abpi
Bringing medicines to *life*

Bridging the skills gap in the biopharmaceutical industry

Maintaining the UK's leading position in life sciences

January 2022

Contents

Foreword

George Freeman MP
Minister for Science,
Research and Innovation

The Biopharmaceutical sector is critical to the country's health, wealth, and resilience. With Core Biopharma turnover of £40.7bn and employment of 66,000 people across the UK, the sector represents one of the great drivers of UK economic growth in the twenty-first century. The Sector has also been integral to the response to the Covid pandemic, and to the role in rapid vaccine development.

Since the UK Government's first (ten year) Industrial Strategy for Life Sciences in 2011, investment in the Life Sciences sector has grown by 1000%. The 2021 Life Sciences Vision sets out our ambition for the UK to become a life sciences superpower over the next ten years and focuses on what Government, the NHS, regulators, companies, medical research charities, academia and the philanthropic sector must do to create the environment in which industry and the NHS can work together to create a healthcare innovation economy in which the UK is not just the best place to research disease and discover potential treatments and cures, but also the best place in the world to test, prove safety and efficiency in patients and secure regulatory and procurement approval.

Critical to the UK's success in this global race will be our ability to attract, recruit, train and retain the skilled workforce that we need. The Life Sciences Vision includes the ambition to develop a strong talent pool across industry, academia, and the NHS. To do so will require Government, the Life Science industry, educational institutions and the NHS to work together to develop new ways to create a sustainable skills pipeline and an innovation-ready workforce suited for the new technologies being developed.

The ABPI has closely monitored the skills and talent pipeline within the sector over a number of years, and this latest study comes at a critical time for Life Sciences in the UK. As our sector enters a new phase, which includes developing advanced therapeutics and personalised medicines, the skills we need are rapidly evolving.

This 2021 report contains much good news. There are areas where skills gaps have started to narrow and in some areas, such as biological and chemical science, we are seeing rapid improvements. Core skills – such as scientific knowledge, communication and problem solving – have also improved. However, some areas of concern remain, with major skills shortages reported in areas such as computational and digital skills, and the integration of clinical, industrial, and economic research, as well as genomic and phenotypic insights and the integration of data across the patient pathway to aid both research and treatment, which is particularly in demand.

This ABPI report sets out a blueprint for how Government and industry can work together to grow the Life Sciences talent base, provide opportunities for life-long learning and re-skill the Sector's workforce to meet the evolving skills demands in the next decade.

Executive summary

Richard Torbett, Chief Executive
The Association of the British Pharmaceutical Industry

This report provides robust evidence of the current skills needs and future pipeline in the pharmaceutical and biopharmaceutical industries and updates the analysis contained in our 2018 report.[1] Specifically, this report aims to:

- Benchmark changes in the current and future skills needs for the pharmaceutical industry against those identified in 2018;
- Assess how well the UK education and skills system is meeting these needs; and
- Identify activities and actions by various stakeholders, including Government, research and training funders, academia and industry which could address new or emerging/evolving skills gaps.

Key findings

1. There have been **encouraging improvements since our last survey.** This suggests that the action taken by industry and Government has started to address some of the previously identified shortages.

   Skills shortages overall seem to be decreasing and there are fewer subjects this year which have been identified as top priority compared to the last survey.

   Some of the key areas of skill shortage – **including biological and clinical science areas – show clear signs of improvement** (although the problems are still not yet fully solved).

   There has been a **sustained reduction in the percentage of respondents who see the availability of workers with core skills** – such as scientific knowledge, communication and problem solving – as a concern.

2. There remains room for improvement in a number of areas. Seven disciplines are listed as top priorities:

   - Chemometrics
   - Formulation science
   - Physiological modelling
   - Computational chemistry (including chemoinformatics)
   - Pharmacokinetic/pharmacodynamics modelling
   - Epidemiology and pharmacoepidemiology
   - Engineering in manufacturing

   Five of the above top priorities clearly show the increasing role **data and digital** is playing within life sciences, R&D and manufacturing. Many of these featured in the 2018 survey as well. It is the crossover between these digital skills and scientific experience which is of particular concern.

3. Many of the skills shortages highlighted in this report are associated with the **quantity of candidates** rather than the quality. This suggests that the growing demand for candidates with specific skills is being outstripped by the supply – there are candidates with the right skills, but there are simply not enough of them, and in some areas such as digital, data and engineering, those skills are sought by a number of sectors. There will therefore, be a need to increase the number of qualified individuals coming through the education pipeline or reskilling. The sector may also need to better highlight the viable career pathways within the life sciences sector to ensure fully informed career choices.

4. **Attracting, recruiting and retaining experienced staff remains a key priority for companies.** Given the need for experience and the immediacy of the challenge, a clear focus on retaining staff and equipping candidates with the right skills that will see them stay within the industry will be crucial going forward. The industry continues to respond to adjustments in the labour market following the UK's exit from the EU and almost half of respondents acknowledged uncertainty about how the EU exit would impact their ability to attract talent. However, the proportion of respondents that felt the EU exit was a threat to recruiting talent fell compared to 2018, with just 10% describing this as a 'critical issue'. Respondents also indicated that industry's response to COVID-19 had led to an increase in candidates wishing to work in the industry.

Commitments and recommendations

Commitments from the ABPI

The ABPI has a leading role to play in ensuring the sector rises to meet the challenges across the UK.

We will:

1. Support higher education institutions across the four nations with course development and industrial placements to help **boost in-demand digital skills** and further increase the **positive awareness of the life sciences industry** as an attractive employer for candidates with digital skills. We know university is where many students decide on their future career, and there has never been a better time to advertise the benefits – both for the individual and for society – of a career in pharmaceuticals and biopharmaceuticals.
2. **Support STEM education to inspire young people** to develop in-demand skills and knowledge and to **make informed career choices,** through the launch of an updated, dedicated platform of free, high quality, up-to-date STEM resources supporting all key stages for UK curricula. This will help develop young people's foundational STEM skills, **support long-term attainment and drive achievement**, as well as provide support for teachers. Simultaneously, ABPI also commits to continue supporting and enhancing specific initiatives including the CREST Awards, and both the Science Industry Partnership and STEM Ambassador schemes.
3. Conduct **further research into recruitment and retention** of experienced staff and why this is proving a challenge for the sector. Whilst this report contains substantial new information and insight, we must also be clear where we need to know more. As the world of work changes, and government increases its focus on reskilling and lifelong learning, we need to understand what drives shortages in experienced staff and whether the industry needs to reconsider how careers can best be supported in the long term.
4. As part of the **Futures Group,** continue to address industry identified areas for action for securing a sustainable skills pipeline. The '2030 skills strategy'[2] for the life sciences sector was produced by the Futures Group, **a collaboration comprising the Office for Life Sciences, ABPI, The Science Industry Partnership and the BioIndustry Association.**

Policy recommendations

As well as taking action ourselves, we are committed to working with government to maximise the impact of our activity and support us in strengthening a sector which is already vital to the UK's productivity and growth.

Boosting digital skills

- **Use the newly funded Institutes of Technology to prioritise the application of digital skills in the life sciences sector.**

  In the recent budget, the Government confirmed funding to open 20 Institutes of Technology (IoTs) throughout England, which will bring together employers with further and higher education providers in local areas to provide technical qualifications. The Government is investing up to £290 million to establish a comprehensive network of IoTs across England with the aim to establish relationships with other key providers of technical skills in the wider education system, such as University Technical Colleges, so that there are clear progression pathways for students to support them. There are already IoTs providing tailored higher technical education and training in key STEM sectors, such as digital, construction, advanced manufacturing, and engineering, to respond to the needs of business for local areas. The success of existing IoTs in addressing skills issues should be evaluated to ensure new IoTs provide for bringing together digital and life science skills – ensuring that new skills in technology are successfully applied to some of the greatest challenges in healthcare and pharmaceuticals.

- **Stimulate adoption of emerging skills to meet demand by extending pilot schemes, such as those focused on the Skills Value Chain approach and the acquisition of wider research skills.**

  Drawing on the successes of The Skills Value Chain approach in manufacturing, the existing pilot should be evaluated for extending across multiple life science areas to include emerging skills demands in areas of shortage, such as informatics, data analytics, computational biology, visualisation technology and allied areas.

  Building on the R&D People and Culture Strategy, Government plans to design a pilot to help researchers acquire skills and knowledge beyond their own discipline, should be expanded and ensure that grant funders are supportive of digital skills and interdisciplinary/intersectoral research, and of researchers moving between fields.

Creating a pipeline of UK and international scientific researchers

- **Ensure early career researchers are central to broader skills policy, to support the number of new candidates in the pipeline.**

  In order to achieve this, Government should increase the number of PhD scholarships a nd early career awards for early career researchers in life science disciplines. This would build on the R&D People and Culture Strategy announcements, in which Government set out giving a stronger voice to early career researchers.

- **Increase the provision of life science apprenticeship training across level 2-7, through better industry co-ordinated engagement with life sciences employers.**

  In partnership with industry, we should seek to enhance the quality and quantity of skills provision and improve SME engagement in skills provision – including the apprenticeship levy – which will help build sustainable cohorts for specialist subjects. The Government has already suggested it will boost the proportion of the apprenticeship levy recovered by the life science sector from 24% to surpass the national average of 31% by working with industry to ensure the apprenticeship system works for the life science companies, and in particular life sciences SMEs. But more can still be done. For example, the Government can act on recommendations first made in the ABPI's 2021 policy paper Apprenticeships in the Life Sciences Sector to ensure the Government's Spending Review 2021 announcements on apprenticeship funding and flexible training models, specifically meet the needs of life sciences employers.

Attracting experienced expertise

- **Support visa routes for global life sciences talent, including reviewing the attractiveness of funding globally-mobile researchers.**

  The UK's new immigration system, should capitalise on the strengths of the Global Talent visa and the opportunities afforded by the recently announced Global Talent Network. Government should explore expansion of both permissible global prizes which automatically qualify individuals for the Global Talent Visa, and eligible characteristics of high potential for the High Potential Individual route. The introduction of the Global Talent Network – as announced in the recent spending review – is welcomed, and an expansion to more regions could support more experienced and highly qualified staff to locate in the UK.

1. Introduction

Industry landscape

In 2019, the UK pharmaceutical sector had a turnover of £36.7bn.[3] Employment has been growing over recent years, from 61,000 in 2016,[4] to 62,500 in 2018[5] and 72,000 in 2019. According to the Science Industry Partnership, by 2030 the Life Sciences Sector more broadly has the potential to create around 133,000 jobs, through replacement and growth.[6] Overall, there are 2,240 businesses in the sector,[7] and over 95% of these employers are SMEs.[8] Geographically, 66% of employment is outside of London, indicating that the industry invests throughout the UK.[8] Interestingly, the top three segments (small molecules, antibodies and therapeutic proteins) in the biopharmaceutical industry account for 90% of all core employment in the sector.[9]

The pharmaceutical industry is a major contributor to R&D spending and accounted for 18.4% of all industrial R&D expenditure in the UK in 2019, investing around £4.8bn (figures 1a and 1b). Of all industrial sectors, pharmaceuticals was also the group which had the largest growth in expenditure on R&D (6.9%).[10] R&D expenditure peaked in 2011 (approaching £5bn, almost one quarter of all UK industry R&D spending at the time) but trended downwards until 2014.[11] Since then, however, it has been steadily increasing in line with overall growth in R&D spending in the economy. As a result, the pharmaceutical industry's spending as a proportion of total industrial R&D spend is holding at around one fifth (18.4%), the most out of any other industry.[12]

Figure 1a: Pharmaceutical industry expenditure on R&D compared to other industries over time.

