMS) perform routine laboratory diagnostic work and some undertake research and development. *Biomedical Scientist* is a protected title and Biomedical Scientists practising in the UK must be registered with the Health and Care Professions Council (HCPC). To be eligible to apply to become registered with the HCPC as a Biomedical Scientist, scientists need to demonstrate that they meet the HCPC's standards of proficiency. There are a number of ways this can be achieved. One way is to successfully complete the Practitioner Training Programme (PTP) shown in the MSC career and training programme diagram (Figure 6). Meeting these standards will ensure that the practice of biomedical science is conducted in a safe, effective and lawful manner and protects members of the public.

Clinical Scientists perform routine clinical diagnostic work, including interpretation of results, or undertake research and development studies. They are also state registered by the HCPC under the protected title of *Clinical Scientist*. To be eligible to apply to become registered with the HCPC as a Clinical Scientist, scientists need to demonstrate that they meet the HCPC's standards of proficiency. There are a number of ways this can be achieved. One way is to successfully complete the Scientist Training Programme (STP) shown in the MSC career and training programme diagram (Figure 6). Some Clinical Scientists perform duties similar to those undertaken by medical staff in clinical microbiology laboratories, interpreting diagnostic test results and giving clinical advice.

Some Clinical Scientists may go on to undertake Higher Specialist Scientist Training, which will make them eligible to apply for available Consultant Clinical Scientist posts. In the field of life sciences, completion of HSST requires successful completion of the Fellowship examination (FRCPath) of the Royal College of Pathologists (RCPath). HSST training is available in the following specialties:

- analytical toxicology
- clinical biochemistry
- clinical immunology
- reproductive science
- haematology
- histocompatibility and immunogenetics
- genetics
- microbiology
- molecular pathology of acquired disease
- molecular pathology of infection
- virology.

Scientists who work in the physical or physiological sciences can also undertake HSST training through curricula, which have been developed through the facilitation of some of the other medical royal colleges.

Public health specialty training is an alternative option for scientists seeking a broad-based grounding in public health. Another option, to become a public health consultant or specialist, is through the portfolio route, described below.

For specialty training, the Faculty of Public Health (FPH, 2010) sets out the knowledge and skills required, and specifically outlines the individual learning outcomes which need to be achieved during the training programme. Once a candidate has passed both FPH examinations and demonstrated the skills required by the curriculum, candidates can register with the UK Public Health Register (UKPHR).

For the portfolio route, individuals present a portfolio of experience for assessment, to demonstrate that they have gained sufficient experience despite not completing specialty training. The portfolio is then considered for acceptance by the UKPHR (FPH, LGA and PHE, 2013).

PHE also runs its own training programmes. The **UK Field Epidemiology Training Programme** is a two-year postgraduate degree following the European Programme for Intervention Epidemiology Training (EPIET) curriculum, and consists of 12 mandatory and two optional modules. PHE is also a provider of a number of short training courses in radiation protection; biosafety, containment and applied microbiology; cell cultures; and emergency preparedness and response.

2.5.3 Registration

As outlined above, *biomedical scientist* and *clinical scientist* are protected titles, and individuals must be registered with the Health and Care Professions Council (HCPC). This registration is a legal requirement for scientists working with patient samples performing diagnostic functions. For most other scientists in PHE, professional registration is optional, although increasingly there is a drive for individuals to join registers which may become accredited through the PSA.

Like the diversity of functions, training backgrounds and career paths of scientists in PHE, there is a wide range of voluntary professional registration options available. Some of these memberships include:

- Association for Nutrition (Registered Nutritionist)
- Society for Biology (Chartered Biologist)
- Institute of Physics (Chartered Physicist)
- Institute of Physics and Engineering in Medicine (Chartered Scientist, Chartered Engineer, Registered Scientist)
- Society for Radiological Protection (Chartered Radiation Protection Professional) and
- Chartered Institute of Environmental Health (Chartered Environmental Health Practitioner).

In addition, other professional registration programmes may be open to PHE scientists depending on their training and eligibility, including the UK Public Health Register (UKPHR, Public Health Practitioner or Public Health Specialist).

2.6 Current issues and priorities

Good career progression and succession planning are important aspects of building and maintaining a fulfilled and contented workforce. A particular challenge for PHE includes balancing the need for highly specialist expertise, with the need for a workforce that is adaptable and able to respond effectively to current and new health challenges, or rare or unpredictable health emergencies.

Some scientists reported that career progression and succession planning is done quite well in their areas although that appears to be dependent on a few individuals. However most of the scientists we spoke to in PHE felt that both career progression and succession planning could be done much better. This is made more difficult by the fact that many scientists in PHE work in very specialised areas and as highly skilled staff, they need to undertake lengthy training courses in order to gain the necessary competences (three years for PTP training, three years for STP training and five years for HSST training). Some staff need to have broad-based skills, but many need to be leading experts in a narrow scientific field, performing national reference laboratory functions. There needs to be preparedness for low prevalence public health emergency events (e.g. an outbreak of the Ebola virus or pandemic influenza). These are all challenges for PHE in balancing their scientific workforce for both flexibility and national expertise. These issues are discussed further in Section 3.5.

3. Workforce planning approach

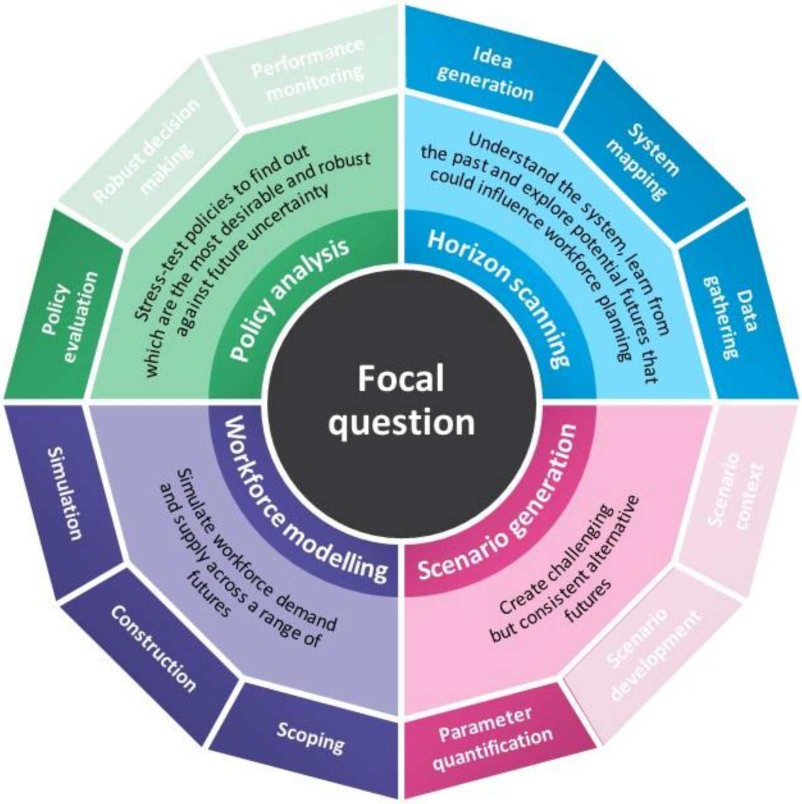
A CfWI workforce stocktake investigates the current demand and supply for a workforce and explores how this is expected to change over a specified period of time. The public health scientists' review looks at this workforce over the next 15 years. Recognising the complex set of demand and supply factors that influence PHE scientists, our review approach consisted of horizon scanning, a clustering workshop, key informant interviews and system dynamics modelling.

3.1 Overview

The CfWI robust workforce planning approach (outlined in Figure 7 below) recognises the complexities of factors influencing demand and supply, and the intrinsic uncertainty of the future. Our modelling shows the likely impact of uncertain variables on both the demand and supply of PHE's scientist workforce.

Figure 7: The CfWI robust workforce planning framework for stocktakes

For stocktake reviews, the CfWI does not undertake the areas faded out in this diagram.



Source: CfWI

3.2 Stakeholder engagement

The CfWI consulted widely with scientists at PHE to gather a range of views and perspectives, and to try to understand the career and training pathways in PHE. The PHE Science Forum, whose membership spans across various scientific disciplines in PHE (DH, 2014), was updated regularly on the progress of this project and facilitated engagement with scientists more widely in PHE.

In addition to 16 horizon scanning interviews, the CfWI conducted 71 interviews with PHE scientists about their training and career pathways, and a further nine interviews with laboratory or scientific managers about their recruitment intentions over the coming five years. The CfWI also held two workshops in conjunction with PHE – one to cluster the driving forces for workforce change, and the second to test the model data and assumptions. The CfWI also received written submissions from PHE scientists who were unable to participate in the interviews. The full list of project participants is at **Appendix A**.

3.3 Horizon scanning

The CfWI's workforce planning approach starts with horizon scanning. Horizon scanning is 'the systematic examination of potential threats, opportunities, and likely future developments including but not restricted to those at the margins of current thinking and planning' (Chief Scientific Advisor's Committee, 2004). The CfWI's horizon scanning vision is to generate high quality intelligence to inform long-range workforce planning.

In March 2014, the CfWI interviewed 16 public health science stakeholders by telephone or face-to-face, to identify the factors that may impact on the demand and supply for scientists in PHE over the coming 15 years to 2029. Stakeholders were asked about potential technological, economic, environmental, political, social and ethical (TEEPSE) challenges, opportunities and likely future developments, and asked to provide supporting evidence if available. These interviews identified a number of factors ranging, from an increased need for multidisciplinary approaches to problem solving, to the impact of genomics, proteomics and the 100,000 Genomes Project to discover treatments for cancer and rare genetic diseases.

Overall, political and technological drivers were the most frequently mentioned by our horizon scanning participants, followed by changes to the delivery model in PHE and economic drivers. The key drivers for workforce change are discussed in Section 4 of this report. A summary of the key drivers identified by our interviewees (both trends and uncertainties) can be found at **Appendix D.**

3.4 Cluster workshop

Following the horizon scanning interviews, the CfWI held a clustering workshop, where the driving factors for workforce change were considered in more depth. The workshop was attended by 13 delegates invited by PHE and the CfWI and drawn from a range of different scientific disciplines and organisations. The majority of the participants were scientists and managers from within PHE, many of whom are members of the PHE Science Forum.

A CfWI stocktake generates a set of clusters to inform the modelling and forecasting of future workforce demand and supply. A cluster is a coherently defined set of factors and driving forces linked through cause-and-effect relationships that describe an aspect of the system under investigation. This encapsulates all the key factors and driving forces that will impact upon the key focal issue.

The coherence of a cluster can be tested by:

- ensuring each factor and driving force in the cluster is linked by causality and/or chronological dependence
- naming the cluster with a higher-level name that encapsulates the essence of the cluster.

A cluster should not include the direction of changes to the factors and driving forces.

The cluster workshop identified a broad range of driving forces for change within PHE's scientist workforce, building on the factors identified through horizon scanning interviews. The development of clusters described how these factors relate to and impact one another. Participants created seven clusters of driving forces for change in the workforce, to show how different factors and forces may interact to create extreme, but plausible outcomes. These clusters help the CfWI to understand the driving forces of demand and supply in the PHE scientist workforce and will inform CfWI's model specification and forecasting of future demand and supply. The clusters that were voted by participants to have the highest impact and uncertainty are described in Section 4 of this report.

3.5 Recruitment intentions interviews

To attempt to quantify workforce attrition and expected joiners for our model, the CfWI undertook a series of short interviews with laboratory and microbiology services managers. These nine interviews discussed the anticipated impact of automation, whole genome sequencing, changes in scientists' terms and conditions, the creation of the Science Hub and PHE's likely future remit: solely service delivery or a focus on research. The findings of which informed our workforce modelling.

3.6 Key informant interviews

To better understand the workforce, the CfWI invited scientists in PHE to participate in key informant interviews, where we explored the training and development needs of the workforce and the conditions that create a rewarding workplace for scientists. In total, the CfWI conducted 71 key informant interviews, mostly over the phone, although some were face-to-face at Colindale or Whitechapel laboratories in London.

