Academy of Medical Sciences response to Invest 2035: the UK's modern industrial strategy – Deadline 25 November 2024

Q4. What are the most important subsectors and technologies that the UK government should focus on and why?

The Academy of Medical Sciences is one of the UK's four National Academies, and is the independent, expert voice of biomedical and health research. The Academy has a Fellowship of over 1400 of the UK's leading researchers, including prominent figures in the life sciences sector.

This response draws on Fellows' and early career researchers' expertise and experience, as well as the Academy's sector-leading policy work.

The life sciences is one of the UK's greatest assets. For decades, the UK has been widely recognised as a global pioneer in this space, including with its leading academic research institutions, and the unmatched research potential of the NHS.

As 'Invest 2035' sets out, this historic strength has yet to reach its full potential to drive economic growth, build an NHS fit for the future and break down barriers to opportunity. Unlocking this potential would transform public services, enable people to live longer and healthier lives, and boost productivity, while driving high-value job creation and attracting investment.

Amidst growing international competition, Government needs to support this sector with long-term planning and investment so that the UK can retain its historic lead, grow the economy and deliver for patients and the public. To do this effectively, a joined-up, long-term approach is required across Government departments and strategies. We also note the plurality of funders in this area with the charitable sector, including Wellcome Trust, being particularly valuable.

While priority sectors are important, Government should not be overly prescriptive with identifying priority sub-sectors, as unexpected innovations can arise from fundamental science research – a broad portfolio of discovery research is necessary for the life sciences industry to thrive and to produce a highly skilled workforce. The focus on very specific technologies could also obscure the intersection of a technology with different sectors - examining the intersection of market sectors and technologies could help identify priority areas.

Key subsectors and technologies within life sciences include, but are not limited to:

- Clinical research and research in NHS settings – the UK has an enviable foundation for conducting research in the NHS, which improves NHS delivery, attracts investment and benefits patients.
- Infrastructure – including the Dimond Light Source, Genome sequencing, UK BioBank, and Our Future Health. Health data needs to be regarded as crucial national infrastructure and the priorities for its development are set out in the recent Sudlow report.
- Biotech and precision manufacturing – the UK has some of the highest value biotech science projects outside of the US, with strong venture capital investment

performance, which allows the development of some of the most specialised health care products and medicines.[1]
- AI and quantum – these are already changing research and healthcare systems and the UK is a leader in many subsectors within this.
- Gene editing – somatic gene therapy and, more broadly, genome editing is a key technology for the UK.
- Medical engineering – having a strong engineering base is important for medical device innovation.
- Regulatory science is a strength in the UK and underpins the development of an appropriate regulatory landscape that can keep pace with developments such AI. This is key to an innovation-friendly environment.

Q5. What are the UK's strengths and capabilities in these sub sectors?

World-leading, engaged research workforce

The UK has historically been one of the best places in the world for life sciences and medical research. This has consistently attracted highly skilled and committed international and domestic research talent to work in the UK life sciences industry.

Diversity of the life sciences sector

Life sciences in the UK benefits from diverse funding sources, skills and collaborative working (particularly in the pre-competitive space). It has a strong global reputation that leverages investment. This includes:
- Public-funding structures for life sciences, e.g. UKRI and the National Institute for Health and Care Research (NIHR), which leverage private funding and research in NHS settings.[2] [3]
- Universities are major contributors to the economy, knowledge generation and diffusion, and the UK's international reputation.[4]
- The UK life sciences industry is a major employer, driving skills, health innovations and inward investment, including DeepMind and disruptive data technology [5].
- Medical research charities are an essential part of the life sciences ecosystem, from funding research into rare diseases to the UK's most pressing health challenges, including mental health and dementia.[6]

Clinical research and research in NHS settings

Embedding research in the NHS is key for delivering the Government's growth and NHS missions, the NHS 10-Year Plan, and the Industrial Strategy – a joined-up, cross-departmental approach is key.