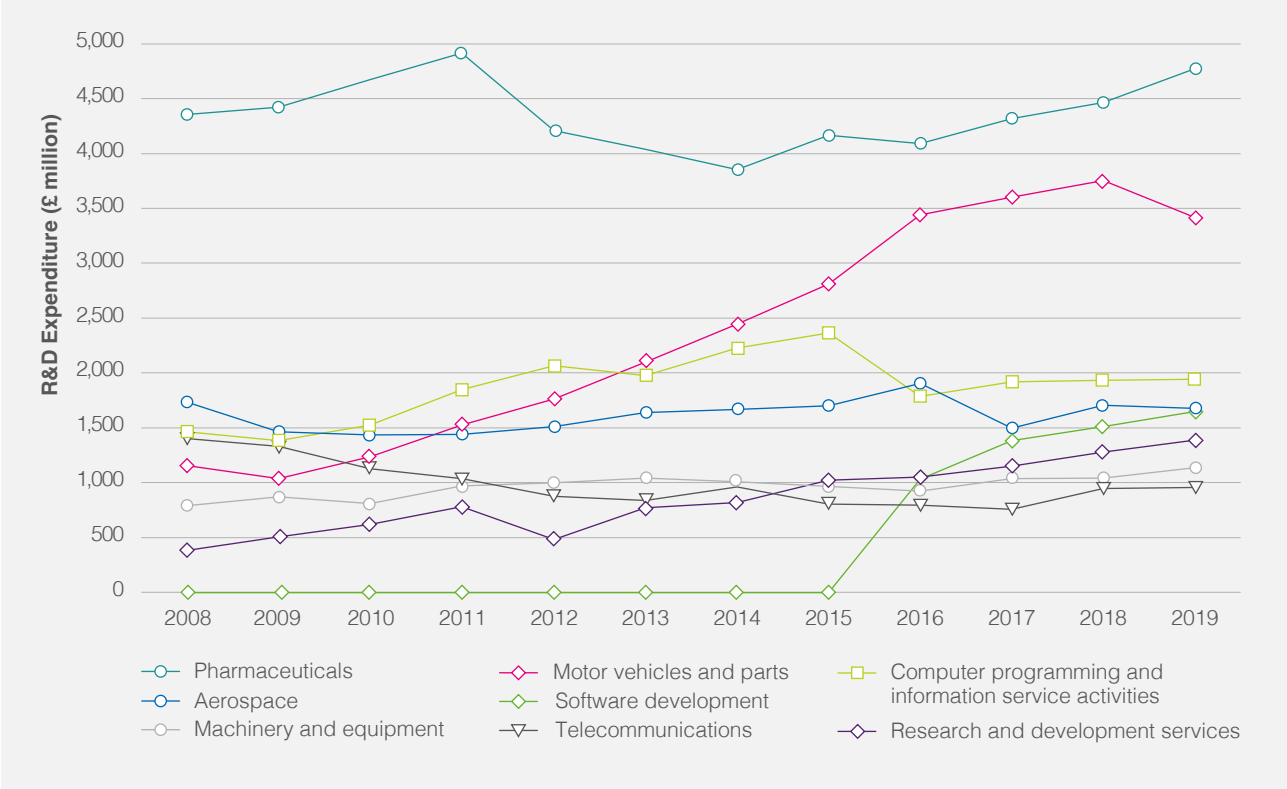
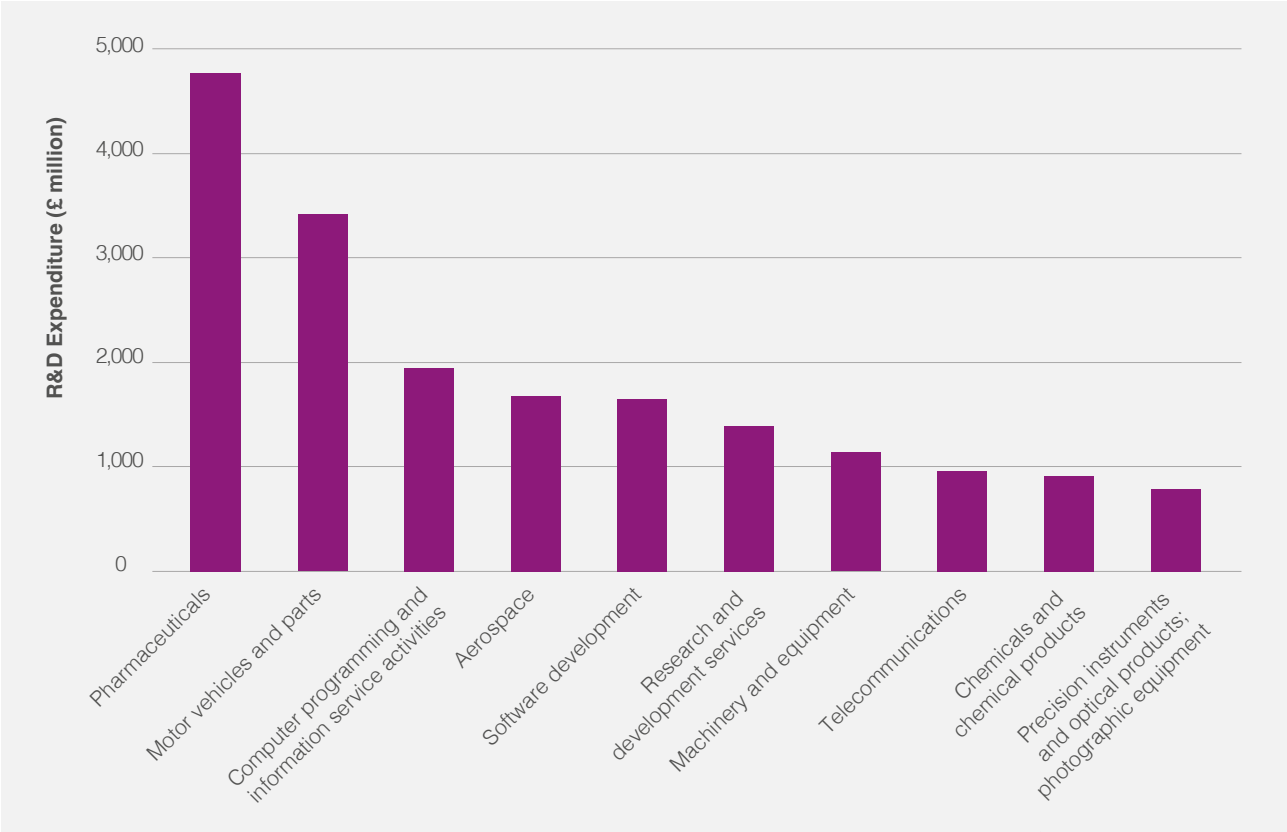


Figure 1b: Pharmaceutical industry expenditure on R&D (2019) compared to other industries.



It is against this backdrop that the Life Sciences Vision was published in July 2021. The Vision highlights that the UK must "develop the highly skilled workforce needed to position the UK as the global hub for Life Sciences, ensuring the Sector has access to the skills, talent and people it needs to innovate and grow and be able to capitalise on emerging opportunities".[13]

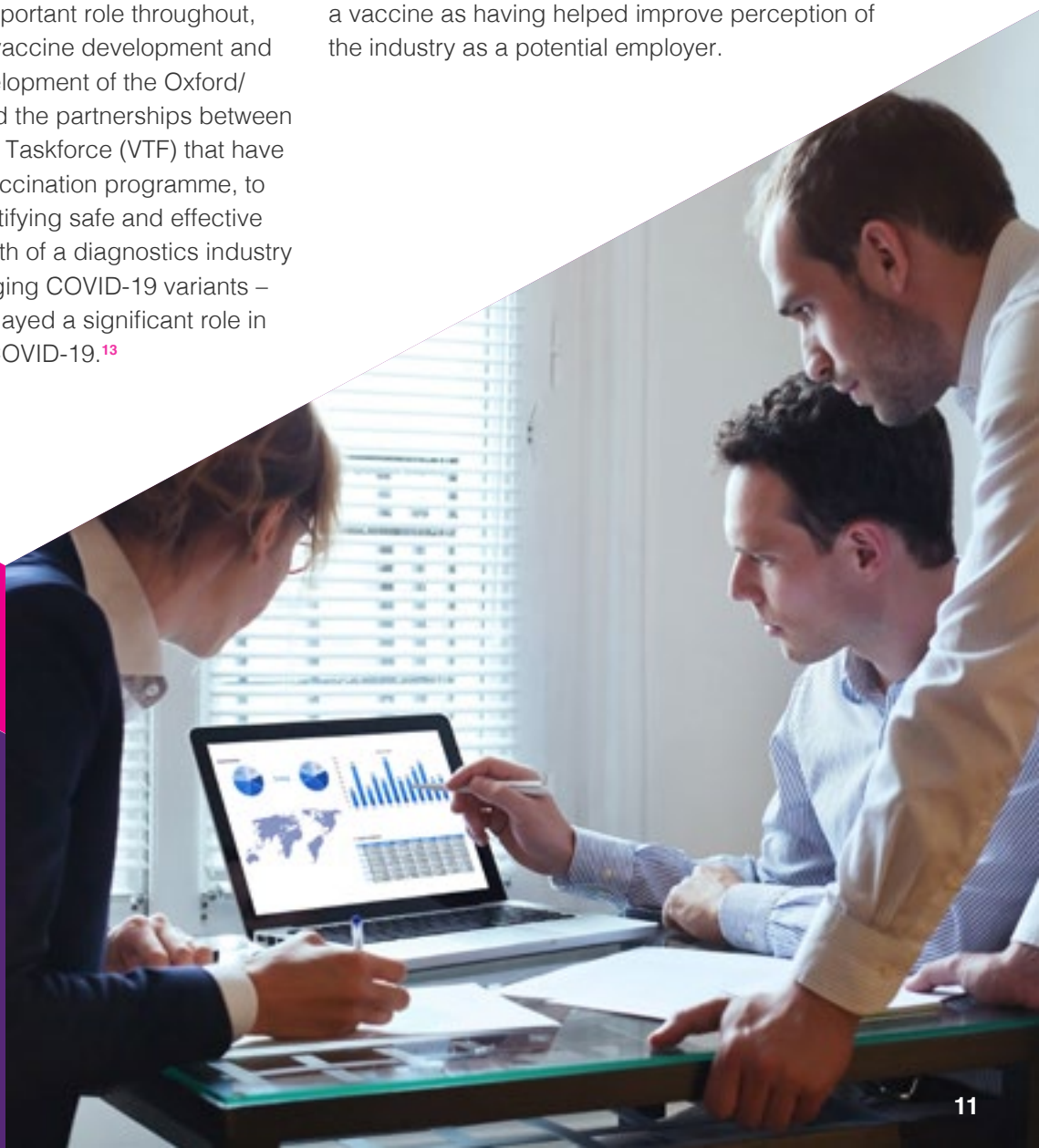
The Government has recognised that achieving this will involve attracting the best global talent and following the UK's exit from the European Union, the Government has made changes to the new immigration system which now includes specialist routes to ensure this is possible for the life sciences sector. We await more detail on how the role of the Office for Talent, and the newly announced Global Talent Network can support the life sciences workforce.[14]

These are welcome measures that the ABPI supports and it will be critical to get the implementation of these right if we are to recruit the highly qualified workers that the industry needs, particularly bringing in talent to the UK, such as through intra-company transfers, which is still a fundamentally important factor which drives companies to maintain their European headquarters in the UK. Some respondents to our survey recognised that the impact of the UK's exit from the EU on the ability for companies to attract talent remains uncertain.