These interviews sought to answer the core questions that could not be answered through analysis of existing data. The interviews were also used to quality assure the work of the CfWI during the course of the project and to test our understanding of the workforce. The interviews were semi-structured, and broadly covered the following topics:

- the function, location and staffing arrangements of PHE laboratories
- the training provided and the training required by the PHE scientist workforce
- the implications of Modernising Scientific Careers (MSC) for PHE scientists
- the public health science system and its capacity and flexibility to deal with a public health crisis
- career options and career progression available to professionals in science at PHE
- succession planning, staff retention and recruitment in specialised areas
- how will PHE scientists work differently in future (e.g. remote working, multi-disciplinary collaboration, application of new technologies).

3.7 Workforce modelling

The CfWI regularly produces models for medical specialties and similar workforces. These models are based on a number of typical demand and supply factors. For our models, demand is the number of skilled people (either headcount or FTE) *required* to deliver the level of service expected. In this case, the number of scientists PHE *needs*. Supply is defined as the number of people (either headcount or FTE) with the required skills and competencies in the workforce in question. In this case, the number of scientists PHE *has*.

The purpose of this workforce modelling is to forecast demand and supply for scientists in PHE. There is insufficient data and metrics available to robustly and explicitly model demand or supply for this workforce. However, the CfWI's qualitative discussion of demand drivers in Section 5.1 draws on a framework from a Canadian research programme on health human resources (Birch, et al., 2011). The framework separates out four key elements of demand:

- **population** – the size of the population being served, by age and gender
- **level of need** – the needs of the population given the distribution of health and illness, and future risk factors
- **level of service** – the service planned to be provided according to the population's level of need
- **productivity** – the ability of the workforce to deliver the necessary services, taking into account factors such as skill mix and technology.

The CfWI uses this framework because it provides a clear, logical separation of the key factors and allows the exploration of each set of drivers in a focused and sensible way.

A good workforce model makes use of simulations in order to understand how a system changes over time. It represents these changes by using the analogy of flows of stocks (people, money, materials) accumulating and depleting. In these models, 'stocks of people' can be segmented by, for example, age and gender, where data exists.

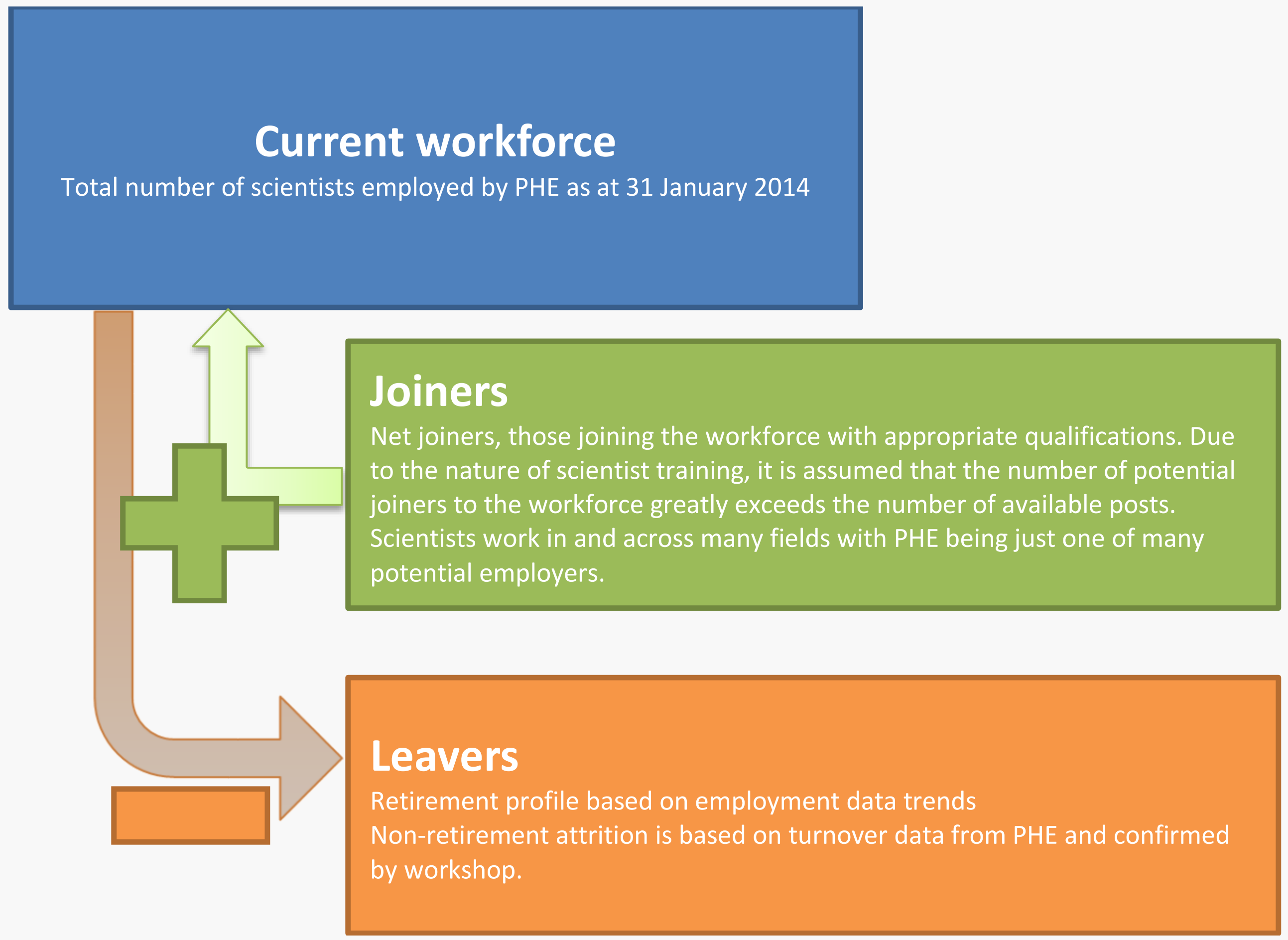
Figure 8 shows that supply is generally driven by the following factors:

- **New joiners to the workforce** – this includes the number of students graduating in relevant subjects each year as well as the number of people joining the workforce through other routes. In some occupations there are organisations like Health Education England that commission training places which are funded places for specific training courses.
- **Current workforce** – the size of the workforce, as well as its age and gender makeup.
- **Attrition** –the proportion of the workforce that leave employment due to retirement and other reasons.

Typically CfWI considers expected rates of joiners, usually as they complete training, but also some who re-join the workforce. We forecast expected joiners as a proportion of those coming through the training pipeline and historical rates at which people have re-joined the workforce, taking into account participation rate (or FTE) of joiners. From this we subtract the number of people expected to leave the workforce either through retirement, or through non-retirement attrition. This gives us our supply, or the expected growth (or contraction) of the workforce.

Figure 8: PHE scientists workforce supply model stock and flow diagram

The main stocks of the PHE scientist workforce are: universities and the employed workforce. It is important to note that supply of university science graduates far outnumber potential new recruits into PHE's scientist workforce.



Source: CfWI

3.8 Model testing workshop

A workshop was held at PHE's offices and brought together a small number of PHE's scientists from a range of disciplines and sites to consider the likely direction of trends in workforce numbers. The group considered the high impact, high uncertainty clusters generated at the clustering workshop, as well as the model's baseline supply side assumptions. Participants were consulted on the assumptions made in our modelling including for recruitment and retention, and the likely direction of impact for horizon scanning factors and the high impact clusters. This was an opportunity to the CfWI to explain our modelling methodology and elicit advice and input from the affected workforce.

4. Key informant interviews

In talking with scientists at PHE, it is evident that a large number are feeling a high degree of uncertainty about the future of science within the organisation. Factors that scientists considered still unresolved following the transition in April 2013, include: the change over from Agenda for Change (AfC) to civil service terms and conditions; the creation of the PHE Science Hub, consolidating Porton, Colindale and Whitechapel laboratories, and associated staff concerns relating to relocation to a new site not within commutable distance of the existing laboratory sites; and budget austerity which has resulted in a recruitment freeze and other cost saving measures.

While many scientists we spoke to, expressed a level of concern about PHE, there was an overarching positive feeling that this workforce takes a great deal of pride in what they do:

> “ I'm very happy with what I'm doing, I absolutely love my job. I might not love everything surrounding it – there's been an increase in bureaucracy recently – but the research and the science I love. (Interview #22)

> “ I always wanted to help people. My research is focused on protecting people from radiation. I can do research on almost anything... I've had a great time here... ” (Interview #66)

> “ There are certainly great opportunities. In field epidemiology you can work for the national body, with opportunities across the country. There are lots of interesting things to do here. ” (Interview #1)

> “ I have a great job. I'm lucky and work in an interesting bit of PHE. Scientists have the freedom to publish and present their work. We're busy, but we can do research which is a great feature of Colindale. There are some areas with a great track record on this. ” (Interview #4)

However, as noted above, there was a feeling that PHE, still being a relatively new organisation, was yet to settle into business as usual, encapsulated by the following from a scientist in the Centre for Radiation, Chemical and Environmental hazards (CRCE):

> “ We haven't had any recruitment in our department lately. We've got vacancies that we can't fill because there's a freeze. We're stuck because we've just moved into PHE. They're trying to sort everything out. Last week we were told there'll be a restructure of CRCE. It will be a while before we can recruit. We've got acting heads of department without being promoted. I'm sure it's just waiting to sort out the move to PHE. ” (Interview #69)

It is as yet unknown how susceptible PHE will be to changing governments or shifting political priorities. There are also a number of unresolved changes to the workforce including the move to civil service terms and conditions, the likely creation of a Science Hub in Harlow, and the impact of the requirement for PHE to 'do more with less' (Vickers-Byrne, 2013).

Civil service terms and conditions

Most scientists in PHE are currently on Agenda for Change (AfC) terms and conditions, a legacy of their previous organisations prior to the formation of PHE. There are a small number of scientists who were already on civil service terms and conditions, for example, nutritionists who were previously based in the Department of Health, and others who have joined PHE since April 2013 or have changed positions within the organisation. It is apparent that scientists based in regional laboratories, co-located with NHS laboratory staff (who remain on AfC), are most concerned about the impact of civil service terms and conditions on their ability to attract and retain the best candidates. There is a view that civil service terms and conditions are less favourable, and that being on different T&Cs than other colleagues will restrict movement of staff between PHE and NHS laboratories.

> “ I think we've been drawn in and called civil servants. It's not the right thing for people out in the laboratories. We're a huge part of the staff at this organisation and we're dissociated. We're on NHS sites, in NHS laboratories, working with NHS staff and they're on different terms and conditions. It feels to a lot of us like a really odd situation. It's natural to be resistant to change. ” (Interview #53)

> “ People tend to stay long term. If people leave it's to go for a more senior position. We used to have people going across from the Public Health Laboratory Service (PHLS) to the NHS – a free backwards and forwards. If I want to keep my T&Cs and pension, I now have to stay in PHE, or take a hit. ” (Interview #17)

There is anecdotal evidence that senior posts are difficult to fill externally because experienced scientists are reluctant to take up a post in a PHE laboratory if it means switching from their AfC terms and conditions. This is a concern that PHE should monitor, as given the relative size of the scientist workforce, there may be cause to ensure there is equivalence with NHS scientists' terms and conditions.

Career progression and support

Our interviews identified that overall, scientists felt PHE and its predecessor organisations have a good track record of support for development of scientific staff including support for further study, and opportunities to publish, present at conferences and to create a rewarding scientific career. There was some concern that this may be at risk in the current climate of budget constraints.