The UK healthcare system has been a leader in clinical research for commercial and non-commercial actors, with a single healthcare provider with cradle-to-grave records for the population, an extremely developed health research infrastructure, and a committed clinical research workforce. Previous underinvestment has stretched the healthcare system to such an extent that research has been deprioritised. Whilst this is manageable in the short term, this will be highly damaging in the medium term, if not corrected. The UK has the potential to emerge as a global leader in clinical research, including in experimental medicine approaches, at a time of immense change. Such an opportunity cannot be missed.

Embedding research and innovation into the routine functioning of the NHS supports the transition to a high-value health system that delivers better health outcomes while managing rising healthcare costs and fostering economic growth. Research may also help to address key issues facing the NHS, including the backlog of care, by improving processes and pathways.

Biotechnology

The UK is a global leader in biotechnology, hosting firms such as IQVIA Biotech, Oxford Nanopore and Vertex. This sector is supported by world-class research institutions like the Francis Crick Institute, which drive advancements in genomics, synthetic biology, and bioengineering. The sector is powered by such leading research institutions, skilled talent, and the NHS's ability to deliver for clinical trials and provide health data.

Other examples include the Cambridge Biomedical Campus, which acts as a hub of biotech innovation, supported by industry organisations such as GSK, AstraZeneca and Abcam and Rothamsted Research, which leads in solutions for global health and food security.

Precision manufacturing

The UK's expertise in precision manufacturing is rooted in its advanced engineering and materials science capabilities, with institutions like Imperial College and the Graphene Institute. The UK's established aerospace and automotive sectors, particularly in the Midlands, excel in precision engineering and supply chain management. The Institute for Manufacturing at Cambridge is advancing manufacturing further by integrating AI, optimising production workflows, predicting maintenance, and enhancing precision - supporting the UK's position as a leader in sustainable, high-value manufacturing. Regional hubs across South Wales, Sheffield, and Glasgow support local economies and enhance supply chain resilience, positioning the UK as a leader in sectors from aerospace to medical devices.

Regulatory science

Initiatives such as the Birmingham Health Partners Centre for Regulatory Science and Innovation[7] seek to encourage the development of a network of UK Centres of Excellence in Regulatory Science and Innovation, similar to the United States FDA model. This would provide a mechanism for regulators to build long-term relationships with academic institutions. This would also tie in with the role of the MHRA in conducting internal regulatory science research.[8]

Q6. What are the key enablers and barriers to growth in these sub sectors and how could the UK government address them?

Key barriers to growth for life sciences relate to a lack of sustainable investment, issues within the research workforce, difficulties with embedding research in the NHS, prohibitive cost of visas for international talent, lack of cross-sector working/career mobility, untapped potential of health data and issues keeping pace with necessary skills for innovation.

Life sciences research requires long-term, sustainable investment

To drive economic growth, capture a disproportionate share of international business, and deliver for patients, public and private UK R&D investment must be internationally competitive; however, the UK spends less on R&D than competitor nations. This means the UK risks losing a historic competitive advantage and decreasing attractiveness for investment and talent. Secure, long-term public funding commitments for R&D would provide the certainty required to attract private investment. This would signal to private investors on national research priorities to encourage investment.

Additionally, the sustainability of our universities is precarious, as they continue to show a substantial deficit, increasing to £4,482 million in 2021-22 from £3,828 million in 2020-21.[9]

The October Budget was welcomed by the R&D community and showed the Government's dedication to research. The multi-year settlement in spring 2025 is a key opportunity for Government to solidify this message and provide the life sciences sector with the long-term financial stability it requires to drive growth and build an NHS fit for the future.

Government should:

- Devise mechanisms to crowd in private sector investment (UK and international)
- Set a target to lead the G7 on R&D investment and be among the top science nations globally.
- Commit to investing £22bn by 2026/27 in public R&D.
- Continue to develop 10-year funding cycles for key R&D activities – the Academy is pleased to be involved in these discussions with DSIT.
- Increase investment in the underpinnings of health research including through reversing the real terms decline in Quality-Related (QR) funding to ensure the UK university sector can sustainably drive advances in research.

The NHS struggles to embed research

Research in the NHS is crucial for Government's health and growth missions, the 10-year NHS plan and the Industrial strategy. However regulatory issues, clinical delivery pressures and a failure to value the contribution that research makes are creating a healthcare system that is unable to prioritise research.