The impact of the COVID-19 pandemic has added to this uncertainty. The UK pharmaceutical industry has played a uniquely important role throughout, being at the forefront of vaccine development and treatment. From the development of the Oxford/AstraZeneca vaccine and the partnerships between industry and the Vaccine Taskforce (VTF) that have underpinned the UK's vaccination programme, to the RECOVERY trial identifying safe and effective therapeutics, to the growth of a diagnostics industry that is sequencing emerging COVID-19 variants – UK Life Sciences have played a significant role in the global fight against COVID-19.[13]

However, the industry has been affected by recruitment and skills issues in a similar manner to other sectors. The closure of laboratories and halted supply chains have had their own knock-on effects, and have created many financial and personnel issues for the industry.

Despite this, the industry has adapted to new demands, changing recruitment strategies and identifying which skills will be needed post-pandemic. COVID is not seen as a top threat by most respondents to the survey and there is a broad consensus that the industry will be able to adapt and recover and there are some who view the industry's performance in the development of a vaccine as having helped improve perception of the industry as a potential employer.



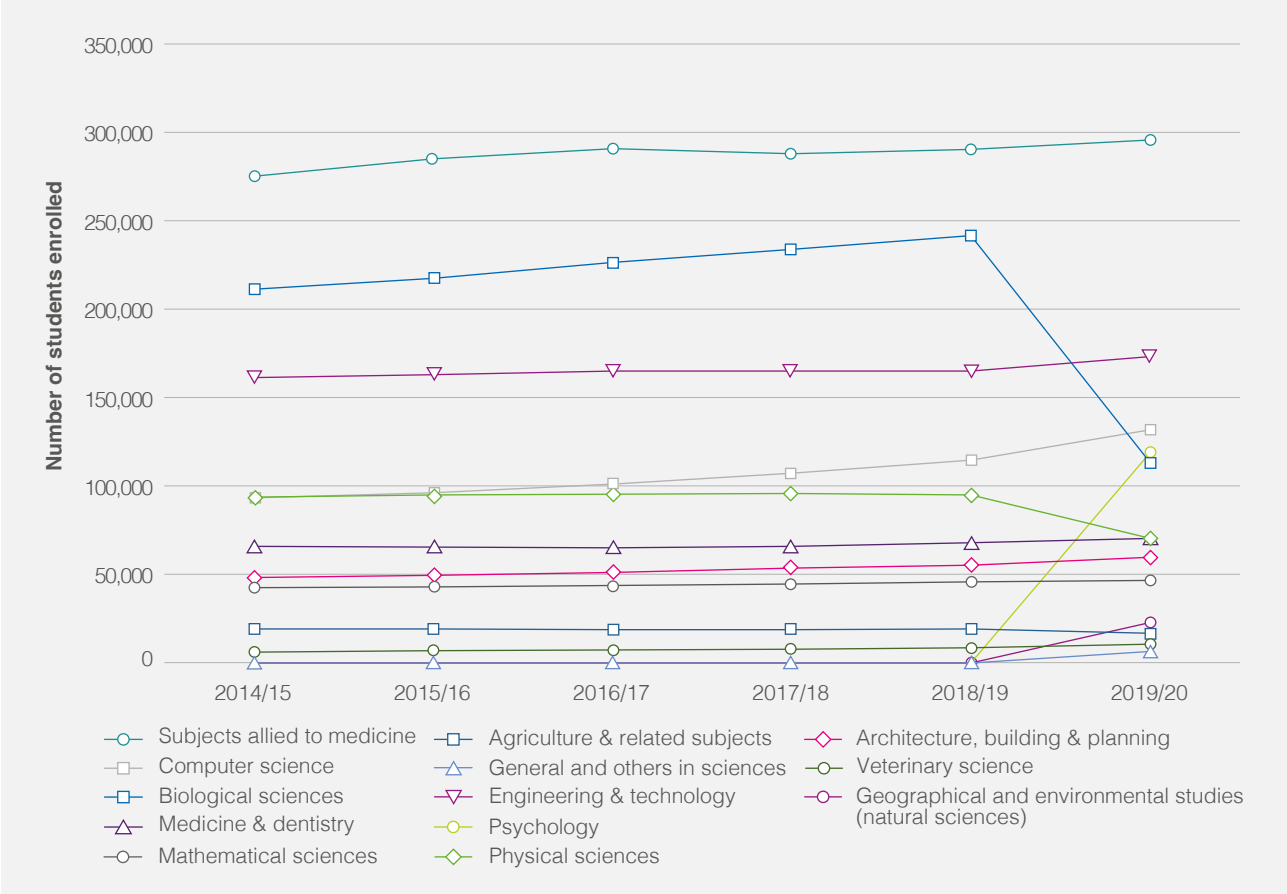
Education and skills

In 2019/20, 45% of student enrolments at higher education institutions were in STEM subjects, and this figure has remained fairly constant for many years.[15]

In the same year, 'subjects allied to medicine' was the second most popular category of degree behind 'business and administrative studies'. Whilst 'biological sciences' degrees are no longer in the top three as they were in our previous survey, this can be accounted for through a recent change

in reporting which in 2019/20 separated out 'psychology' degrees from biological sciences degrees. Along with 'biological sciences' and 'psychology', the two other STEM subjects in the top 10 for 2019/20 are 'engineering and technology' and 'computing' (figure 2).

Figure 2: Number of students enrolled in higher education per STEM subject over time.



While the overall number of STEM students has increased over the last decade, part of that is due to overseas students (who currently make up 19% of STEM undergraduates, up 6% from our last survey).[15] However, the increased popularity of STEM amongst UK students is still welcome news. As we stressed in our last report, it is vital that the number of STEM students is sustained and keeps increasing in the future. It is also important that the pharmaceutical industry continues to be proactive in attracting STEM graduates. The pharmaceutical industry continues to offer opportunities to a wide range of university students, enabling them to: work on the front-line of the industry during their degree; develop practical and technical skills; experience first-hand, the fulfilling nature of roles in the industry.

The findings of this report support those outlined in the ABPI's recent policy paper Apprenticeships in the Life Sciences Sector however, demonstrating that simply having increasing numbers of STEM students at universities is not enough.[16] Academic education tends to be separated into siloed faculties, which creates graduates with skills that are often poorly aligned with industry needs. To be industry ready, candidates need to have a range of interdisciplinary skills which allow them to work across different teams and in different areas. Such skills gaps are limiting the productivity of graduates in the sector, often leaving them struggling to keep up with the rapidly changing technologies and innovations of their working environment.

The Skills and Post-16 Education Bill, includes

£2.5bn

to support apprenticeships

Undoubtedly, university degrees are not the only way into the pharmaceutical industry. Recent research from UCAS indicates 78% of students not planning to enter into higher education immediately, were interested in an apprenticeship, with the primary attractions being the varied ways of learning and the ability to earn and learn simultaneously.[17] This is supported by the strong apprenticeship growth in the life sciences and industrial sciences sectors, with estimated starts on science-specific apprenticeship standards in 2018/19 over 14 times higher than in 2015/16.[18] These new starts are driven by our ambitious apprenticeship agenda, that delivers high-quality, high-level apprentices to where the industry needs them. The development of degree apprenticeships has been significant and positive although proposed changes to policy are a risk to the sector maintaining such growth. For example, there are concerns around the development of 'occupational degrees' within apprenticeships which have the potential to result in long term narrowing of degrees, lack of independence in end assessment and the prospect of future degree apprenticeship lacking the academic rigor that currently benefits transferability into academia and career progression.

Work has been done with the intention of improving access through vocational routes, for example, the recent Skills for Jobs white paper will be implemented in the Skills and Post-16 Education Bill, which includes £2.5bn to support apprenticeships in 2021-22.[18] The newly opened apprenticeship incentive scheme is intended to support workforce investment in apprenticeships, and it is encouraging to see further support for apprenticeships and technical skills as outlined in the recent Spending Review.[19,20] However overall, life sciences employers invest in talent for the long term, and favour a stable and supportive policy framework for apprenticeships rather than short term activity.

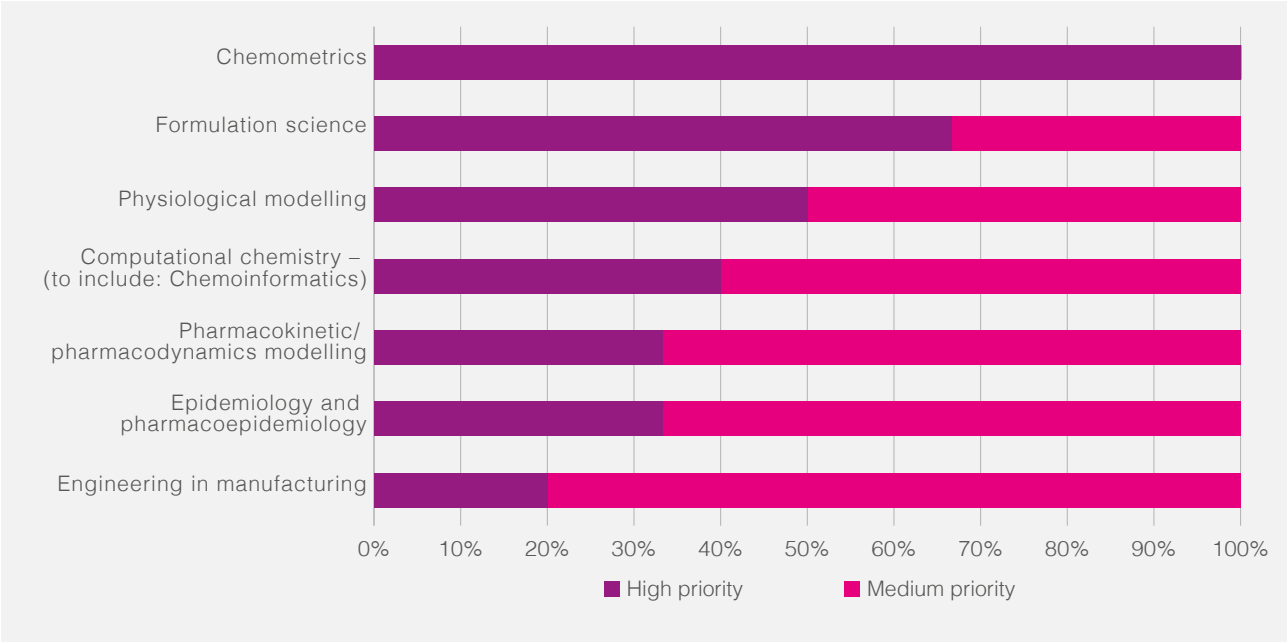
2. Survey findings

Top priorities

Top priority disciplines are those deemed nothing less than high or medium priority by all respondents.