> “ When you're in a role, they're good at professional development and getting you to learn new skills. For instance PHE are sponsoring my doctorate in public health and giving me time to do it. It's a cultural thing within the organisation. I have known other people doing PhD by publication. Generally overall the CPD seems pretty good. ” (Interview #25)

> “ There are a lot of conferences and they encourage us to go to some if appropriate. You have to apply for funding. They're supportive of us attending to develop. They're also supportive of articles for journals and they want to strengthen that in field epidemiology. ” (Interview #43)

> “ PHE has a positive reputation, we have stringent training and requirements. We spend a lot of time training our staff compared to other organisations. We'd like to do more but we're a bit limited by resources. To do training now you'd need a strong manager in your corner, you really have to fight for training given the lack of resource. (Interview #46)

Of concern to many was the lack of a clear career pathway in PHE, with many stating that the pyramid structure offered relatively little opportunity for on-the-job career advancement. It was noted that it was very rare for scientific posts to be re-graded to reflect a scientist's advancement in their role. Many scientists described a system of 'dead man's shoes', whereby the usual route for progression is to step up into higher grade post when someone above leaves:

> “ I would like to stress that there is a need for clear career pathways for scientific staff here. It's been neglected and it is really, really needed. ” (Interview #12)

> “ There's not really good opportunities for career progression – there's not a good clear pathway – you either get lucky or you don't. Many people in the lower levels (Bands 5, 6, 7) would not see any way to progress. I know someone who has been Band 5 for 10 years. As an organisation it's not good if people don't have any ambition. With training and support you need to give people opportunities. Some line managers are very good at pushing people they manage to the next level while other people are constrained. ” (Interview #56)

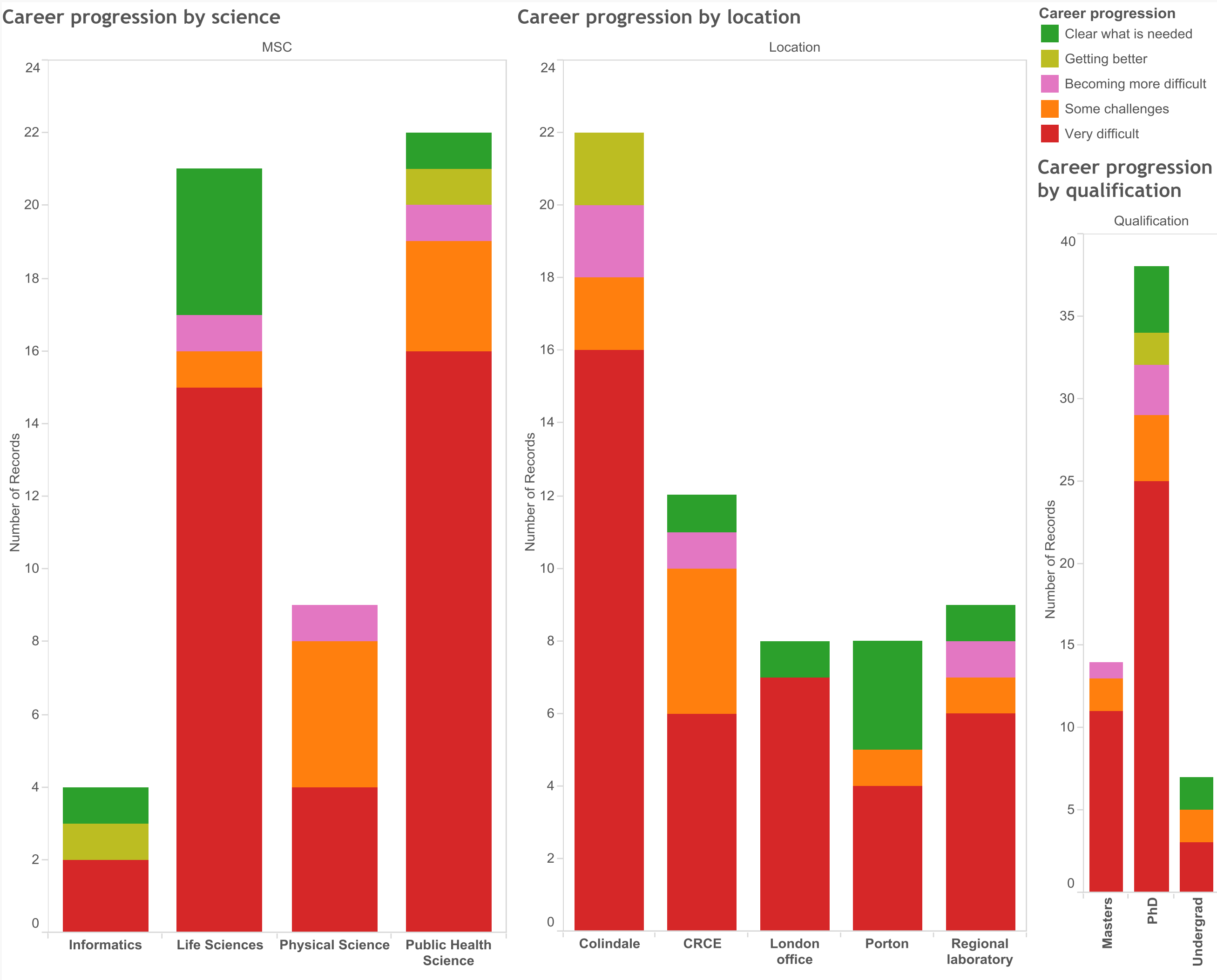
> “ As with some organisations, there's 'dead man's shoes'. There are no jobs opening up, and there's no clear expectation that in five years I expect you to do this, 10 years I expect you to be that…. Part of the concept of Agenda for Change was to develop people in their jobs. When you work in science, you pick up things as you go on, you become more valuable every year. When you start from university you don't have the practical skills, but the more you do it the better your abilities. The spine points of AfC acknowledged that. Now having staff on Civil Service T&Cs the increasing value isn't recognised – there's no regular increment. ” (Interview #41)

> “With our reference function, you become a local, national then international expert in your small area. There’s nowhere else that needs that level of expertise. There’s no obvious route for people to progress. Manager positions are all about managing people, not about the scientific expertise.” (Interview #16)

Figure 9 shows that while a small proportion of scientists feel that career progression is well-defined or improving, the majority of scientists regardless of qualification, site or discipline (with the exception of those in informatics) feel that career progression in PHE is challenging or very difficult.

Figure 9: Career progression, by science, location and qualification

Most scientists noted that it was very difficult to progress through the organisation as, usually, positions were not able to be re-graded.



Source: CfWI, 2014

Modernising Scientific Careers

Very few of the scientists we spoke to were familiar with the Modernising Scientific Careers programme, although many felt that the programme, as we described it, would be welcomed if it helped add structure to a scientific career in PHE. The Accredited Scientific Practice programme could have particular relevance where individuals in PHE need to develop 'deep' and specialist areas of expertise. Others felt that it was important to maintain equivalence with healthcare scientists in the NHS, and there was some strong support for the programme from some scientists:

> “ A clinical scientist in the NHS should be equivalent to one in PHE. We don't want a two-tiered system. A biomedical scientist should be the same in both organisations. Different curricula would be a disaster, PHE needs to be consistent with the NHS. ” (Interview #17)

> “ From what I've heard I think it's a good initiative: crucial as the landscape is changing dramatically. The bioinformatics MSC looks pretty comprehensive, but overly ambitious. Seems like an excellent initiative. ” (Interview #9)

> “ Something like MSC sounds brilliant. At the minute your opportunities are dependent on having the right manager with the right attitude. What happens in one unit doesn't happen in another. A unified pathway might provide better structure – would make me feel more secure that there are opportunities. ” (Interview #10)

Some scientists had hesitations about whether it would be applicable outside laboratory-based scientific disciplines or in niche areas of science.

> “ It might well be a good idea for the majority of people. But it's not good to apply it to everyone. If you ask my group, they don't consider themselves healthcare scientists. Some need generic skills and can move to flu, salmonella: same skill set, different diseases... I came to the conclusion it's not relevant to us. It's for laboratory scientists or healthcare scientists. ” (Interview #27)

> “ I wonder can you have a one-size-fits-all? A lot of people within industry have the MSc degree in radiation protection. Nuclear physics, particle physics, mining, academia, local authorities: we move in and out of the industry. ” (Interview #63)

> “ The requirements are different in all the different teams. There are times when I think everyone should have gone through certain roles, but I don’t know if that works necessarily. In a lab there are skills you need to tick off the list. I can’t picture how it would work elsewhere, but maybe someone could do something. ” (Interview #54)

> “ I’ve only seen it from the microbiology/pathology side. I’m not sure it’s something that’s set up for public health. I was told that to do it I’d have to go back and do a new undergraduate degree, Master’s degree, and my PhD wouldn’t count. If they were to extend it, would there be a focus on epidemiology? There’s a little bit in there but not enough. ” (Interview #15)

> “ I’d need more information, there are different career routes possible in science in PHE. In R&D, bidding for external money, it doesn’t always lend itself to formal training. ” (Interview #40)

Emergency response preparedness

Most scientists thought PHE was well set up to deal with a public health emergency having sufficient emergency response plans, and people with experience dealing with environmental hazards or infectious disease outbreaks (Figure 10).

> “ Yes [we have the right people to respond to a public health crisis], I’ve seen evidence of that with swine flu – testing in Bristol and the operation centre in London. Scientists were pulled off projects to do things we weren’t trained to do, e.g. writing meeting minutes. However we have great skilled people for Ebola. ” (Interview #3)

> “ We’ve got the right scientific skills: adaptable and flexible and committed to the work. I think PHE attracts good people. I can’t think if there’s anything missing. ” (Interview #13)

Some scientists were concerned that PHE’s continued ability to respond to a public health emergency was at risk due to staff turnover, budgetary and staffing pressures and a perceived lack of prioritisation within the organisation. There was some concern expressed about strain on individuals and the organisation when emergency response plans were activated, however these concerns were not widespread.

> “ Yes and no. We invest a lot of manpower and resources into emergency response training here. We have people in Africa doing Ebola related stuff at the moment. You wouldn’t believe the number of plans! Everything from the number of chairs, tables, pens, paper! But when it goes wrong, it’s chaos. I’ve been involved in two of these things now – the poisoning of Litvinenko in 2006 and swine flu in 2009. I think things could be handled better – you rely on volunteers who travel across Britain thrown together in a stressful atmosphere. ” (Interview #71)

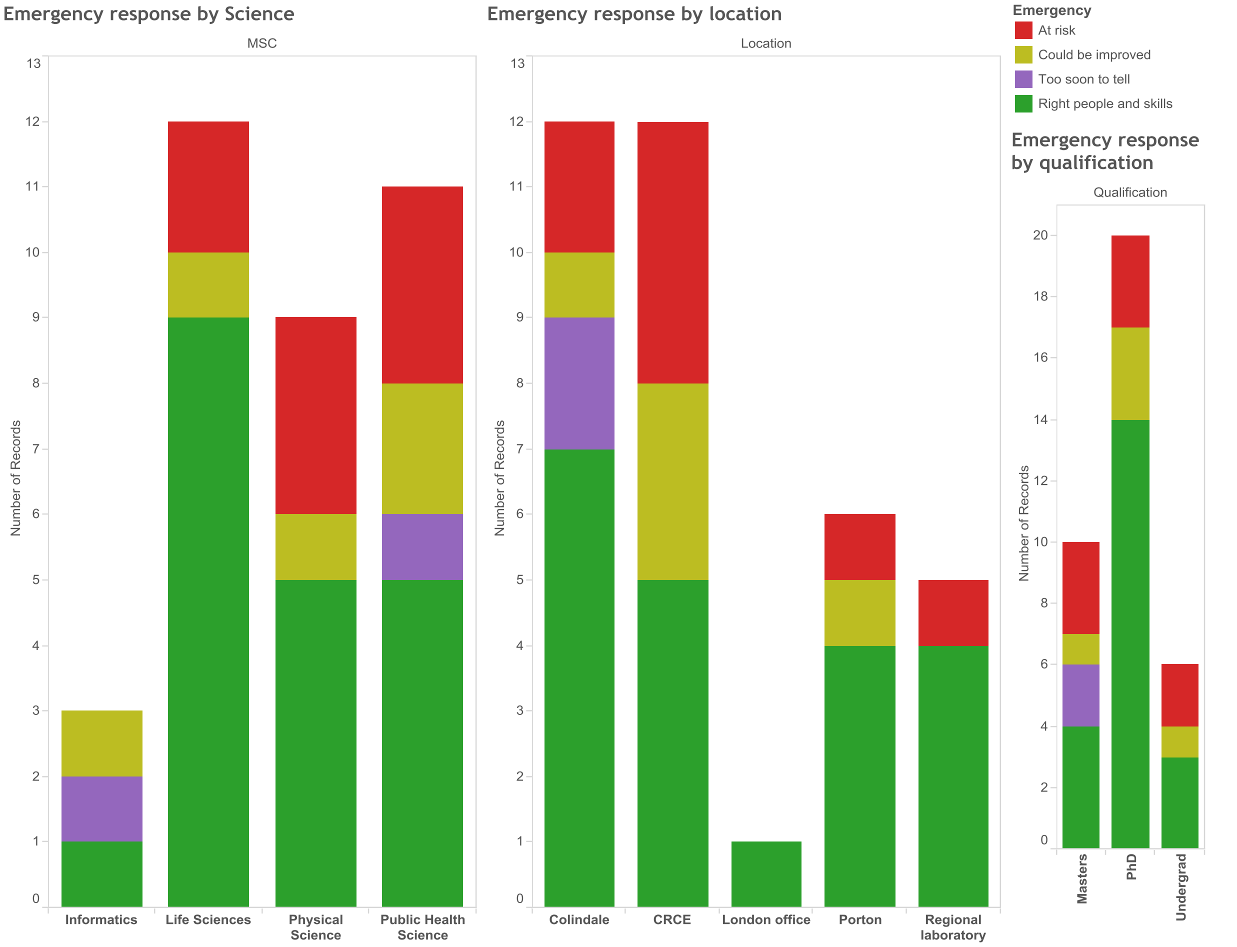
> “ We are pared to the bone for a sustained response. Radiation incidents happen rarely but when they do we are under a lot of pressure. It's a concern how few staff we have and the availability of staff. Budgets are tight, and things are restricted. ” (Interview #60)