A major barrier is the limited opportunities for people who drive research in healthcare settings. Clinical academics struggle to develop their dual careers between academia and the NHS, whilst healthcare professionals wishing to engage in research do not have adequate time nor support to do so. There has been a worrying decline in the number of clinical academics across the UK, from 8.6% of consultants in 2011 to 5.7% in 2020.[10]

Government should:

- Work across DSIT and DHSC and the wider sector to reverse the decline in clinical academics as a proportion of NHS staff across all clinical professional groups
- Fund an NHS research pilot where a proportion of NHS healthcare workers are offered a contract that includes dedicated time for research.

Life sciences require international collaboration and talent

To unlock world-leading innovations and growth, UK R&D needs world-leading domestic and international talent, however prohibitive visa costs are a barrier to recruiting international talent. From 2021 to 2024, total upfront immigration costs in the UK increased by up to 58% depending on visa type. Since 2019, they have increased by up to 126%.

More broadly, international collaboration is vital for life science innovation and growth. The UK's association to Horizon Europe is a key way that UK researchers can access long-term, prestigious funding and build valuable connections across the world.

Government should:

- Reduce the upfront cost of visas, including the NHS surcharge, for international researchers and their families in line with competitor nations.
- Provide funding for UK researchers and the sector to remove barriers of participation in Horizon Europe, for example through pump priming schemes.

Life sciences requires interdisciplinarity, a diverse workforce and cross-sector mobility

Innovation happens at the intersection of sectors, and the UK benefits from a vibrant and diverse life sciences sector.

However, limited understanding between sectors, poorly aligned incentives, and a perception of both personal and institutional risk from cross-sector mobility continue to create conditions in which movement between sectors is, at best, unidirectional and, at worst, disincentivised.

This is a problem for clinical academics, who work between NHS and academia, as discussed above.

Government should:

- Work across departments to invest in training and maintaining a world-class research workforce, through investment in career sustainability, including the ability of the workforce to move across sectors, disciplines and borders.
- Encourage secondments and joint appointments between academia, industry, NHS, Government departments and agencies.

An effective, resilient, supported and diverse research workforce is also central to the life sciences industry. However, research culture and career structures can be inflexible, precarious and exclusive. Fellows reflected that research culture is not consistently supportive of team science and interdisciplinary research. Government should continue work to deliver the R&D People and Culture strategy, raising the profile of this work externally to show Government's commitment to supporting a diverse research workforce.

There is significant unfulfilled potential of patient data as a research resource

The recently published Sudlow Review sets out that the safe use of health data is essential for improving health and lives, and that people in the UK overwhelmingly support the use of their health data, with appropriate safeguards, to benefit themselves and others. Transparent processes and public trust are essential for success.

However, health and care professionals, researchers and policymakers face many obstacles and delays in accessing, linking and analysing health data in the UK. These barriers arise from the UK's complex and inefficient systems for managing and accessing health data. This can prevent or delay crucial analysis and research and hold back the life sciences sector. Health data is a critical national infrastructure that can underpin the health of the nation.[11]

Government should assemble a health data infrastructure for the whole population by building upon existing expertise within industry, academia, research funders and the NHS. This should include a joint national health data strategy for all health relevant data that is developed in partnership with the research community and in light of the findings of the independent Sudlow Review on health data.

The UK must keep up life sciences skills demands

Attendees of a 2023 FORUM workshop on 'Bolstering UK health and life sciences innovation through cross-sector collaboration', noted that it is important to consider the workforce skills that will be required across the health and life sciences sectors to respond to future health challenges and capitalise on opportunities. To prevent a skills gap within the workforce, participants suggested that conducting a horizon scanning exercise for skills would be valuable so these could be rapidly addressed.[12]

Examples of skills-related challenges identified by Fellows include:

- A lack of digital literacy and data skills in the life sciences and healthcare workforce, that undermines confidence to adopt health technologies, including AI.[13] Skills England should strengthen its role in advancing data competency and technical skills.
- It is difficult for employers to keep up with frequent changes in skills policy - some stability would be helpful for this.