The breakdown of votes for top priority areas can be seen in figure 3, where the disciplines are ranked in order of highest priority to lowest priority.

Figure 3: Percentage of respondents rating each top priority discipline as high or, medium priority.



There are fewer top priorities than in previous years and it is worth noting that four out of the seven top priorities from this survey were identified as top priorities in 2018, and an additional one was considered a top priority in 2015. This means that only two top priorities are new, and therefore indicates a longstanding difficulty in attempts to close the skills gaps for these disciplines. This is especially true for computational chemistry, which has been identified as a top priority in all three surveys.

Top priority disciplines in 2021 which have been considered a top priority in previous surveys, and which therefore have proved difficult to close skills gaps in, are:

- Chemometrics (2018, 2021)
- Formulation science (2015, 2021)
- Physiological modelling (2018, 2021)
- Computational chemistry (including chemoinformatics) (2015, 2018, 2021)
- Pharmacokinetic/pharmacodynamics modelling (2018, 2021)

These areas have posed persistent challenges for the industry and must therefore require careful attention.

There have been encouraging improvements since our last survey

In general, skills shortages seem to be decreasing and there are fewer subjects which have been identified as top priority compared to the last survey.

Since our last survey, there have been some encouraging improvements which indicate that work undertaken following previous surveys is beginning to have positive outcomes.

For example, there are fewer top priorities than previous surveys, which indicates on the whole that things have improved since the last survey. This is true even if we choose to adopt the definition of top priority from previous surveys. In 2018, there were sixteen top priority disciplines and in 2015 there were eighteen (table 1). This year, there are seven top priority disciplines.

Table 1: Comparison of 2015 and 2018 top priorities with 2021 top priorities.

Top priorities 2021	Top priorities 2018	Top priorities 2015
Chemometrics	Immunology	Clinical pharmacology/ translational medicine
Formulation science	Genomics	Data mining
Physiological modelling	Clinical pharmacology/ translational medicine	Statistics
Computational chemistry (to include: Chemoinformatics)	Pharmacokinetic/ pharmacodynamics modelling	Bioinformatics/computational systems biology
Epidemiology and pharmacoepidemiology	Medicinal and synthetic organic chemistry	Qualified person PV
Pharmacokinetic/ pharmacodynamics modelling	Bioinformatics/computational systems biology	Qualified person QA
Engineering in manufacturing	Computational science	Veterinary and toxicological pathology
	Automation	Health informatics
	Physiological modelling	Health economics and outcomes
	Metabonomics	Formulation
	Device technology	Clinical pathology
	Computational chemistry	In vivo physiology
	Proteomics	Computational chemistry
	Biomedical imaging	Biomedical imaging
	Chemoinformatics	Proteomics
	Chemometrics	Process chemistry
		Metabonomics
		Chemoinformatics

Some of the key areas of skill shortage – including especially biological and clinical science areas – show clear signs of improvement (although the problems are not completely solved).

This year, no biological science disciplines were considered top priorities. This is an impressive improvement since the last survey, where four biological science disciplines were identified as top priorities (immunology, genomics, metabonomics, proteomics). However, there is still a slight cause for concern for some biological science disciplines. Human genetics, histology, and drug metabolism and ADME all appear in the top 10 for overall priority rating and biochemistry, structural biology, toxicology and veterinary and toxicological pathology had 50% or more of respondents rating them as 'high priority', which means they would be considered top priority disciplines in previous surveys. In general, it is important that the biological science areas are carefully monitored, as over 70% of these areas had over half of respondents rate them as 'medium' or 'high' priority. Whilst the top priority disciplines may have changed since the previous survey, there are still persistent concerns across all biological sciences around both the quality and number of candidates.

Other peripheral scientific disciplines, especially clinical, pharmacy, regulatory and business-related disciplines also continue to be relatively low priority. Until now, clinical pharmacology/translational medicine has consistently been a top priority since the first ABPI skills survey in 2005. Whilst an overwhelming 80% still see it as either a medium/high priority, it is encouraging to see that the proportion of respondents seeing it as high priority has dropped from 70% in 2015 to just under 60% in 2018 and only 10% this year. Similar to biological areas, whilst this technically means that no clinical areas are deemed a top priority this year, further scrutiny of the data suggests that we must not forget about this area. All clinical disciplines apart from registered nurses were deemed medium priority (over 50% of respondents thought they were either medium or high priority), with the registered nurses category still having the second highest proportion of high priority responses in this area (25%). In particular, apart from clinical pharmacology/translational medicine and the new categories surveyed this year (medical information scientists; precision medicine), the proportion of respondents who deemed clinical areas medium or high priority has actually increased across the board from 2018. Therefore, the progress on skills gaps outlined in the area in 2018 may have started to stagnate; this may be related to a specific comment made by one of the respondents in 2018 that the skills base was not keeping pace with technological change.

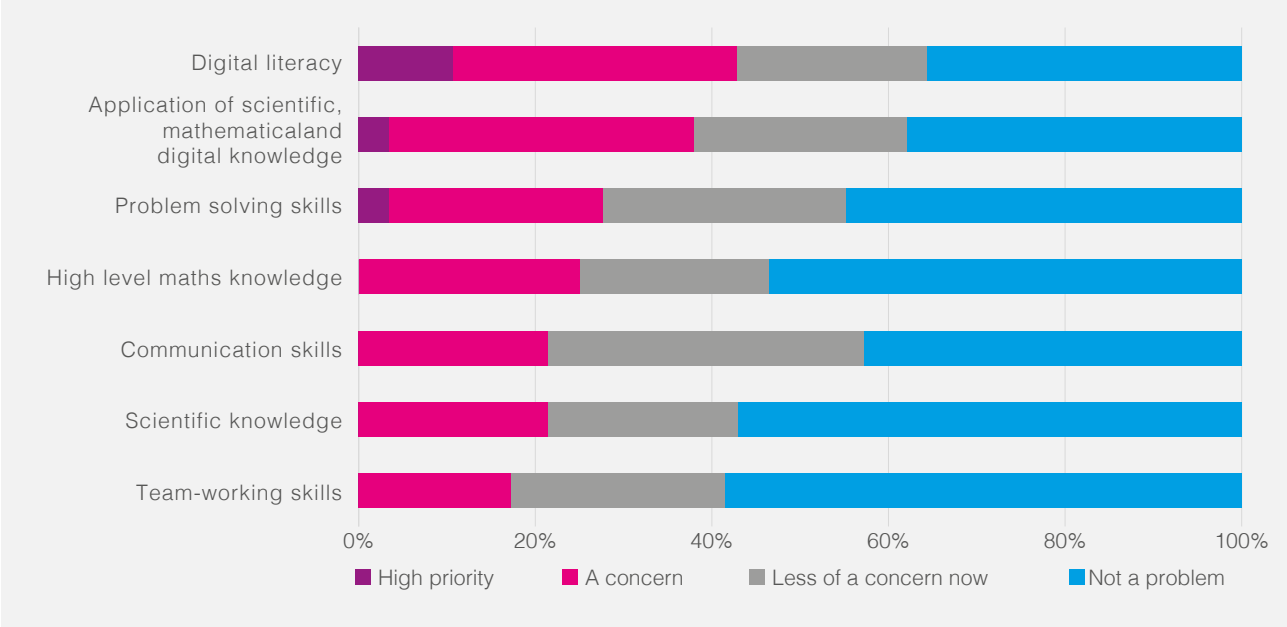
In addition, the chemical sciences were not considered very high priority by respondents, with the exception of formulation science. Most notably, chemical biology was seen as 'not a problem' by 100% of respondents, with no respondents suggesting a problem with either the quality or quantity of candidates, identifying any staff shortages or any practical skills shortages. However, there are more disciplines this year where at least 50% of respondents consider them high or medium priority when compared to 2018 (there were only two).

Other areas such as pharmacy, regulatory and business areas were also of typically low concern. For example, formulation has gone from high priority in 2015 to high/medium priority in 2018, to only medium priority now. Regulatory disciplines such as qualified person (QPPV) and pharmacovigilance have also experienced similar improvements.

There has been a sustained reduction in the percentage of respondents who see the availability of workers with core skills as a concern.

Non-specific to particular topic areas, respondents were also asked to indicate what core skills and knowledge they felt were problematic. They were asked to rank the skills on a spectrum ranging from a major concern to not a problem (figure 4).

Figure 4: Percentage of respondents rating each core skill as a major concern, a concern, less of a concern, or not a problem.



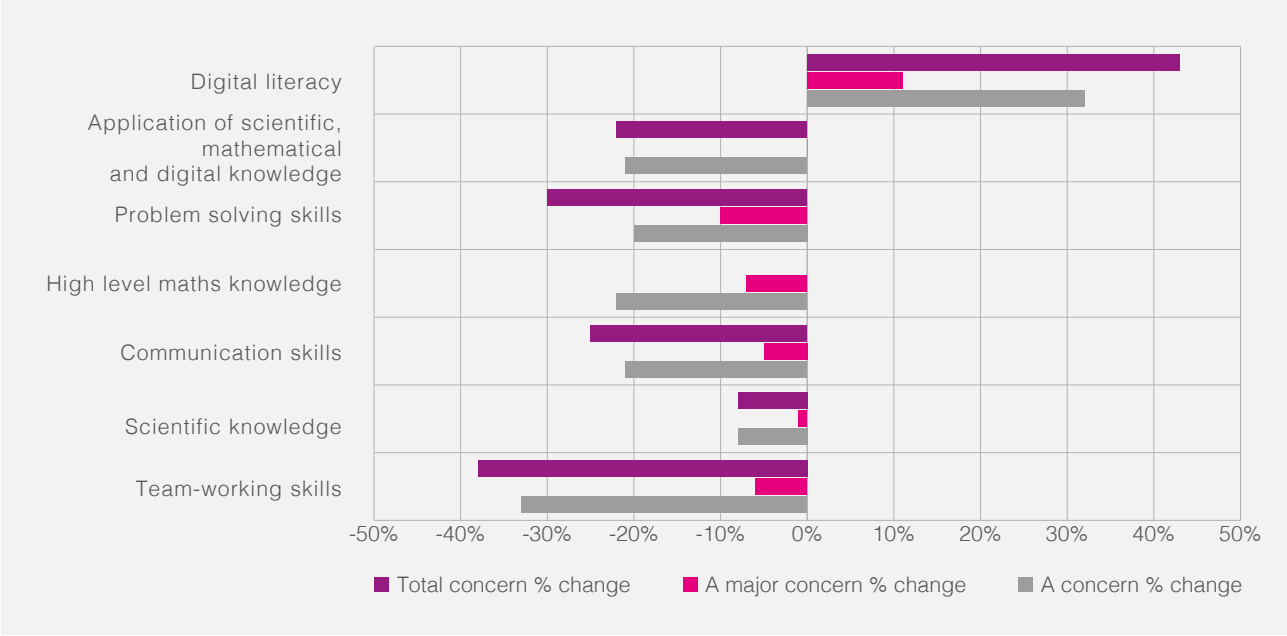
Since the last survey, and continuing the trend from 2018, there has been a general reduction in the percentage of respondents who see core skills as a concern, particularly this year with significant reductions in scientific knowledge (-38%), communications (-30%) and problem solving (-29%) (figure 5). As noted in the last survey, this may be the result of consistent efforts over time to improve the quality of the scientific and maths curriculum in schools. It appears, in this respect, at the compulsory school level, the education system in the UK is increasingly meeting sector needs for those core skills surveyed on previously.