> “ Surge capacity will always be a problem for any organisation. At the moment we have job freezes and vacancies. Most incidents are smaller in scale. We managed with swine flu in 2009, at Colindale we called in scientists from all different areas and standard "epi" skills are transferable, and utilised temporarily. You call people in from neighbouring [PHE] departments. ” (Interview #4)

> “ I don't know what's happened to emergency response since we joined PHE. It was one of the priorities of the HPA; there was a lot of work going on with teams from the NRPB (National Radiological Protection Board) and Porton to produce dovetailed plans. HPA could be reasonably confident about its emergency response. PHE has inherited that so I'm confident about that. I don't know if the priority is maintained though. ” (Interview #58)

Figure 10: Emergency preparedness, by science, location and qualification

Most scientists felt that PHE was well prepared to respond to a public health emergency with adequate skills, and protocols in place. A small number felt that PHE's emergency preparedness was at risk or could be improved.



Source: CfWI, 2014

Recommendation of a science career in PHE

When asked if they would recommend a career in science at PHE to their family and friends if they expressed an interest, most scientists said that they would, although many of these had hesitations (Figure 11). This is consistent with the CfWI's survey of public health consultants and specialists, where about half of those surveyed said they would recommend a career in public health, while 22 per cent of said they would not (the remainder were not sure) (CfWI, 2014). Within PHE, hesitations tended to centre on the uncertainties about the future.

> “ I find my job stimulating and challenging and I really enjoy it. But it’s a difficult sector. There were three options for clinical scientist: industry (not flexible), academia (impossible to get a permanent post), and healthcare scientist (job for life, but that’s changed in the last five to 10 years). The problem is the sector is changing so much. We’re likely to go through austerity and technological changes, not to maintain or improve services but for the sake of reducing costs. I would be hesitant to recommend clinical scientists training. Not sure about biomedical science either. Will depend on what the jobs are. I would look at the epidemiology roles. Not because it’s PHE, but healthcare science. ” (Interview #62)

> “ Here at Porton we have stable contracts [in industry and academia scientists tend to have short-term fixed contracts] and job security counts for a lot for people. The job is varied and we see a range of different things, we have a lot of opportunities, job satisfaction and interest. We’re unique in the UK in terms of what you can do. ” (Interview #58)

> “ I would recommend a career in science at CRCE. I think that our model, our centre, works extremely well. People have great careers here and it’s worked well for 30-40 years. ” (Interview #59)

> “ Yes definitely. PHE is quite open to new ideas and new ways of working, it’s a progressive and forward thinking organisation. You feel that you can do a lot of learning and development. You’re working with so many different people that have different specialties, you get a broad awareness of public health activities. Because of where we sit in an office, we’re surrounded by different teams which gives you the opportunity to talk to people. Some big events where people from the centres get together have been great. ” (Interview #38)

> “ Definitely. It’s a very personal thing. In science you really need to have drive within yourself. It’s not like you’re given a task every morning, finish by five then go home. You need drive, curiosity, to not stop until the task is finished. You have to want to know more, understand more. If I find a young person who is really driven, I would definitely recommend PHE. PHE has been a great environment for me to do my research, it has been supportive. I’ve produced a lot, and the organisation is supporting my research, they have got me a new lab which is very rewarding. ” (Interview #65)

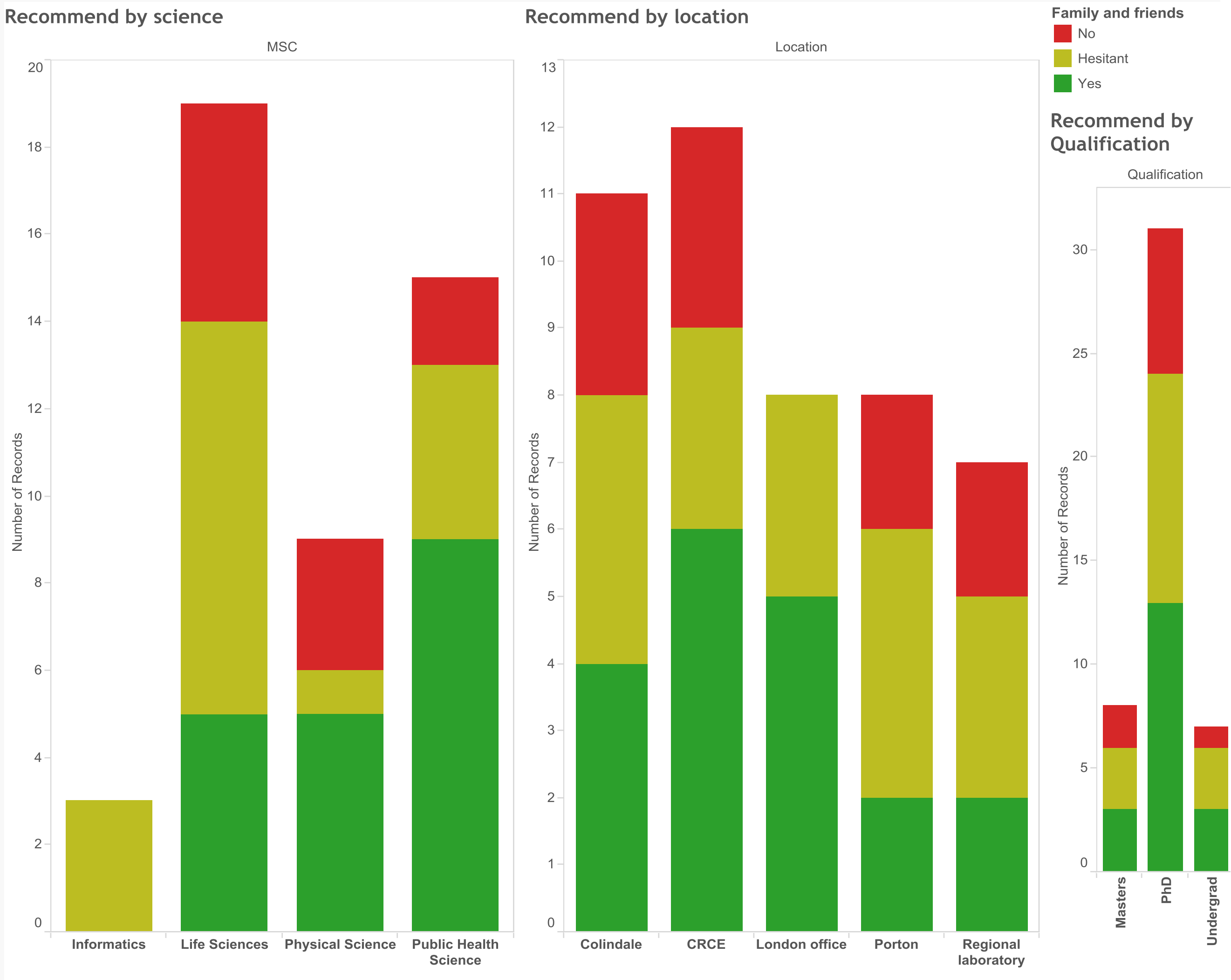
While about a quarter of the scientists who were asked this question said that they would not recommend a scientific career in PHE, half of these indicated that a structured career progression would help:

> “ I don’t think I would. Not that I don’t enjoy my job. It’s the time that PHE’s in at the moment. Some sort of structured career progression would help but I don’t know how you would do it when you have such diverse roles. ” (Interview #18)

> “I would suggest they think very carefully. It’s not clear where it would take them. I think there’s stuff they can learn and do here but not for a whole career. If we had a clear road map on how a scientist progressed through the agency and a structured training programme, I’d be more likely to recommend it. There are wider questions about PHE’s role and how it fits into the system. It currently feels quite negative, but change usually does.” (Interview #2)

Figure 11: Recommendation of a career in science at PHE by science, location and qualification

Scientists were asked if they would recommend a career in science to their family and friends if they expressed an interest. Most scientists answered ‘Yes’, although some did so with some hesitation.



Source: CfWI, 2014

Challenges for PHE

Some scientists noted that PHE has some unique challenges in being a civil service organisation with a remit as large as protecting the public and improving health inequalities.

> “We’re trying to balance the breadth of science with the depth of expertise. Particularly in infectious diseases, each one is different and requires its own study: epidemiology and microbiology... For a long time, we’ve managed to have people with expertise in these areas, but it’s quite costly. Expertise may not be of use until it is: for the last 20 years, Ebola expertise wasn’t important, now it is.” (Interview #16)

> “The challenge for PHE is that it’s still evolving and working out what it’s going to do. Formed by inheriting mature organisations but blending them into a new organisation is quite a challenge. There’s a bit of a feeling that we still don’t know if PHE wants us all. How do we fit? We’re all brought into the mix but it’s a bit like a forced marriage. Sometimes it would be helpful to get more positive messages about what we do, and that we are valued by the organisation... Everyone wants to be useful.” (Interview #40)

> “Roles will change, and an understanding of the behavioural and social sciences are beginning to come through now. Especially when you look at PHE’s big campaigns on smoking and obesity, it’s all to do with behaviour.” (Interview #28)

There was a feeling among some scientists that the importance of science to the organisation has not been adequately recognised since the transition:

> “PHE is such a big institution, the microbiology is hidden from ‘don’t get fat, exercise, keep your blood pressure down’... I wouldn’t want to criticise our chief executive, but PHE is too big for one man. He’s got very good people around him, but there is difficulty from a scientific career point. We should be placarding how clever we are in microbiology, we’re very good at controlling infections.” (Interview #11)

> “PHE doesn’t have a strong brand at all, because it’s new. But also, I work for PHE and I don’t fully understand what the point of PHE is... PHE is too big and does too many things.” (Interview #8)

Many scientists wished to emphasise the importance of research and development activities to support PHE’s service delivery functions:

> “A lot of our work is service delivery/routine. It requires research and development to support and progress it. We like the R&D to be valued and fell important. And PHE scientists have the talent and capability to do it. PHE has great people and needs to support them. [There’s a] general feeling that we’re undervalued and not recognised. We feel a bit ignored... It’s about recognition of the quality of science that goes on here.” (Interview #26)

> “We’re here to provide the evidence base for those folks in the Department of Health. We need opportunity to do research. But we do a lot of service delivery, routine delivery and reporting that is very time consuming. There’s not much time to do additional research projects, this can be frustrating.” (Interview #42)

5. Scientist workforce projections

5.1 Demand drivers

The horizon scanning and clustering workshop held in April 2014 identified that there was a great deal of uncertainty amongst scientists at PHE about the future demand for their specialty.