Improved skills base in robotics, manufacturing and automated assembly are required to co-localise innovation with scale-up and product manufacturing.

- The UK lacks sufficient entrepreneurship and business skills which are essential for the life sciences ecosystem.

Q7. What are the most significant barriers to investment? Do they vary across the growth-driving sectors? What evidence can you share to illustrate this?

The UK life sciences sector is a major driver of employment and growth. However, there are signs that the UK is losing out to international competition.

Complexity of initiatives and processes, and the difficulty of accessing funding in a way that aligns with innovation, are major barriers to investment.

Lack of long-termism in public funding

Private-sector investment thrives in the context of stable, predictable and sustained public policy that seeks to attract international capital (finance and people). Public investment can play a particularly important leveraging role in life sciences by de-risking, simplifying or stimulating research in areas where there are potentially large health benefits, but where market-size and upfront costs or complexity can initially deter

private investors from financing projects. The UK Biobank is an example of how long-term public investment in medical research lays necessary foundations for private investment.

We are pleased to be involved in early conversations with DSIT about 10-year funding cycles for key R&D activities. This kind of approach sends positive signals to investors.

Complicated processes deter investment

Our Fellows identified the following challenges around navigating the life sciences funding system:

- Accessing Government and UKRI funding is complicated and there is no single decision-maker to interact with to accelerate action and funding decisions. The speed of grant-making processes is too slow for some industries to keep pace with innovation, e.g. digital technologies.
- For inward investment (e.g. overseas companies wanting to invest in UK science) the landscape is too hard to navigate.
- For growth of spin-out companies beyond early stages, the availability of late-stage and long-term capital is limiting innovation and expansion.
- We heard that there could be more financing accessed from the City of London, e.g. through unlocking pension funds.

Funding gaps create a 'valley of death'

Long-term, stable funding is a particular challenge in high-risk fields with lengthy timelines, such as drug discovery. For example, a critical funding gap exists for biotechnology - most Research Council funding only supports up to Technology Readiness Level (TRL) 6, leaving a 'valley of death' in late-stage financing. With biotech projects typically requiring over seven years for a return on investment, private sector appetite remains low due to high costs and long timelines.

To overcome this, it was suggested that Government could incentivise private investment through public-private partnerships, co-investment schemes, and targeted tax incentives, structured to derisk late-stage projects and enhance private sector returns.

Tax environment

Life science investors operate globally – the UK must have internationally competitive tax and regulatory framework to attract investment. Government should maintain current rates of R&D tax credits to incentivise private investment and evaluate the way R&D tax reliefs support innovative start-ups and scale-ups in priority growth sectors of the economy to better inform policymaking. We have heard that a lower tax burden on early non-profit making companies helps them to employ skilled staff at the optimal numbers required for success.

Healthcare settings struggle to adopt innovation

It is generally agreed that the NHS is currently not well equipped to act as a recipient and purchaser of new and innovative technologies. This is due to structural and cultural reasons, including the organisation of the NHS procurement system, an embedded historical culture of risk aversion, and time and resource pressures, which makes it difficult for NHS staff to embrace new and innovative therapies and technologies. There is a reported disconnect between the NHS/clinicians and tech developers, and systems

for implementation are slow. This disconnect is exacerbated by the lack of 'joined-up' health datasets and fragmented application systems for data access which limits research into AI-based health technologies.

Our Fellows have identified that UK Government procurement is notoriously difficult to navigate, often causing biotech and start-ups to set up operations outside of the UK. One Fellow stressed the need to have a centralised system for NHS innovation procurement, so that digital health solutions do not need to negotiate with each hospital trust separately – a 'single front door' for the roll out of innovations for Integrated Care Boards and/or Health Innovation Networks.

We have heard that the UK should consider the use of the Government (or Government agencies) as a 'first customer' for innovations, particularly with consideration of innovation in public sector procurement. This alignment model is already used in countries such as the United States to drive investment in growth and innovation.

Please see our answer to Question 20 for comments on regulatory barriers for investment and associated solutions.

Q11. What are the barriers to R&D commercialisation that the UK government should be considering?