The education system in the UK is

increasingly meeting

sector needs

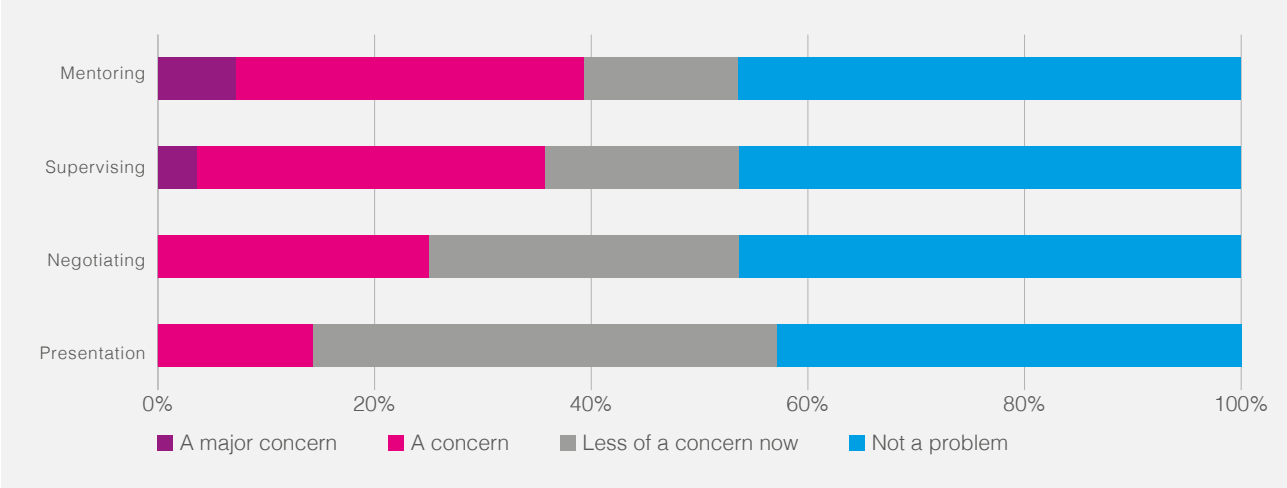
Figure 5: Percentage change from 2018 in votes for total concern, major concern, and concern for each core skill.



*Note: digital literacy was not assessed in 2018.

This year we also asked which skills were deemed problematic for candidates moving into leadership or management roles (figure 6). Of these four skills, mentoring and supervising were deemed the most problematic, but overall none of these core skills were seen as a major issue.

Figure 6: Percentage of respondents rating each core skill for those moving into leadership or management roles as a major concern, a concern, less of a concern or not a problem.



Data and digital skills are priorities for life sciences

Five of the seven top priorities are informatics, computational, mathematical, and statistical disciplines, which reflects the increasing role data and digital is playing within life sciences R&D and manufacturing.

The number of top priorities in this area has decreased since the previous survey – thus showing a response to the skills gap identified in this area – however, survey responses indicate there are still long lasting and persistent skills gaps in particular disciplines that need to be addressed. This suggests that the subject area presents key skills challenges for the industry, and has been an un-addressed problem for some time. The five disciplines that were deemed a top priority in this subject area are:

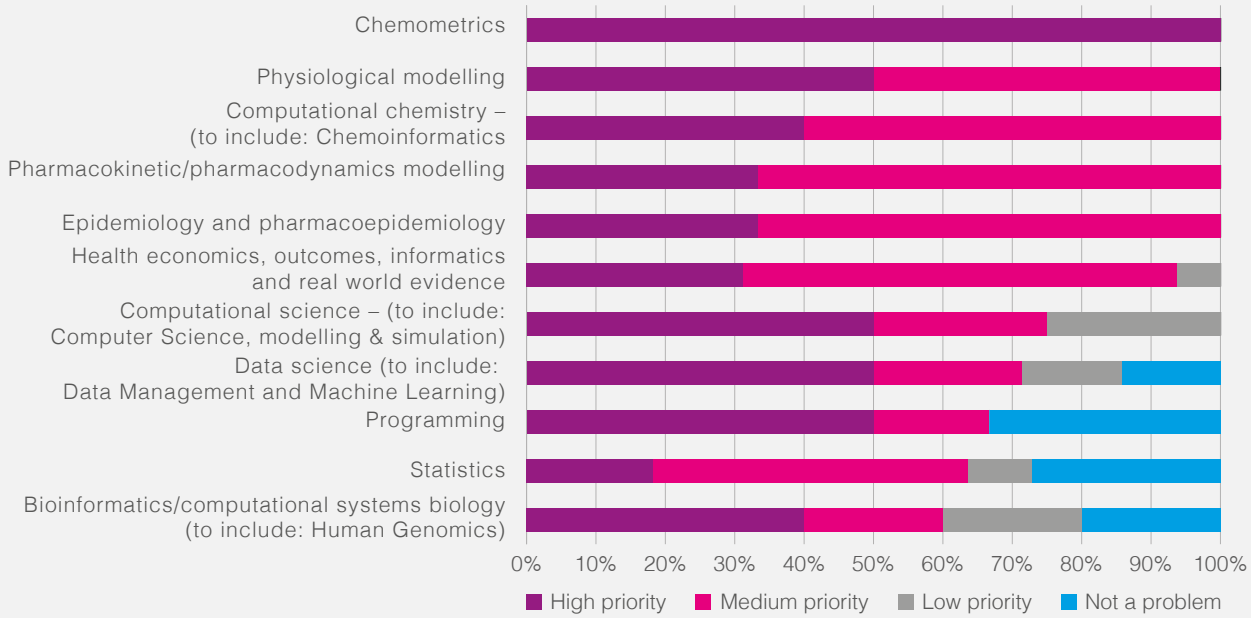
- Chemometrics
- Physiological modelling
- Computational chemistry (including chemoinformatics)
- Pharmacokinetics/pharmacodynamics modelling
- Epidemiology and pharmacoepidemiology

With a further three disciplines having over 50% of respondents seeing them as high priority:

- Computational science
- Data science
- Programming

It is cause for concern that of these eight disciplines, six were identified as top priorities in the previous survey (chemometrics, physiological modelling, computational chemistry (including chemoinformatics), pharmacokinetics/ pharmacodynamics modelling, and computational science).

Figure 7: Percentage of respondents rating each informatics, computational, mathematical and statistics discipline as high, medium or low priority or identifying it as 'not a problem'.



Future issues

We also asked respondents which areas they anticipated being top priorities in the future. Areas which are not top priorities now but are thought to be in the future should be watched very closely. The areas where more than 50% of respondents thought they would be problem for the future are highlighted in the Appendix. The top seven future concerns which aren't currently part of the seven top priority disciplines are all interdisciplinary in nature and involve some form of computational, digital, or statistical skills. Four of these five are also part of the informatics, computational, mathematical and statistical subject area. These future concerns are:

- Computational science – (to include: Computer Science, modelling & simulation)
- Clinical pharmacology/translational medicine (to include: Clinical Pharmacology Scientists (non-medical); Physician Pharmacologists; Pharmacometricians (modelers))
- Bioinformatics/computational systems biology (to include: Human Genomics)
- Data science (to include: Data Management and Machine Learning)
- Statistics

Not only are computational, mathematical and digital subjects a cause for concern now, they are also considered to become increasingly problematic in the future. Much work must therefore be done to ensure that skills gaps within these disciplines are filled so that the UK life sciences sector can maintain its position as a global leader.

> **"This is a huge growth area for healthcare data science, and demand currently outstrips supply. A significant proportion of strong data science candidates have limited life sciences experience, and this must be taught on the job for them to become effective."**
>
> Survey respondent talking about data science.

Concerns for core skills may have declined, but core skills related to digital literacy are a major concern

Very much interlinked with the previous chapter is the fact that core skills related to digital literacy are considered to be a major concern.

Of the same core skills that were surveyed in 2018, application of scientific, mathematical and digital knowledge remained the biggest core skill issue, with 38% of respondents considering it a concern or major concern (albeit this is still a 25% reduction from 2018). This year, however, digital literacy was also assessed as a core skill, and it is evident that this is by far the skill that raised most concern. 43% of respondents marked digital literacy as either a concern or major concern, with 11% of respondents – the most by a long way out of the other skills assessed in 2021 – marking it as a major concern alone. This serves as further evidence for the major skills gap identified in the informational, computational, mathematical and statistics disciplines, where digital skills feature most prominently.

> **"Another high priority area and attracting talent to our industry is difficult (vs other sectors). Many chemistry/pharmaceutical type courses or even mainstream chemistry/chemical engineering courses typically don't train in these skills and so this is likely to be a growing problem area."**
>
> Survey respondent talking about computational science.

Monitoring digital skills across all subject areas is important

The top priority disciplines tend to be more computational and interdisciplinary, overlapping between both scientific and data/computational skills. However, it is important to monitor closely all disciplines which require digital skills, even those which may be considered low priority overall. This overlap between scientific and data/computational skills is a particular concern for the industry – for example as seen in genomics – which although being considered low priority overall, is experiencing issues with data analysis.