While some factors will have predictable impacts on the workforce, for example, the drive for efficiency and automation is likely to reduce the number of people required to carry out a set number of tests in life sciences, there are other significant factors that are not as easy to foresee. This workforce is highly dependent on government policy and funding allocations. Also demand for prevention and health protection do not have the same population or disease prevalence drivers as medical or clinical professions.

5.1.1 Horizon scanning

The CfWI undertook 16 horizon scanning interviews with scientists across PHE and academia, identifying a diverse range of factors that are likely to influence PHE’s scientist workforce over the 15 years to 2029. There were a number of factors which often emerged in discussions with people across the sciences.

There was a general theme that there is likely to be significant technological and policy changes over the coming 15 years that may have a substantial impact on the size, shape and skill mix of PHE’s scientist workforce. Our horizon scanning identified that there is a likelihood of an increased demand for skills in informatics across information science, statistics, modelling, bioinformatics and genomics. A second theme is the reduction in demand for life sciences, particularly in microbiology, having the greatest impact on the number of mid-tier and senior scientists (AfC Band 6 and above). There are a number of factors driving these changes, explained below.

Research and technology

Expansion of **genomics and proteomics** has already had an impact on the diagnosis of infectious diseases at PHE and the skills of the workforce required to deliver services and research. PHE is working on the whole genome sequencing of infectious diseases including tuberculosis (TB), HIV, Hepatitis C (HCV) and salmonella. It is expected that the application of these techniques will expand further. The 100,000 Genomes Project will influence our understanding of an individual’s genetic susceptibility to disease, and treatment of chronic illness; the fields of proteomics and genomics are likely to grow. This will require greater numbers of scientists with skills in informatics including genomics, bioinformatics, statistics and computer science.

Automation of diagnostic techniques is already having an impact upon the delivery of microbiology services. Automation has led to a higher throughput of samples and is reducing the demand for microbiologists. Further expansion of high throughput machines is likely to change the skill mix in laboratories, with an increased need for lower grade scientists to prepare samples and load the machine, and a small number of senior scientists (either biomedical scientists or clinical scientists) to oversee the processes and interpret results. In PHE regional laboratories it is estimated that over the past three years, automation has reduced staffing levels by 20 per cent, with a 5 per cent reduction in staffing spend expected annually over the next five years.

Delivery model

Multi-disciplinary working is anticipated to become more important in PHE. The technological advances discussed above will likely require complex analysis and a multi-disciplinary approach to problem solving. Some scientists foresee an increasing role for epidemiologists in chronic and infectious disease surveillance and control, working alongside life sciences and informatics to trace patterns in the population. It is also anticipated that behavioural scientists may become more in demand as PHE investigates ways of influencing behaviour change to tackle its priorities of tobacco smoking, reducing harmful alcohol consumption and obesity.

Microbiology and diagnostic services have in recent years faced increased competition from the **private sector**. While there was no prediction that PHE may face competition for the reference testing for reportable infections, many of PHE's regional laboratories work with routine diagnostics for the NHS. These functions, as well as research and development across all sciences are in competition with private laboratories, research groups, universities and industry.

The future **remit and focus of PHE** emerged as a great uncertainty for a number of scientists. It is possible that PHE may evolve in its functions to become an organisation that interprets and implements science rather than leading on research and development. It is expected that information science may expand in PHE as the demand for people who can identify and interpret scientific evidence increases. At the same time, if PHE reduces its investment in research and development, there may be a reduced demand for research scientists across disciplines. The scientists who raised this possibility all emphasised that while they acknowledge that service delivery and communication public health messages are the core of PHE's function, they consider research and development key to the organisation's reputation and status. *It was noted that PHE's ability to compete for research grants has been severely limited since it became a civil service organisation, ineligible to apply for public research funding schemes without an academic institution as the research lead.*

Aggregation of services has been a theme for cost saving and efficiency gains. This has been driven by themes discussed above, including automation and competition from the private sector, but also the introduction of 24/7 diagnostic services. By consolidating laboratories, the number of senior life scientists required to oversee the laboratory technicians and provide diagnostic services is potentially reduced. The board of PHE has recommended to the government that their Porton, Colindale and Whitechapel laboratories be consolidated into a single PHE Science Hub within the coming five years. The CfWI is not aware of any plans to consolidate services in the regional laboratories or other PHE sites.

Other

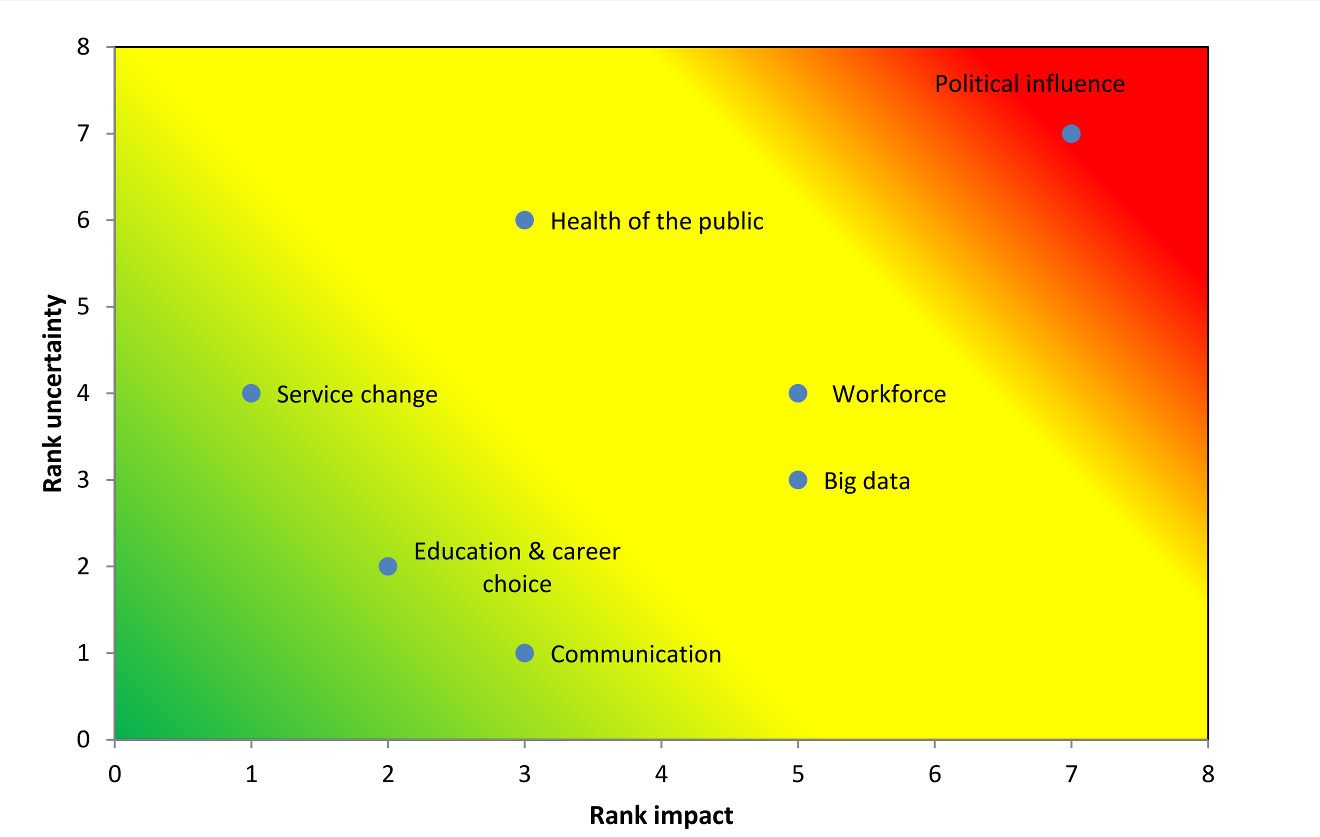
Access to information, data and research is likely to increase, with the evolution of genomics, increased automation and moves towards increased open access publications. PHE will need people who can create, mine and apply the data for health protection, surveillance and diagnostics, which will increase demand for scientists in informatics. Secondly PHE will need the interpretation skills for policy development, which is likely to be scientists from across all disciplines but with the most impact in informatics and public health sciences.

The **political framework** is a great uncertainty among scientists in PHE, who are concerned that much of the demand for research, development and service delivery is based on funding allocations. A number of scientists noted that PHE is potentially vulnerable to shifts in government spending priorities, which could unpredictably impact the scientist workforce.

5.1.2 Cluster workshop

The themes identified in horizon scanning were fairly consistent with the findings from our clustering workshop.

Figure 12: Clusters – impact and uncertainty



Source: CfWI

The cluster workshop identified **political influence** as being both the highest impact driver for demand for scientists in PHE, and the cluster with the greatest uncertainty. Factors such as government funding, the public health agenda, structural and organisational change and the policy function of PHE, are dependent on the policy priorities of current and future governments. These factors also have potential to have a significant impact on the scientist workforce, although the size and direction of this impact is difficult to predict.

The **workforce** cluster developed by the workshop is driven by acknowledgment that the public perception of science as an attractive career will impact the number and quality of recruits into science at PHE. Workshop participants rated the workforce cluster as having the second greatest potential impact and third highest uncertainty of all the clusters developed. Factors raised include: pay rates, visibility of scientists with a high and respected profile, and the value that society gives to a profession or group of professions. Additional drivers include the quality of education and training and the location of employment opportunities. Globalisation and the migratory nature of the workforce will also be an influence in the future, all of which will impact on the need to fill gaps in skill levels, the regulation of scientists and career progression.

Big data was identified by the cluster workshop as having the second largest potential impact on the future workforce. It was acknowledged in this cluster that there would be an inevitable increase in the quantity of data produced across the health and community sectors, be it through molecular diagnostics, electronic patient records, or industry consumer information. The potential for data generation and analysis for applying molecular diagnostic techniques to chronic diseases, such as personalised treatment of cancer or whole genome sequencing of infectious disease outbreaks, was discussed as was the increase in the skills required to interpret large amounts of data.

The impact of big data is likely to be a change in the required skill mix of scientists. There is a general feeling among scientists at PHE that over the coming years there will be an increased demand for skills in bioinformatics, genomics and computer science.

The cluster rated second highest for uncertainty, and third highest for impact was **health of the public**. This cluster is important because it reflects PHE's success in achieving its aim to improve the health of the population of England. Factors that drive workforce change in this cluster include early alerts, early warning of diseases and risk factors that will affect people's health and the burden of disease. Other key factors include screening and early diagnosis, scientific discoveries, emerging public health threats, new social behaviours, vaccination rates, and climate change. Success or failure in these areas will impact on whether PHE's scientists will have a proactive or reactive role in health protection and health improvement in the future.

5.2 Qualitative discussion of demand drivers

When the elements of demand, as set out in CfWI's framework, are considered in the context of PHE's scientists and the nature of the work they do, some elements take on more weight than others. Change in population demographics does not have the same impact on the quantitative demand for this workforce as it does for medical or clinical professions. For example an increase in population size is less likely to imply an increase in demand for public health scientists but an increase in the sickness level of the overall population might. Although 'level of need' is important for this workforce it is subsumed by the workforce's high dependency on government policy and funding allocations, which are the factors that determine how this workforce responds to the population's level of need. Many of the drivers identified in the horizon scanning process were focused around service delivery and productivity.

At the model testing workshop, the group discussed the possible directions that demand might take for each of the four clusters: political influence, workforce, health of the public, and big data.