This Strategy should seek to improve linkages between academia and industry through supportive schemes and removal of barriers, in order to smooth the translation of basic research into products that can be commercialised. Our Fellows identified some specific areas where commercialisation could be improved:

- Companies are frequently bought before they have matured, meaning the number of companies producing and growing in the UK is smaller than it might otherwise be. Oxford Nanapore Technologies was suggested as a rare example of a company that was sufficiently funded to commercialise and grow on its own without being bought.
- A lack of access to raw materials may be limiting commercialisation. One Fellow said that the UK buys in almost all of the raw materials for medicines manufacture of active pharmaceutical ingredients (API), as well as packaging from overseas. The Government may wish to consider investing in UK capability to produce the materials such as chemicals, glass, needles, polymers for plastic and film-coating, such as for blister packs. Co-locating such capability around medicine and vaccine R&D and manufacturing clusters could be beneficial.
- When considering investment in New Towns, it was suggested to us that the Government may wish to link each town with a specific investment in a manufacturing capability in growth-driving sectors.
- As highlighted in Question 7, the UK needs the right skills to ensure there is early consideration of the needs of research end-users and potential routes to market. Reimbursement for innovation is not linked to life sciences strategy for investment, but this is the opportunity to build a more 'virtuous circle'. If the fruits of many years of R&D investment (such as medicines) are not accessible in the UK due to an unwillingness to pay for them, the incentive to invest is reduced.

- As noted in Question 7, adoption times within the NHS for successful innovation are too long versus other comparable countries. One Fellow noted that it is critical for the UK global investment offer that the NHS functions as a full partner to life sciences and technology companies as they seek to develop products and services.

Q20. Do you have suggestions on where regulation can be reformed or introduced to encourage growth and innovation, including addressing any barriers you identified in Question 7?

It is well-acknowledged that taking a proportionate approach to regulation contributes to a supportive research and innovation ecosystem. Participants of a 2021 FORUM workshop on 'Advancing regulatory science for innovative medical products' noted that a regulator that is dynamic, pragmatic, flexible, efficient, interactive, and driven by public interest will attract investors.[14] Although international regulatory alignment is important (see below), UK regulators are also globally influential and have the potential to pioneer new approaches and catalyse international innovation in the regulatory practice. When gathering evidence for the Academy's response to the previous Government's 'Pro-Innovation Regulation of Technologies Project Commission', we identified several areas where UK regulators could improve its approach. These are discussed in detail below.

Regulatory capacity

We welcome the announcement of the Regulatory Innovation Hub in the UK. However, we have heard that the capacity, rather than the design of the regulatory system often poses barriers to innovation and ensuring that regulation keeps pace with the speed of development of medicines, vaccines and emerging technologies.[15]

We therefore recommend that the Government should maintain a strong regulatory and governance environment for clinical research, including through sufficient resourcing for the MHRA and other relevant bodies to allow them to meet increasing demand in a timely manner.

There is an opportunity to learn lessons from the COVID-19 pandemic, in terms of accelerating and streamlining regulatory processes – for example, changes that enabled the rapid regulatory approval of COVID-19 vaccines. This includes proportionate risk-benefit analysis in regulatory pathways which may help ensure stable investment in novel technologies.

A dynamic approach

Regulation of health innovations must be sufficiently flexible to safeguard against potential harms without stifling innovation and preventing the realisation of their potential. In rapidly developing industries, such as AI-based medical devices, where regulatory frameworks are still being developed, there is a need for bodies such as the MHRA to proactively interact with research communities and conduct internal horizon scanning to promptly identify gaps in the regulatory pathway.[16] These activities are, however, limited by the capacity within regulatory organisations, mentioned above.

Implementing regulatory sandboxes for biotech and advanced manufacturing would allow companies to test new technologies under flexible oversight. This agile approach could align regulation with the pace of innovation, reducing time-to-market while maintaining safety and compliance.

Consistency of regulatory framework

International regulatory harmonisation is essential for successful global collaboration and innovation. The UK has historically employed a science-led, risk proportionate approach to the regulation of research and innovation, which has successfully promoted better research in both the UK and EU.

However, this must be balanced against the need for consistency, stability and clarity of regulatory frameworks for collaboration and the guidance of capital in investment decisions around innovation.