Recent research conducted by the ABPI which involved deep dive interviews with Bristol Myers Squibb; Covance; GlaxoSmithKline; Merck Sharp & Dohme; and Roche, shows the extent of the digital skills gap in the discipline of genomics. The research highlighted, for example, the fact that genomic data needs to be easily interpretable for healthcare professionals. As data analysis is becoming a core skill for the clinical workforce, high quality educational programmes are needed which are tailored to these demands. Whilst genomics came out as the least problematic discipline in the biological sciences area in the current report, it is important not to overlook specific digital skills gaps which persist in the subject.[21]

Competition for digital skills

One particular common theme from the qualitative comments in this section was that candidates with the right skill sets in areas such as computational science and data science were being attracted to industries where salaries have been drastically inflated over recent years. For example, candidates across all levels – whether they be recent graduates or experienced staff – don't necessarily think of the pharmaceutical industry as a potential employer for digital skills and instead opt for the better salaries which large technology companies can offer. Taken together, this lack of awareness and inability to compete with large technology companies is contributing to a distinct digital skills gap for the industry. The sector must therefore focus on how to become an attractive employer of digital skills through highlighting the wider benefits of working in the industry, such as levels of fulfillment and relevance to the wider world.

"Competition with highly paid data science jobs in digital industries is an issue – scientific salary brackets are not compatible with market reality for data scientists/bioinformaticians, and result in employment offers that need a boost of 20% with respect to a biologist of equivalent seniority."

Survey respondent talking about bioinformatics/ computational systems and data science.

"Although many people are now being somewhat trained in this area, there has been a surge in need for people with these skills which has meant that anyone with experience commands a huge salary and is often hard to secure into the pharma industry if competing with jobs in the tech industry."

Survey respondent talking about computational chemistry.

"Competition from other sectors is influencing unrealistic expectations in terms of salary."

Survey respondent talking about epidemiology and pharmacoepidemiology.

"We have seen that there are generally good candidates for roles we advertise but the expectations around salary are unrealistic (competition from other sectors perhaps influencing this) and candidates generally don't have a good understanding of the career opportunities available to them longer term in our industry. This is a high priority area for us and we have immediate and future needs for people with these skills."

Survey respondent talking about health economics, outcomes, informatics and real world evidence.

There are problems more around the quantity of candidates rather than the quality of candidates

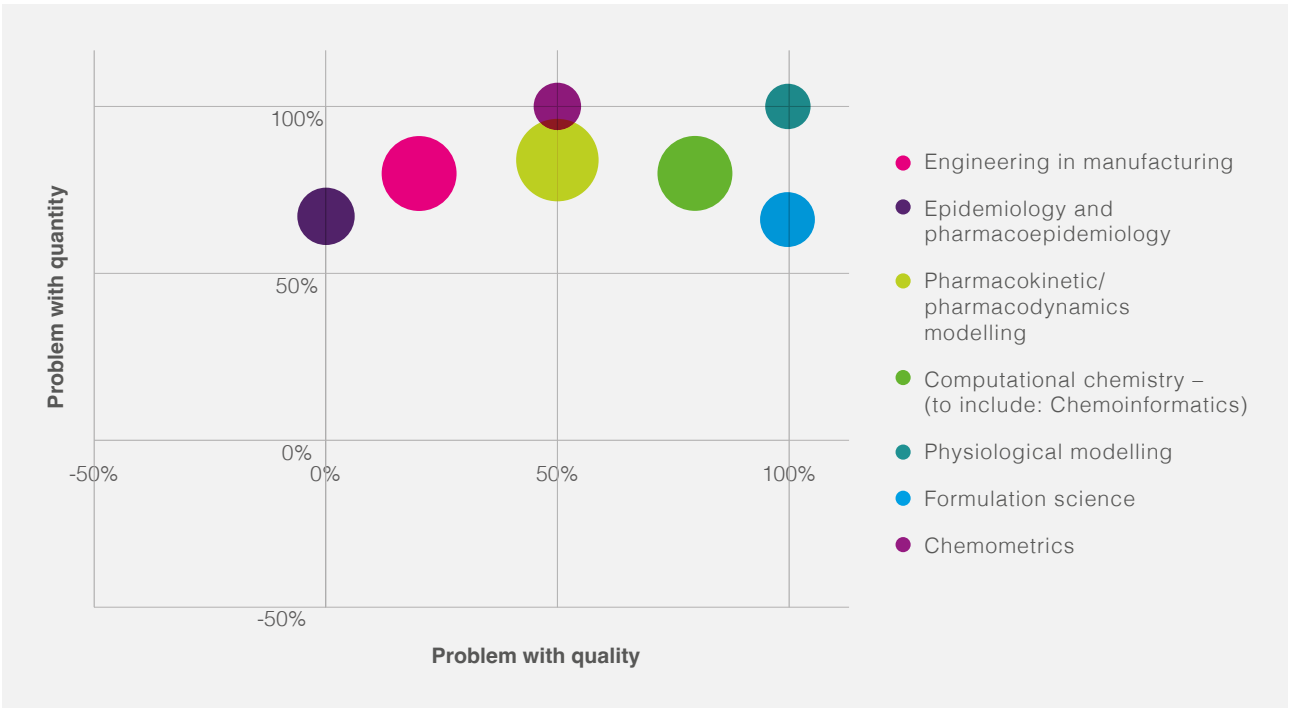
We asked respondents whether the key challenges they felt were number of applicants; quality of applicants; or both.

Figure 8 shows that for top priority areas, there is most certainly more of a problem with the quantity of candidates rather than the quality. This is a theme seen across almost all disciplines surveyed, although the fact that all top priority areas were identified by over two thirds of respondents as having a problem with the quantity of candidates shows that the issue is very profound for these areas of most concern. In particular, chemometrics and physiological modelling had 100% of respondents identifying the discipline as having issues with the quantity of candidates, with physiological modelling also having 100% of respondents identifying the discipline as having issues with the quality of candidates too.

On the other hand, issues with quality of candidate were more varied, with epidemiology and pharmacoepidemiology having 0% of respondents identifying this as an issue whereas formulation science had 100% of respondents identifying this as an issue.

This suggests that the growing demand for candidates with specific skills is being outstripped by the supply, thus requiring a combined effort from industry and government to increase the number of qualified individuals coming through the education pipeline or reskilling, as well as ensuring the sector better highlights the viable career pathways within the life sciences sector to attract those individuals.

Figure 8: Percentage of respondents identifying a concern with the quantity vs quality of candidates in each discipline (size of bubble represents the number of respondents).



Looking deeper at specific subject areas we see that concerns about the quantity of candidates are echoed. For example, for all informatics, computational, mathematical and statistical disciplines, over 60% of respondents reported problems with the quantity of candidates. This was the same for all clinical disciplines too, where 50% or more of respondents were worried about the quantity of candidates. Similarly, the quantity of candidates appeared to be of greater concern than the quality of candidates in regulatory disciplines too, with 86% of respondents suggesting that qualified person (QA) had an issue with the number of candidates it was recruiting. This provides further evidence supporting the fact that the quality of skills is less of an issue but rather that the demand for candidates to fill these roles is outstripping the supply.

"We have always historically struggled to recruit in this field due to the lack of individuals in this field in the UK."

Survey respondent talking about computational science and pharmacokinetic/pharmacodynamics modelling.

"Again the biggest problem is the lack of candidates on the market versus the number of vacancies."

Survey respondent talking about health economics, outcomes, informatics and real world evidence.

"There is an issue with the talent pool and numbers when we have a vacancy that needs addressing."

Survey respondent talking about statistics.

"Quality tends not to be an issue"

Survey respondent talking about precision medicine.

"Distinct lack of candidates every time we recruit in this field."

Survey respondent talking about clinical pharmacology/translational medicine.

"On average 40-50% of the overall Clinical team are sourced from outside of the UK. This is partly to ensure the highest quality of staff but also to address the significant shortage within the UK. The shortage of candidates supports the poor quality, but also contributes to significant and unsustainable salary cycles/sign on bonuses. The reduction in the applicants for science degrees, often a pre-requisite for entry to the industry, combined with a lack of promotion of the industry opportunities mean the fantastic career potential of the industry remains hidden – until we increase the knowledge of the industry and thus the supply of suitably qualified candidates the above issues will remain – and potentially worsen, further limiting the ability of the UK to deliver in highly globally competitive market."

Survey respondent talking about clinical research operations.

"This is always a difficult area to recruit for permanent staff due to a large contractor base and high demand vs supply of individuals."

Survey respondent talking about qualified person (QA).

"Anticipate shortages in the future as industry wide demand increases."

Survey respondent talking about cell and gene therapy.

Attracting, recruiting and retaining experienced staff

Recruitment of experienced staff is the main skills challenge facing the industry, and this applies in almost all subject areas – for example, for all disciplines in the informatics, computational, mathematical and statistical areas, at least 50% of respondents suggested that recruitment of experienced staff was a concern.

This was a particular issue for data science, computational science and statistics. In the biological areas, difficulties with the recruitment of experienced staff was the most common concern too, with 19 out of the 21 subjects having over 50% of respondents claim that it was an issue. In particular, for 16 of those subjects, 100% of respondents thought recruitment of experienced staff was an issue.

All clinical disciplines had the majority of respondents raise concerns over the recruitment of experienced staff, with registered nurse -s being the only discipline where it was the joint primary concern with other levels (graduate/MSc and apprenticeship). Across all the regulatory areas, recruitment of experienced staff was once again the biggest challenge for all disciplines, with the exception of environmental, health & safety where there seemed to be no recruitment difficulties at any level. This was the same with pharmaceutical engineering, with 80% of respondents reporting difficulties at this level.

Again, staff shortages in chemical areas were seen mostly for experienced staff, with five out of the seven disciplines in this area having 100% of respondents who identified the subject as a priority saying that they had an issue recruiting experienced staff. Despite this, post-doc and PhD recruitment was also very problematic too, which reflects the sentiment felt in the last survey in which respondents outlined that disciplines in this area often need at least a year's worth of industry experience and that the good volume of applications from graduates doesn't always come with this experience.

It is difficult to determine the specific reason as to why recruitment of experienced staff is causing the most problems in general.

> **"Main issue in terms of number of candidates is in the more senior / well-experienced cohort."**
>
> Survey respondent talking about health economics, outcomes, informatics and real world evidence.

> **"Finding experienced candidates with a knowledge of the pharma industry will be challenging: there will be well paid roles in other industries available."**
>
> Survey respondent talking about data science.

> **"Senior deep industry experience and leadership skills are difficult to source. Candidates are geographically widespread and UK less attractive to candidates since Brexit."**
>
> Survey respondent talking about biopharmaceuticals/biologics.

"Another area of concern is senior/experienced roles. Many experienced colleagues in the analytical area develop a breadth of interdisciplinary skills and knowledge given that an analytical scientist's role will touch or integrate with most scientific areas in the biopharm business. The positive impact for these individuals is that they are often sought after for senior roles in multiple business areas and often end up switching career direction (e.g. out of analytical to other areas – regulatory being one example). This brain drain from core experienced analytical roles puts pressure on the business and increases competition in the sector around attracting experienced senior analytical professionals."

Survey respondent talking about analytical chemistry/biochemistry.

"Lack of experienced analytical staff limits some of our activities... pharma experience is often lacking."

Survey respondent talking about analytical chemistry/biochemistry.

"We have struggled to recruit experienced staff in this area and often ended up downgrading roles to entry level to train up; but this has issues in terms of resource and then talent being poached elsewhere down the line."