Table 2: Qualitative summary of the four highest impact clusters on demand for scientists in PHE

Cluster	Impact	Demand direction
Political influence	Highest impact driver with greatest uncertainty. It was felt that with the strong growth of PHE's public identity and function that the level of uncertainty may begin to decrease.	indeterminate
Workforce	Second highest impact driver but equal third in degree of uncertainty. It was felt that the perceived value of the workforce and that of scientists may be diminishing.	small decrease
Health of the public	Fourth largest impact but ranked second in the degree of uncertainty. Public health interventions and emerging diseases may be on the rise.	small increase
Big data	Second largest impact driver but equal third in degree of uncertainty. It was felt that due to an increase in data production the quantity of analysis performed would rise sharply. However the major impact is most likely to be in the skill mix of scientists.	small or no increase

Source: CfWI

The clusters when considered together, but without political influence, suggest a possible small to no increase in demand for public health scientists. However, the political influence cluster, as the highest impact driver and greatest uncertainty, may determine the demand for public health scientists in the next 15 years.

The influence of future government policy on this workforce is impossible to predict, reflected in the political influence cluster's ranking as the highest uncertainty. In trying to quantify the likely workforce impact over the next 15 years, we were unable to ascertain even the most likely direction that demand would take. PHE is currently experiencing a time of budget austerity, which is having an impact on managers' ability to recruit or promote scientists. It is expected among most people we spoke to in PHE that the next few years are likely to see a reduced demand for scientists, which is likely to be met by natural attrition and increased automation.

The overall skill mix of scientists in PHE is likely to change over the following 15 years. It is anticipated that the number of scientists in senior roles in life sciences may decline with the spread of automation, but the extent to which that may happen will be dependent on policies such as 24/7 working and consolidation of laboratories. This may be offset by an increase in the number of junior life scientists, and increased demand for people with skills in informatics, or behavioural sciences. However actual demand will be policy and budget dependent.

5.3 Baseline supply

Our supply model presents another challenge with the PHE scientist workforce. The model inputs, constraints and assumptions described in Section 3.7 that we would normally use to build our model are either not available or not applicable for the PHE scientist workforce.

In the case of PHE, there is no set training pipeline for scientists who are recruited from a variety of academic, public sector or private sector backgrounds. The diverse entry pathways to the profession mean that there is no single recruitment pool for PHE scientists. While the potential supply of skilled people is not a constraint for the organisation as a whole, some specialist areas may have more difficulty recruiting than others. Essentially for this workforce the number of new joiners to the workforce is only limited by the number that PHE employs.

A single snapshot of HR data gives very little information about trends in recruitment and retention, let alone projected future trends. The uncertainty in the demand drivers that make demand difficult to model for this workforce are also reflected in the supply drivers. Our recruitment intentions interviews indicate that the rate of recruitment may fall over future years in light of budget cuts and the need to ‘do more with less’. However there was a great deal of uncertainty about the extent of budget constraints.

We have built a baseline supply model, which projects recent patterns of recruitment and expected attrition forward into future years. The assumptions that underlie this process are explained in Table 3. The baseline supply model considers joiners and leavers into/out of the workforce ***if it continues at the current rate***. In this case baseline supply is the current number of scientists in PHE, plus the expected number of new joiners (based on how many of PHE’s scientists have joined the organisation over the past 5 years), less those who are expected to leave the organisation (anticipated retirements, plus non-retirement attrition).

Table 3: Assumptions made in baseline supply model

Variable	Data confidence rating	Source of data	Data/assumption
Number of joiners each year	Low	PHE, 2014. Analysis of anonymised HR snapshot of workforce data.	This assumes that the future recruitment practices of PHE stay the same as they have been between 2007 and 2013. This assumption was validated and agreed in the modelling workshop by PHE scientists.
Historical and current workforce totals	Medium	PHE, 2014 Anonymised HR snapshot of workforce data.	Provides the current age and number of scientists employed by PHE from 2013. Given that PHE was established in 2013 there is no available historical workforce data.
Age profile of workforce	Very High	PHE, 2014 Anonymised HR snapshot of workforce data.	Actual age distribution used in the model
Net attrition rate of the workforce ***- Number of leavers by age below 50*** ***- Number of leavers by age over 50***	Medium	PHE, 2014 turnover and leavers data	PHE leavers and turnover data is used to build a picture of the likelihood of a scientist leaving the workforce at a given age. For those aged below 50 we use a shaped probability profile to forecast what age scientists will leave the workforce (we assume the majority of leavers 50 and over are due to retirement). The profile is based on historical (2013-14) records of leavers and behaviour of scientists at these ages. The retirement (or over 50s) net attrition rate is calculated from the total number of leavers from PHE due to retirement total headcount scaled for the PHE scientists HC. This is used to determine a mean retirement age which is then used to create a possible statistical attrition distribution for all leavers 50 and above.
Future participation rate	High	PHE, 2014. Analysis of anonymised HR snapshot of workforce data.	Participation rate is a measure of the amount of part-time working, defined as FTE/HC. Future participation rate (PR) is based on the snapshot of workforce data provided by PHE for all scientists employed by PHE. Research and interviews with PHE scientists suggest that PR is unlikely to change in the near future.

Source: CfWI

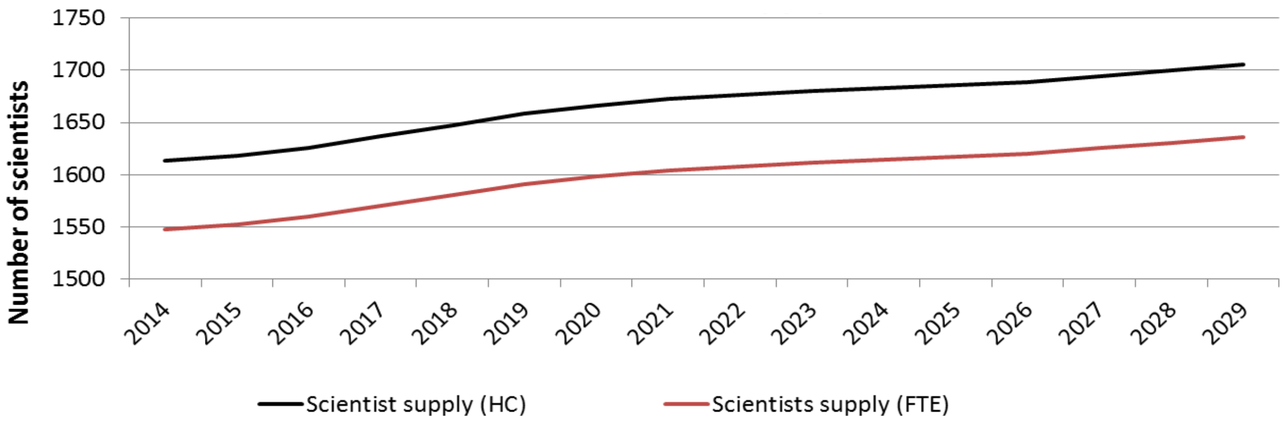
Figure 13 shows the baseline projection of the number of scientists at PHE (headcount – black solid line, and full time equivalent – red solid line). This assumes that recruitment continues at the rate seen between 2007/08 and 2013/14, a fixed non-retirement attrition rate of 4% and an individual age dependent attrition profile for those 50 and over. It shows that by 2029 there is an estimated increase of almost 100 scientists from about 1,613 HC (1547 FTE) to about 1,705 HC (1636 FTE) which is an increase of about 6 per cent from 2014.

The number of scientists estimated to join the workforce annually is about 100. This assumption is based on the start date of scientists at PHE who were employed at 31 January 2014, and the number who had started between 2007/08 and 2013/14.

The number expected to leave the workforce annually is between 90 and 98. This is based on expected retirements (based on the age profile of the workforce) and some assumptions about turnover. Our single snapshot of HR data was unable to provide any information about the number of scientists who have historically left the organisation, however PHE HR were able to provide us with some information regarding turnover for the period 2013/14. The age profile of the current workforce (see Figures 1 and 2 in section 2.2) is such that the number of scientists approaching retirement increases after the next five years, from 2020 onwards.

Figure 13: Baseline supply projection

These projected figures show the possible size of the PHE scientist workforce based on expected attrition through retirement, participation rates and recruitment rate between 2007/08 and 2013/14.



Source: CfWI

The number of scientists estimated to leave the workforce approaches the number estimated to join the workforce from about 2021. This suggests that there is a risk of the size of the workforce declining if there is only a small decrease in the number of scientists recruited or a small increase in the number leaving. The number of women estimated to be joining the workforce is about two thirds of all new joiners which matches the current ratio of women to men in the workforce. There is little change to the participation rate during the forecast period. The participation rate of women is 0.94 and men 0.99. This suggests that as the workforce ages after the next 15 years, the overall participation rate which is currently at 0.96 may tend closer towards 0.94 as a larger proportion of women occupy the 30-50 age range where the participation rate is lowest. This could further contribute to a decrease in capacity.

Note that the above baseline supply represents the projection of recent recruitment levels into future years. The CfWI has no data to support that this is the likely pattern of recruitment in future. In fact anecdotal evidence suggests that recruitment rates may decline in the coming years.

5.3.1 Uncertainty and data limitations

PHE is a relatively new organisation with its workforce made up of staff from a large number of predecessor organisations. This means that there is very little historical data available to use to understand past trends in recruitment, retirements and work patterns. The CfWI was provided with a single snapshot of HR data, and while our models would benefit from multiple snapshots over time, this was not possible because the data extraction is a resource intensive, manual process, that deals with confidential staff records. The net change in the number of scientists joining the workforce each year could not be determined, as the data only includes those who were still employed at the date the data was extracted in January 2014. Any that may have left before that date will not be counted. For those leaving the workforce we used the turnover data for the limited period that was available (PHE was only established in April 2013) as well as reported leavers due to retirements.

To attempt to quantify workforce attrition for our model, the CfWI undertook a series of short interviews with laboratory and microbiology services managers. These nine interviews discussed the anticipated impact of automation, whole genome sequencing, changes in scientists' terms and conditions, the creation of the Science Hub and PHE's likely future remit: solely service delivery or a focus on research. The findings of which informed our analysis and interpretation.

5.3.2 Exclusions

The analysis and modelling in this work focused on the PHE scientist workforce. However, much of the stakeholder engagement implicitly considered skill mix and, by extension, ideas such as the impact of multi-disciplinary working on the service provided by scientists within those teams.

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.

5.4 Conclusion

PHE is a new organisation undergoing tremendous change. This is creating some uncertainty and feelings of instability in the workforce. In addition to the usual stressors that come with organisational restructuring PHE also faces budget austerity, enormous technological advancements, and transition to a new civil service organisation.

In designing a forecasting model of PHE's scientist workforce, the CfWI was constrained by the limitations of a single snapshot of data with limited availability of historical information. Our review identified that there is a great deal of uncertainty around both demand and supply for scientists in PHE as the organisation is dependent to a great extent of government policy and prioritisation of funding. While our demand and supply predictions appear to broadly match, supply could change quickly if retirement and recruitment patterns change. Demand is relatively stable but can change quickly depending on political priorities. However there are some factors that will have an inevitable impact on the shape and skill mix of the workforce, including increased automation in microbiology services and advances in genomic techniques.

6. What could be done?

The CfWI found PHE scientists, on the whole, to be engaged and passionate. However many expressed some concerns about the new organisation and the future of science within it. Based on these concerns, the CfWI makes the following suggestions to PHE, for consideration with regards to workforce planning, development and support for scientists.

Given that the qualitative analysis of demand suggests that demand for PHE scientists rests heavily on the direction that government policy takes, PHE can plan the changes to the workforce in that context. However the continued monitoring of the health of the public as well as the changing roles due to the growth of big data will also be key to help ensure that there are sufficient scientists with the required skill sets to meet the change in demand during the next 15 years. Furthermore the issues around the perceptions of scientists, and specifically public health scientists, by the population could lead to recruitment challenges if they persist.