Clinical trial regulation

Alignment with international regulation and standards is particularly pertinent for clinical trials. International regulatory harmonisation is vital for international clinical trial collaborations, reducing regulatory burdens, and the attractiveness of the UK as a place for investment in innovation.

- A 2022 report by the Association of the British Pharmaceutical Industry (ABPI) highlighted that the number of industry clinical trials initiated in the UK per year has fallen by 41% between 2017 and 2021, with pharmaceutical companies increasingly placing their trials in other countries (e.g. Spain and Australia) and reviewing UK research affiliate headcounts.[17] The report suggests that this decline has been driven by consistently slow and variable study set-up timelines. The report makes a number of recommendations to address these issues for industry clinical trials. Lord O'Shaughnessy's report offers practical recommendations to improve this.
- The current challenges to the UK's ability to deliver clinical research, including recruitment to trials and the capacity in the NHS to deliver these trials, are not limited to industry trials and are also faced by non-commercial clinical trials supported by public and charitable funders. Although there may be particular challenges for industry trials, solutions are needed to facilitate clinical research across the clinical research ecosystem if we are to realise the health benefits to patients as well as the economic benefits to the nation.
- Trials for treatment of rare and ultra-rare diseases is an often-overlooked area, where the current regulatory regime may be particularly disproportionate. Attendees of a 2022 FORUM workshop on this topic highlighted several areas where clinical trial regulations were prohibitive.[18] Issues raised included restrictions regarding trial advertisement and the way pharmaceutical companies are able to interact with patients, where companies have also raised concerns around perceptions of influencing patient groups. Also noted was the geographical distribution of patients where multinational trials are required. This is an area where the previously discussed issue of international regulatory harmonisation is particularly important.

Data regulation and accessibility

- Efficient regulation of, access to, and linkage of, high quality and representative (health) datasets is an essential part of the successful research, development and downstream deployment of many new innovations.

- Regulatory systems must be proportionate in ensuring that mechanisms are provided to enable data access and linkage whilst upholding the duty of confidentiality and protecting the data subject's right to privacy.[19] Initiatives such as HDRUK and NHS Digital Secure Data Environments need to enable appropriate data linkage and provide sufficient computational power to allow for data analysis and development of new algorithms.

Q21. What are the main factors that influence businesses' investment decisions? Do these differ for the growth-driving sectors and based on the nature of the investment (e.g. buildings, machinery & equipment, vehicles, software, RDI, workforce skills) and types of firms (large, small, domestic, international, across different regions)?

Factors that influence businesses' investment decisions have been covered in our answers above. This includes whether products (e.g. medicines) are bought in the UK at a price that reflects the investment that firms have made in their development. However, these factors varied in some respects between the types of life sciences firms. We heard that:

- Large pharmaceutical firms may require other incentives to invest in the UK than smaller firms, as the UK is a relatively small percentage of their business.
- The Enterprise Investment Scheme is also valuable to SMEs, as well as to investors, such as Parkwalk.

Q24. How can international partnerships (government-to-government or government-to-business) support the Industrial Strategy?

Global partnerships for research

Successful life sciences companies and individual researchers need access to global markets and linkages across countries.

To maintain and enhance the UK's place in life sciences on the global stage, we must consider how to remain a global research partner of choice.

As well as partnering with major life sciences hubs, such as within the USA, participation in Horizon Europe and in the next EU research and innovation framework are essential components of strong health research in the UK. Government must continue to work closely with the sector to promote Horizon programs to UK researchers so that the UK can make the most out of its association and continue to provide funding for UK researchers and the sector to remove barriers of participation in Horizon Europe, for example through pump priming schemes.

Q31. How should the Industrial Strategy Council interact with key non-government institutions and organisations?

It is important that the Industrial Strategy Council consults the full breadth of the life sciences and health research sector, to gain a holistic sense of how the Strategy would work in practice. This includes NHS, industry, universities, public funders, charities, patients and the public. The Academy is experienced in convening in this way to stress-

test ideas (e.g. around the development of regulation) and consider examples of what has and has not worked well in the past.

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