Survey respondent talking about medical information scientists.

"Challenging market place for specialized physicians, often requiring medical degree and additional PhD or higher qualification, plus appropriate (training, eg, registrar, consultant level). Limitations on UK market candidate pool and Brexit impacting attractiveness of UK roles."

Survey respondent talking about medically qualified clinicians.

"Difficult to get experienced people."

Survey respondent talking about quality assurance and quality control.

"There is a lack of experienced statistical programmers, which means hard to recruit, but also a high turnover of staff as other CRO/Pharma are starting to pay premium compensation packages."

Survey respondent talking about programming.

"There is a gap in the marketplace for experienced engineers looking to work in the pharma sector."

Survey respondent talking about engineering in manufacturing.

"This is becoming a competitive area with fewer high-quality, industry experienced, candidates."

Survey respondent talking about structural biology.

In 2018, prior to the UK's exit from the EU, respondents indicated significant uncertainty about how exiting would impact on the ability for the sector to recruit experienced staff. 25% of respondents indicated that they felt this was a critical threat to job growth. This has fallen significantly to 10% of respondents in 2021 (figure 9). This is not to say that some uncertainty doesn't remain, with almost half of respondents saying that they were not confident they knew how EU exit would impact their company's ability to recruit suitably skilled candidates – something which was also reported in open responses. It is also worth noting that there is a particular emphasis on recruitment across all levels from within the UK and less from both the EU and outside of the EU (figure 10). This is particularly the case with graduates and PhD/postdocs.

Figure 9: Percentage of respondents who thought each of the following would pose a threat to job growth in their company over the next three years.

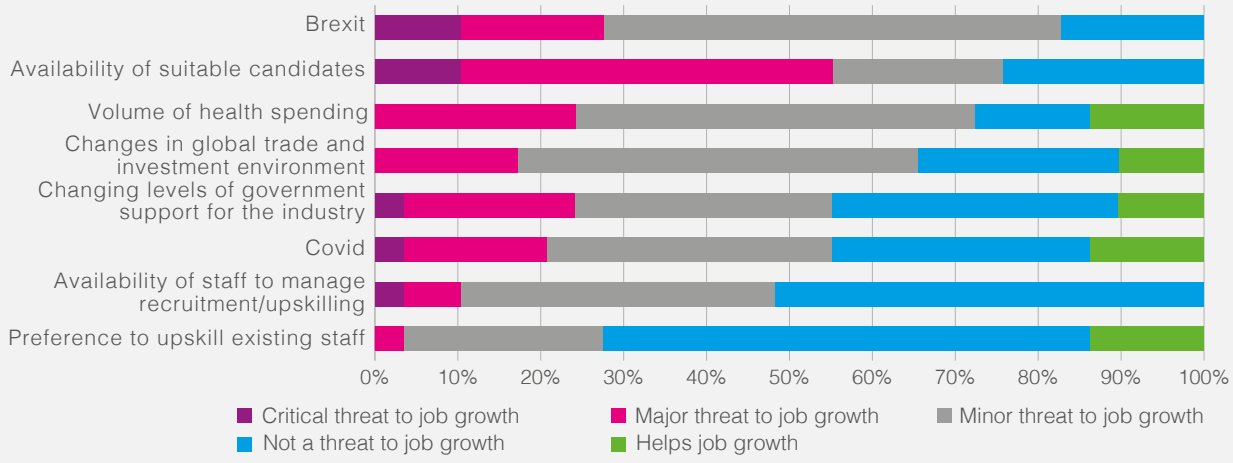
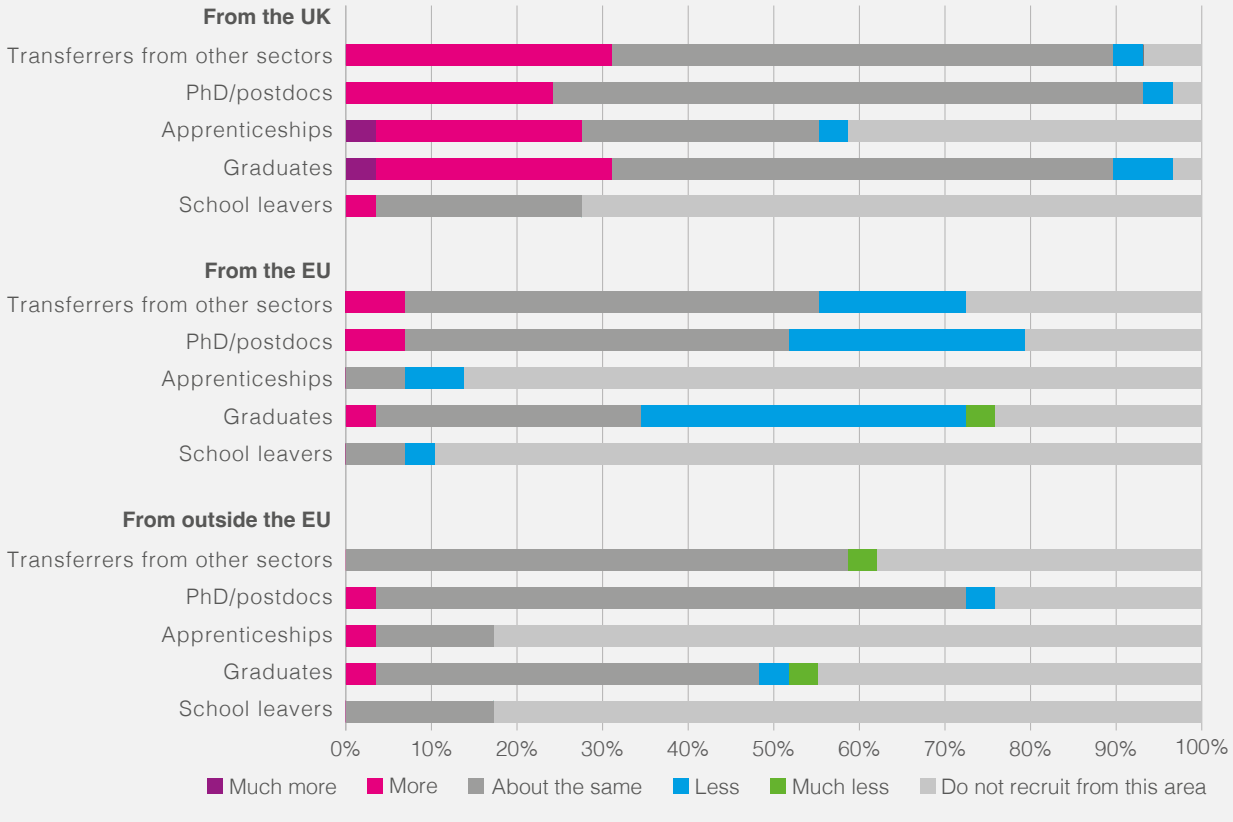


Figure 10: Percentage of respondents answering what type of candidates they are recruiting and from where.



Given the need for experience and the immediacy of the challenge, a clear focus on retaining staff and equipping candidates with the right skills that will see them stay within the industry will be crucial going forward. Further research into the causes of this concern will be necessary to ensure that the industry can effectively close this skills gap.

Whilst it is premature to settle on firm conclusions as to how the COVID pandemic will impact on the skills requirements of the industry in the longer term, our survey has started to draw together initial indications. Much uncertainty remains about how the pandemic will impact the availability of suitably skilled candidates, with 45% saying they did not know what the impact would be (figure 11). Whilst the majority of respondents do not think COVID has increased the need to recruit more staff with specific skill sets, a quarter of respondents (25%) think that COVID has increased the need for new skills in business areas, with clinical areas a close second priority at 18% (figure 12).

Figure 11: Percentage of respondents who thought COVID will affect the availability of suitably skilled candidates.

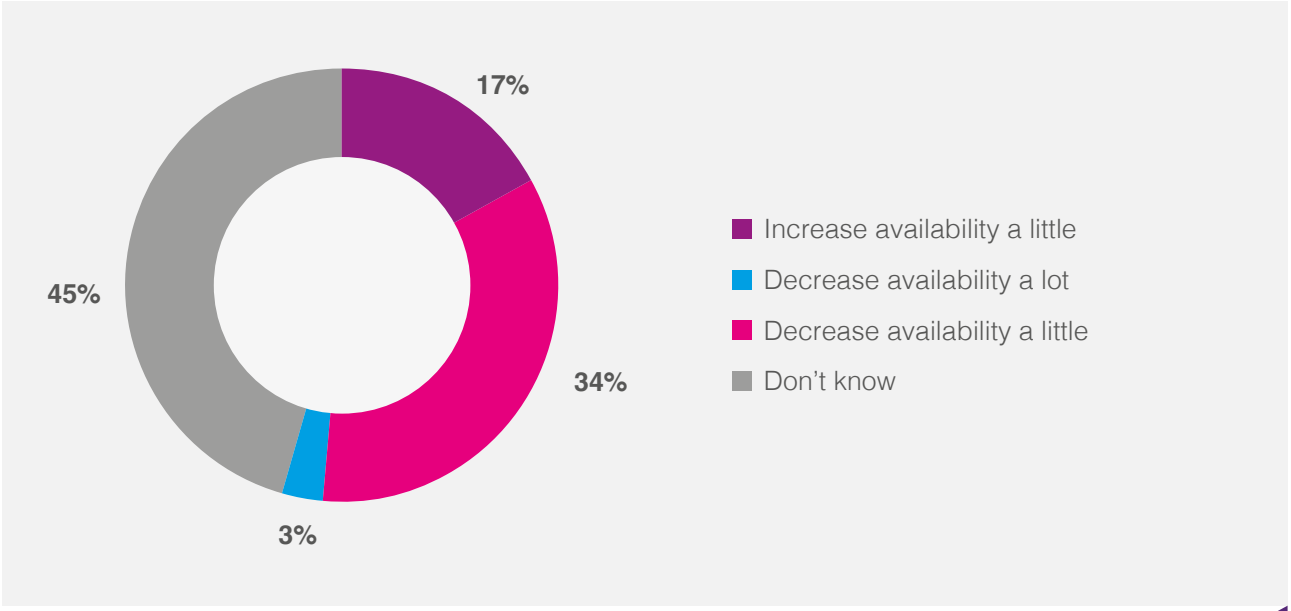
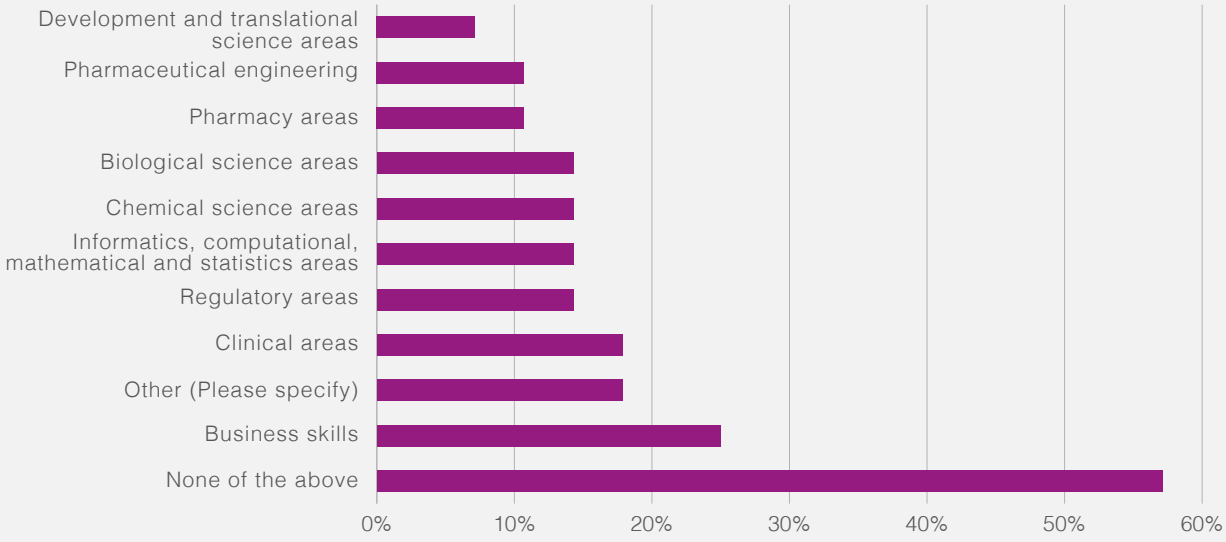


Figure 12: Percentage of respondents who think COVID has increased the need for any new skills in each industry sector.