6.1 Short-term suggestions (next 1-2 years)

The following suggestions could be implemented fairly quickly to address some of the concerns raised by PHE's scientists over the course of this review:

- **Continued support of scientific career development.** For scientists, there are a few factors that are important for career development and engagement that may be different to other civil servants. The opportunity to attend conferences is important for the creation and maintenance of professional networks, and the cross-fertilisation of ideas. The freedom and support to compete for and win grant funding and to publish in peer-reviewed scientific journals is important for scientists in their long term career progression and national/international recognition. One way PHE can support scientists in developing grant applications is the extension of the pump prime funding initiative, which supports small pilot or 'proof of concept' research. There is also an opportunity for PHE to maximise its multidisciplinary workforce, by creating professional networks, or development events such as workshops, conferences or multidisciplinary working groups where scientists from different locations, backgrounds and specialties can network, learn from each other, establishing creative approaches to public health challenges.
- **Increased secondment opportunities.** In talking to scientists in PHE, it is evident that in many disciplines there is a tendency for people to become deeply specialised. While this deep specialisation is to be commended, to enhance flexibility of the workforce, the CfWI suggests that PHE considers a rotational programme for junior scientists, where appropriate, to give staff exposure to the wide range of issues and concerns. This approach may also foster long term collaboration between individuals from multi-disciplinary areas to creatively address the complex issues PHE is addressing at the population level.
- **Increased profile of scientific functions in PHE**. Many scientists feel they have a low profile within the organisation and are concerned that this could damage morale and their international reputation that is a legacy from some of the previous organisations that merged to form PHE. A few suggested ways that PHE could easily address this concern include the introduction of a scientific stream at the PHE annual conference, improved visibility of scientific functions on the PHE website and greater inclusion of science in PHE's internal and public messaging.

- **Review and update emergency response plans.** Review PHE's internal surge capacity in priority skill sets and response to national or international incidents in the light of recent experience responding to the 2014 Ebola outbreak in West Africa.
- **Succession planning.** PHE has a significant demand for highly skilled and specialised expert scientists. Many of the scientists we spoke to over the course of this project emphasised the unique, specialised nature of the work they do, and the significant amount of time, experience and exposure it takes to develop the level of expertise required. The implications for PHE are that in order for the organisation to maintain the level of expertise in senior scientific staff, investment needs to be made in training scientists to a high standard, and supporting staff through career development (see **Appendix E**).
- **Review scientific representation on the PHE executive**. PHE may wish to review scientific representation on the executive, to ensure there is a professional lead and advocate to represent the large number of scientists working across diverse specialties. PHE's scientists are currently beyond the remit of the Chief Scientific Officer, however strong leadership and representation through a head of profession or equivalent is important for scientists in PHE.

6.2 Longer-term suggestions (next 3-5 years and beyond)

The following suggestions may help mitigate some of the issues raised by PHE's scientists over the course of this review in the longer term:

- **Expanding the skill set of microbiologists in genomics, computer science and bioinformatics.** PHE is expected to become increasingly dependent on its ability to analyse large quantities of data. The inevitable growth in genome sequencing and increases in data availability, will mean that these data analysis skills will become more important. There is an opportunity for PHE to develop its own informatics workforce with a deep understanding of infectious diseases, by training existing laboratory staff in informatics, through the MSC programme.
- **Modernising Scientific Careers.** There is scope for further consultation on and promotion of MSC, which many of the scientists that the CfWI spoke to knew little about. While work continues between PHE and HEE to adapt the curricula for public health, promotion of the opportunities that MSC offers to the existing workforce may provide guidance on opportunities for career progression within the organisation. Many scientists in PHE felt the organisation would benefit from a structured programme for career progression, and it will be important to work with the Academy for Healthcare Science to ensure that there is adequate recognition of equivalence for scientists trained outside this programme.

References

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

Centre for Workforce Intelligence (2014), *Public health consultants and specialist survey 2013: survey results*, http://www.cfwi.org.uk/publications/the-cfwi-public-health-consultant-and-specialist-staff-survey-2013/ [Accessed November 2014]

Department for Business Innovation & Skills (2011), *Strategy for UK Life Sciences* https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/32457/11-1429-strategy-for-uk-life-sciences.pdf [Accessed November 2014]

Department of Health (2010a), *Modernising Scientific Careers: the England action plan*, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/139529/dh_115144.pdf [Accessed November 2014]

Department of Health (2010b), *Modernising Scientific Careers: the UK way forward,* https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/138326/dh_113990.pdf [Accessed November 2014]

Department of Health (2011a), *Public Health England's Operating Model*, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/216716/dh_131892.pdf [Accessed November 2014]

Department of Health (2011b), *An overview of Modernising Scientific Careers*, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/215897/dh_123911.pdf [Accessed November 2014]

Department of Health (2012a) *Health and care structures fact sheet*, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/138258/A3.-Factsheet-Overview-of-health-and-care-structures-240412.pdf [Accessed November 2012]

Department of Health (2012b) *Structure of Public Health England*, http://webarchive.nationalarchives.gov.uk/20130805112926/http://media.dh.gov.uk/network/18/files/2012/07/phe-structure.pdf [Accessed November 2012]

Department of Health, Public Health England and Local Government Association (2014), *Healthy Lives, Healthy People: Update on the public health workforce strategy*, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/324989/workforce_strategy.pdf [Accessed November 2014]

Faculty of Public Health (2010), Public Health Training Pathway, http://www.fph.org.uk/uploads/training_pathway_diagram.pdf [Accessed on 6 December 2013]

Faculty of Public Health, Local Government Association and Public Health England (2013), *Guidance on Directors of Public Health in Local Government: Guidance on appointing directors of public health*, http://www.local.gov.uk/documents/10180/12075/DsPH+in+LG+guidance+on+appointments.pdf/7f060f72-9ec5-47eb-8eda-390318f5ef21 [Accessed November 2014]

Health Education England (2014) *Scaling the Heights: an overview of Higher Specialist Scientific Training (HSST) in Healthcare Science*, http://hee.nhs.uk/wp-content/uploads/sites/321/2014/01/Scaling-the-Heights-final.pdf [Accessed November 2014]

Health Protection Agency (2012) *UK Field Epidemiology Training Programme: Core Learning Objectives*, http://webarchive.nationalarchives.gov.uk/20140714084352/http://www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1317132830140 [Accessed November 2014]

Health Protection Agency (2013) *Annual Report and Accounts 2012/13*, *https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/246760/0174.pdf* [Accessed November 2014]

McCartney, C. (2014) *A revolution in genomic sequencing*, Blog post: public health matters https://publichealthmatters.blog.gov.uk/2014/01/20/innovations-in-genomic-sequencing/ [Accessed November 2014]

NHS Employers (2014) *Modernising Scientific Careers – explaining the facts*, http://www.nhsemployers.org/~/media/Employers/Documents/Plan/ExplainingTheFacts_Br0935_6a%20as280114.pdf [Accessed November 2014]

PHORCaST (2013), *Introduction to the Public Health Skills and Knowledge Framework (UKPHSKF)*, http://www.phorcast.org.uk/document_store/1367423598_MyBF_introduction_to_the_phskf.doc [Accessed November 2014]

Public Health England (2013a), *Our priorities 2013/14,* https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/192676/Our_priorities_final.pdf [Accessed November 2014]

Public Health England (2013b) *Public Health England Submission - Commons Select Committee Inquiry into Women in STEM Careers September 2013*, http://data.parliament.uk/writtenevidence/WrittenEvidence.svc/EvidencePdf/1365 [Accessed November 2014]

Public Health England (2014), *Who we are and what we do: Our business plan for 2014/15,* https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/319696/Business_plan_11_June_pdf.pdf [Accessed November 2014]

RAND Europe (2013), *The future of public health: A horizon scan*, http://www.rand.org/content/dam/rand/pubs/research_reports/RR400/RR433/RAND_RR433.pdf [Accessed November 2014]

Skills for Health (2008), *Public Health Skills and Career Framework: Multidisciplinary/multi-agency/multi-professional*, http://www.skillsforhealth.org.uk/about-us/resource-library/doc_download/1869-public-health-skills-career-framework-03-2009.html [Accessed November 2014]

Vickers-Byrne, T. (2013), *Supporting people when they need it most*, Blog post: public health matters https://publichealthmatters.blog.gov.uk/2013/10/16/supporting-people-when-they-need-it-most/ [Accessed November 2014]

Legislation

Health and Social Care Act 2012 (UK), http://www.legislation.gov.uk/ukpga/2012/7/contents/enacted [Accessed November 2014]

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Appendix B – scientists by directorate

Directorate	Division	Number of scientists
Chief knowledge officer	Combined due to small numbers	5
Chief operating officer	Development and production	110
	MS operations	57
	Reference microbiology	211
	Regions	21
	Research microbiology	83
	Specialist microbiology services	647
Corporate functions	Combined due to small numbers	7
Health and wellbeing	HW population and behavioural health	6
	Programme improvement and delivery	5
	Other (combined due to small numbers)	3
Health protection	CRCE	259
	Emergency response department	28
	HP field epidemiology	25
	Infectious disease surveillance and control	140
	Public health strategy	5
	Other	1

Appendix C – classification of scientists to specialty

C.1 Assumptions: assignment by position title

The following table presents a selection of the position titles that were assigned to each specialty.

Proposed designated specialty	Titles included	Proposed higher level key (MSC) skills/knowledge
Behavioural science	Nutrition science officer, health and wellbeing programme leader, population health practitioner	Public health sciences
Biochemistry	Radiochemist, protein chemist	Life sciences
Bioinformatics	Clinical scientist/bioinformatician, bioinformatics/public health scientist, epidemiology and bioinformatics analyst, head of informatics	Informatics
Cell biology	Histologist	Life sciences
Clinical engineering	Utilities engineer, electromagnetic force scientist/engineer, heating ventilation and air-conditioning engineer	Physical sciences and biomedical engineering
Clinical microbiology	Microbiologist, bacteriologist, process and analytical method scientist, BIG technician, service manager virology/molecular, quality control technologist	Life sciences
Computer science	Database programmer, IS engineer, IT lead, programming scientist, R&D information manager, scientific systems programmer, GIS project scientist	Informatics
Environmental health science	Environmental scientist, aerobiology, aerosol scientist, air pollution impact assessment, environmental and enteric diseases, emergency planning officer, climate change scientist, SEPA coordinator (Scottish Environmental Protection Agency)	Public health sciences
Epidemiology	Epidemiological analyst, salmonella surveillance, HIV/STI surveillance and prevention scientist, TB cluster investigator, surveillance analyst (Note: Many re-coded field epidemiology based on organisational information)	Public health sciences

Proposed designated specialty	Titles included	Proposed higher level key (MSC) skills/knowledge
Field epidemiology	(Primarily coded from organisation structure, many initially coded as epidemiology)	Public health sciences
Genomics	Proteomics scientist, proteomics mass spectroscopy scientist	Informatics
Immunology	Assay development, pharmaceutical productions, quality – CfI (Centre for Infections), Immuno unit manager	Life sciences
Information science	Data and information policy, LIMS operations manager (laboratory information management system), information officer, health protection practitioner – knowledge management	Informatics
Microbiology	Clinical scientist (VRD - Viral Reference Department), healthcare scientist (VRD), vaccine preventable bacteria scientist, virologist, vaccine scientist, healthcare scientist molecular virology, consultant clinical scientist AMR (Anti-microbial resistance), HPA (Health Protection Agency) culture collections, specialist biomedical scientist MRSA (meticillin-resistant Staphylococcus aureus)	Life sciences
Modelling	Modelling economics, health economist/mathematical modeller, mathematical modeller/statistician, scientist and modeller, specialist Monte Carol modeller	Informatics
Radiation science [1]	Radiation protection	Physical sciences and biomedical engineering
Statistics	Head of statistics unit, medical statistician, statistical data analyst	Informatics
Toxicology	Food technical officer, food technologist, toxicologist	Life sciences

There are 200 position titles that are either too generic to be allocated to a specialty, or where organisational level information might be more appropriate to determine specialty.

[1] Radiation scientists at PHE may come from a variety of scientific backgrounds, and many do not identify as physicists or medical physicists.

C.2 Assumptions: assignment by organisational structure

Of the PHE scientists who were not allocated to a specialism based on their position title, the second stage was to assess the likely area of science they worked in based on organisational structure information. The dataset from PHE's HR system included six levels of organisational information (labelled Org level 2, Org level 3 DIV, Org level 4 RGN, Org level 5 BRN, Org level 6 UNT, and Org level 7).

Scientists were grouped into a specialty based on Org level 7 information in the first instance, then unit, branch, region or division level respectively. The following table presents the assumptions that were made in classification to each specialty.