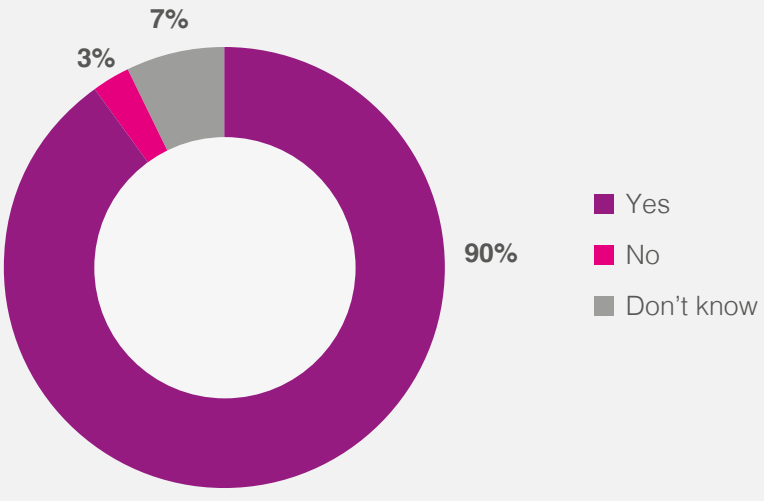


How COVID is affecting the industry's perception as a potential employer

There was positivity amongst respondents who were generally optimistic about the long-term impacts of the pandemic on the sector's ability to recruit.

9 in 10 respondents felt that the drive for vaccines has improved the pharmaceutical industry's reputation as a potential employer (figure 13).

Figure 13: Percentage of respondents who think that the drive for vaccines has improved the pharmaceutical industry's reputation as a potential employer.



"Problem will come as studies restart post-covid, there will be an urgent need to resolve skills issue."

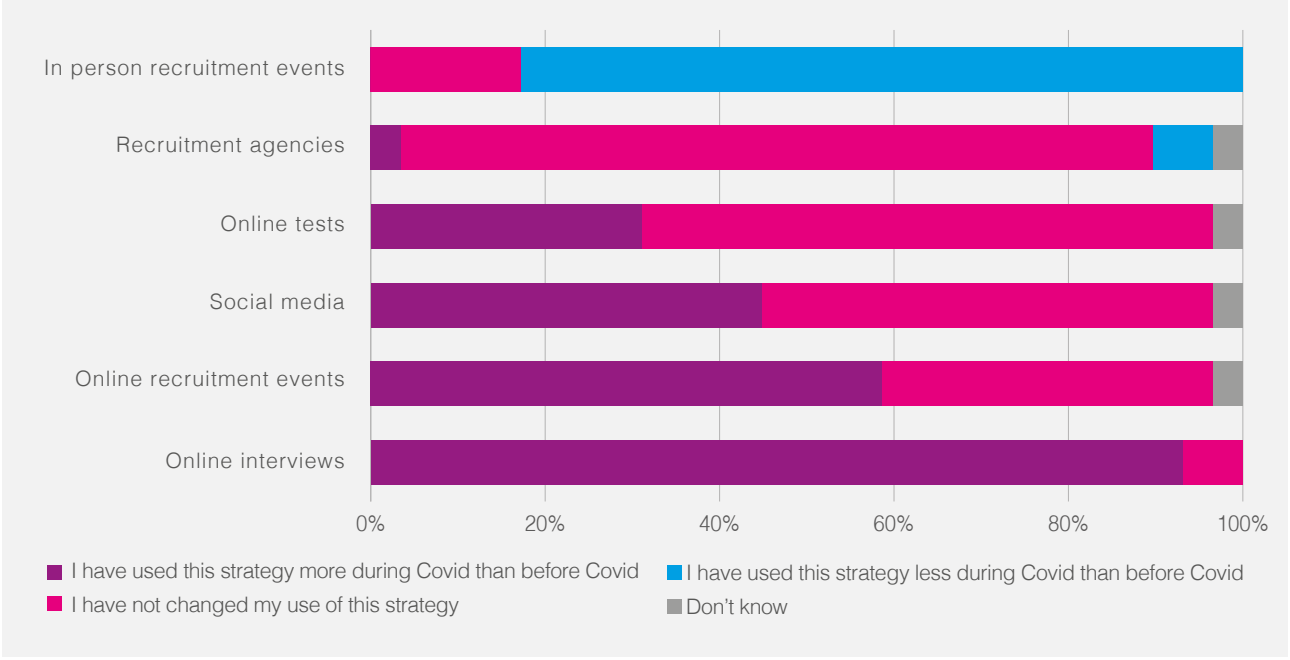
Survey respondent talking about clinical research operations.

"In recent Covid times the field of Immunology has rapidly expanded so a major challenge is finding the required number of candidates with appropriate skills in the area"

Survey respondent talking about immunology.

There has been a remarkable increase in the adoption of online technologies to aid recruitment, with 93% of companies across the industry saying they are using online interviews more, 59% saying they have used online recruitment events more, 45% saying they have used social media more and 31% saying they have used online tests more (figure 14). Understandably, this has come at the expense of in person recruitment events, where 83% of respondents say they have used this recruitment strategy less as a result of COVID.

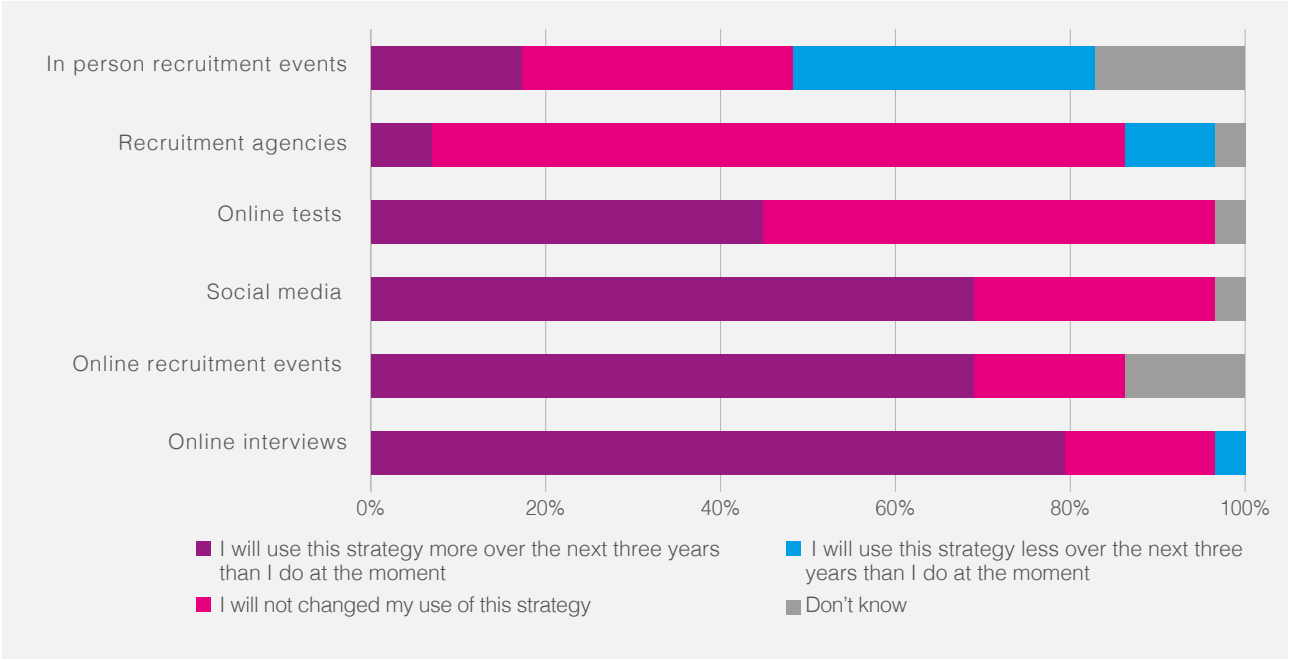
Figure 14: Percentage of respondents who have changed various recruitment strategies as a result of COVID.



It appears that in general companies will continue to use online strategies to help them recruit suitably skilled candidates (figure 15). Over 50% of respondents think they will either use in person recruitment events less or are uncertain about how much they will use them, whilst almost 80% of respondents say they will use online interviews more.

Social media, online recruitment events and online tests are also set to remain important recruitment strategies over the next three years.

Figure 15: Percentage of respondents who expect to change various recruitment strategies over the next three years.



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Appendix: List of participating companies

1. A. Menarini Farmaceutica Internazionale SRL
2. Alimera Sciences Ltd
3. Almirall Limited
4. Amgen Ltd
5. AstraZeneca
6. Bayer
7. Boehringer Ingelheim Ltd
8. Bristol Myers Squibb
9. Charles River Laboratories, Edinburgh
10. Chugai Pharma
11. Eisai Europe Ltd; Eisai Limited and Eisai Manufacturing Limited
12. Eli Lilly & Company
13. GSK
14. Intercept Pharma UK & Ireland
15. Ipsen
16. IQVIA
17. Labcorp
18. LEO Pharma
19. MSD UK Ltd
20. Novartis Pharmaceuticals Ltd
21. Novo Nordisk
22. Pfizer Ltd
23. Quotient Sciences
24. Roche Products Limited
25. Sanofi Aventis Ltd
26. Servier Laboratories Limited
27. Shionogi
28. Sintetica Ltd
29. Swedish Orphan Biovitrum Ltd (Sobi)
30. UCB
31. Vifor Pharma UK LTD

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