Proposed designated specialty	Organisational structure	Proposed higher level key skills/knowledge
Behavioural sciences	Unit: Health and wellbeing	Public health sciences
Bioinformatics	Org level 7: Bioinformatics group	Informatics
Cell biology	Unit: Cancer genetics and cytogenetics	Life sciences
Clinical engineering	Org level 7: MSP GMP engineering Org level 7: MSP production labour pool	Physical sciences and biomedical engineering
Environmental health science	Branch: environmental assessments department Org level 7: Leeds environmental	Public health sciences
Epidemiology	Division: Infectious disease surveillance and control CRCE: Epidemiology section **Exceptions** • HPS Statistics unit (statistics) • HPS Modelling economics unit (modelling)	Public health sciences
Field epidemiology	HP Field epidemiology Org level 7: Biological services department Org level 7: Emergency response department	Public health sciences
Genomics	Org level 7: MSC Centralised sequencing unit Org level 7: MS Diagnostic and genomic technologies Org level 7: Applied functional genomics unit	Informatics
Immunology	Unit: NW Manchester Vaccine Evaluation Lab Unit: Immunisation hepatitis and blood safety Org level 7: MS Commercial Vaccine Research Budget Centre	Life sciences

Proposed designated specialty	Organisational structure	Proposed higher level key skills/knowledge
Information science	Org level7: Radon studies group	Informatics
Medical physics	Branch: Medical exposure	Physical sciences and biomedical engineering
Microbiology reference lab/research	Org level 3 DIV: Reference microbiology Org level 3 DIV: Research microbiology	Life sciences
Microbiology	Org level 3 DIV: Specialist microbiology services Org level 7: Microbial risk assessment Org level 7: MSC Biological services department general	Life sciences
Modelling	Org level 7: Modelling economics unit	Informatics
Physics	Org level 7: Radiation meteorology Branch: Physical dosimetry Branch: Radon services department **Exception:** • CRCE: Technology development group (clinical engineering)	Physical sciences and biomedical engineering
Radiation science [2]	Branch: Dosimetry services department CRCE: Protection advice and training Org level 7: CRCE Leeds Org level 7: CRCE Scotland	Physical sciences and biomedical engineering
Statistics	Org level 7: HPS Statistics unit	Informatics
Toxicology	Branch: toxicology Org level 7: MS toxins **Exception:** • Unit: Biomathematics group (bioinformatics)	Life sciences

[2] Radiation scientists at PHE may come from a variety of scientific backgrounds, and many do not identify as physicists or medical physicists.

Appendix D – horizon scanning factors

Interviewee	Factors
A	Research and technology: technology level – genomics Health and wellbeing: communicable health conditions Research and technology: understanding of susceptibility to disease Delivery model: role of the private sector Health and wellbeing: communicable health conditions Population: net migration Environment: global warming
B	Resources and infrastructure: access to information (data and research) Delivery model: multidisciplinary working Delivery model: role of PHE as arbiter of information
C	Politics and legislation: government research policy Delivery model: role of PHE as arbiter of information Economy: public health funding Politics and legislation: political framework Delivery model: integration of health promotion and health protection
D	Resources and infrastructure: access to information Delivery model: multidisciplinary working Delivery model: wellness vs illness Research and technology: technology level – genomics
E	Research and technology: automation Delivery model: aggregation of services Research and technology: technology level – genomics Delivery model: role of the private sector Employment and labour market: ageing of the ‘old fashioned’ skills Research and technology: understanding of susceptibility to disease
F	Delivery model: developing policy functions in PHE Delivery model: role of PHE as arbiter of information Delivery model: role of the private sector Delivery model: multidisciplinary working
G	Research and technology: technology level – genomics Research and technology: automation Research and technology: understanding of susceptibility to disease

Interviewee	Factors
	Resources and infrastructure: investment in people or machines Delivery model: multidisciplinary working Resources and infrastructure: access to information (data and research)
H	Workforce training and education: training cost Research and technology: technology level – genomics Politics and legislation: government research policy Politics and legislation: political framework Delivery model: role of PHE as arbiter of information Research and technology: understanding of susceptibility to disease
I	Research and technology: technology level – genomics Research and technology: automation Delivery model: aggregation of services Resources and infrastructure: access to information (data and research)
J	Delivery model: multidisciplinary working Delivery model: integration of health promotion and health protection Environment: climate change
K	Research and technology: technology level – genomics Resources and Infrastructure: access to information (data and research) Research and technology: understanding of susceptibility to disease Delivery model: role of the private sector Research and technology: effectiveness of technology and innovation Research and technology: understanding of health and social care
L	Research and technology: technology level – genomics Resources and Infrastructure: access to information (data and research) Research and technology: understanding of susceptibility to disease
M	Politics and legislation: government health and social care policy Research and technology: automation Workforce: unpaid carers Environment: climate change
N	Delivery model: need for monitoring systems Delivery model: quality improvement Delivery model: increased need for behavioural science

Interviewee	Factors
O	Research and technology: technology level – genomics Research and technology: automation Economy: public health funding Delivery model: role of the private sector Health and wellbeing: communicable health conditions
P	Workforce: ageing Workforce training and education: Modernising Scientific Careers Workforce training and education: reduced medical role in laboratories Research and technology: automation Politics and legislation: political framework

Appendix E – succession planning

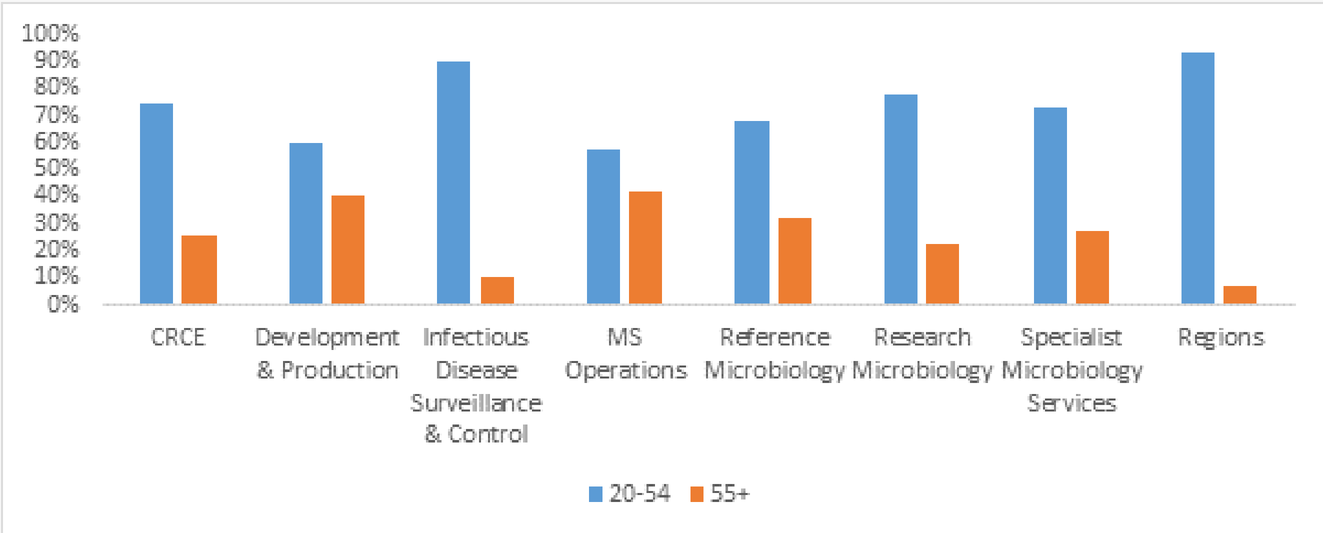
PHE has a significant demand for highly skilled and specialised expert scientists. This applies across the organisation, from infectious diseases to environmental hazards. Many of the scientists we spoke to over the course of this project emphasised the unique, specialised nature of the work they do, and the significant amount of time, experience and exposure it takes to develop the level of expertise required. The implications for PHE are that in order for the organisation to maintain the level of expertise in senior scientific staff, investment needs to be made in training scientists to a high standard, and supporting staff through career development.

MSC HSST training takes five years for scientists who are already qualified to STP level to equip them to be consultant clinical scientists in microbiology. To train a PTP qualified scientist through STP and HSST would take a minimum of eight years. It is likely that PHE will need to train its own scientists for many of its senior roles, where recruitment from industry or academia is difficult due to the highly specific skills and expertise required. Scientists from radiation protection, infectious disease modelling, and research similarly indicated that due to the intensely specialised nature of their work there was a significant challenge in finding people with the necessary skill set, and that PHE needs to develop its own people.

A systematic approach to succession planning and staff development will help PHE identify where senior staff are approaching retirement age with consideration given to their expertise, and whether it exists elsewhere in the organisation.

Figure 14 shows the proportion of Agenda for Change Band 8A staff aged 55 years and older. This chart only includes the divisions within PHE with more than 10 scientists employed at Band 8A or above.

Figure 14: Proportion of Band 8A or above staff aged 20-55 years, or 55 years and older, by division

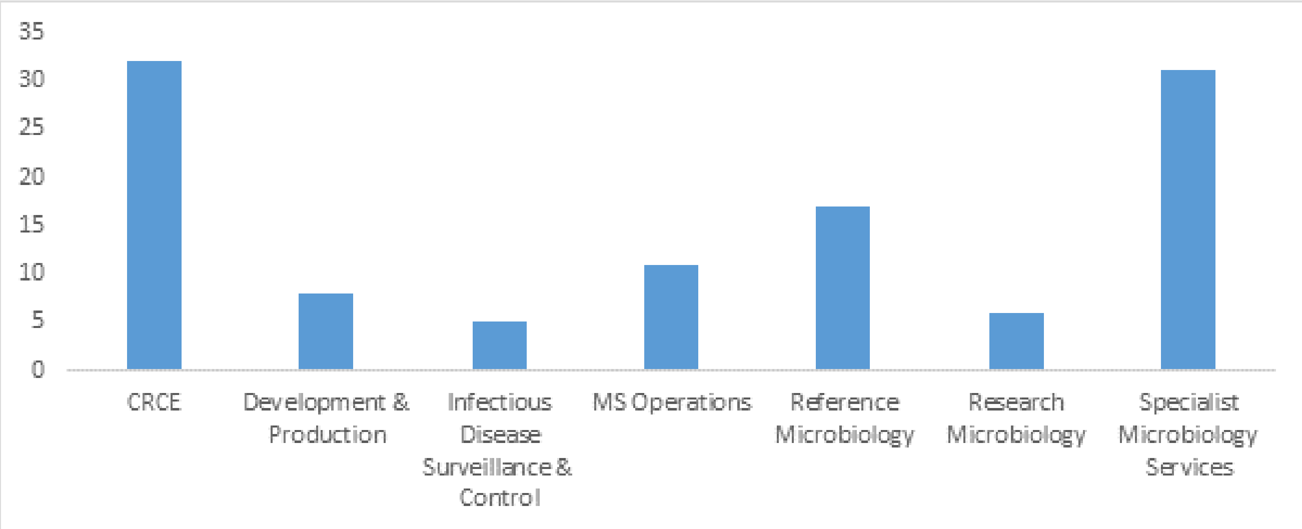


Source: CfWI

There are a few divisions where there is a relatively high proportion of senior staff who will be approaching retirement age within 10 years. The Centre for Radiation, Chemicals and Environment (CRCE), development and production (microbiology services), microbiology services operations, reference microbiology and specialist microbiology services, all have more than 20 per cent of their senior scientific staff aged 55 years or older.

Figure 15 shows the divisions of PHE with more than five Band 8A or above staff who are aged 55 years or older. Retirement may represent a substantial risk of lost expertise in these divisions, and PHE may consider an assessment of the specialist skills and knowledge required and how it might be developed in younger staff.

Figure 15: Number of Band 8A or above staff aged 55 years or older by division



Source: CfWI

PHE may also wish to consider skill mix when planning to replace medical consultant and consultant clinical scientist microbiologist or virologist posts performing clinical laboratory roles, especially in regional public health laboratories, where there is a considerable overlap in role definitions and specialist qualifications (eg FRCPath).

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