**Academy of Medical Sciences' response to the House of Lords Science & Technology Committee consultation: People and skills in UK science, technology, engineering and mathematics (STEM)**

**September 2022**

## Summary


- The Government is committed to being a 'science superpower', attracting the best scientists from across the world. However, scientists and people with STEM skills seeking to move to the UK face high visa costs and onerous bureaucracy compared with other leading science nations. The Government should review the cost of its visa offer, assessing its impact on people with STEM skills seeking to move to the UK.

- Skills and knowledge gaps must be identified to ensure the STEM workforce can meet the needs of employers and society now and in future. Investment in additional and continuing STEM training throughout education and employment must increase. Permeability across sectors should be facilitated to enable people to gain new STEM skills, which will benefit 'Team Science' interdisciplinary projects.

- A greater range of people could be encouraged to pursue STEM careers through collecting 'harmonised diversity data' to better understand the extent of underrepresentation. Organisations can enact equality, diversity and inclusion (EDI) schemes to actively improve diversity of their workforces.

- STEM careers could be made more stable, especially in the early stages. Contributions in 'Team Science' projects should be sufficiently recognised, especially for more junior researchers. The decline in clinical academic numbers could be countered by safeguarding and expanding dedicated time for research throughout the clinical training and professional pathways. The short- and long-term effects of COVID-19 on researcher careers should be mitigated, and EDI policies developed to ensure researchers from underrepresented communities aren't left further behind.


## Introduction

The Academy of Medical Sciences is the independent, expert voice of biomedical and health research in the UK. Our mission is to help create an open and progressive research sector to improve the health of people everywhere.

To deliver the next generation of the STEM workforce, the UK must have sufficient skills, infrastructure and resourcing to train, employ and equip them. The Academy welcomes the opportunity to draw on our previous policy work and highlight the following key points regarding people and skills in UK science, technology, engineering and mathematics (STEM).

## How attractive is the UK as a place for people with STEM skills to move to and make a career and has this changed recently?

*What challenges face scientists and people with STEM skills seeking to move to the UK? What can be done to address these?*

1. The Government is committed to the UK being a 'science superpower', with an increase in funding of public R&D investment to £20bn by 2024-25 and the target for total UK R&D investment to reach 2.4% of GDP by 2027.[1,2] This must be accompanied by an expansion of the STEM workforce, their skills and training.[3] The best scientists and people with STEM skills from around the world need to be recruited to help meet the demand, and international collaboration and mobility are fundamental for good research and innovation.

2. The Academy welcomed the creation of the Global Talent visa; however, we note its high cost compared with other countries (Table 1).[4] Similarly for the Skilled Worker visa, we welcome the dispensations made for those applying for some STEM positions – for example, reduced application fees for jobs in healthcare and education shortage occupations, and reduced salary thresholds for those applying with a PhD-level qualification – however we note the final cost is still high.[5] High costs represent a significant barrier to talented people moving to the UK, elaborated upon in the following question.[6] The Government should assess the impact of the cost of the UK's visa offer on the movement of global research staff to the UK, especially in comparison to other leading research nations.[7,8]

3. The Academy notes recent changes to the immigration system to support early career scientists and STEM workers, such as research technicians, through extending post-study work rights, removing the cap on skilled migrants and reducing the salary threshold for skilled workers.[9] As these new visa categories and requirements become established, it will be important to understand trends in their use in order to ensure that researchers from across the globe are finding the UK an attractive place to work.

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[1] UK Government (2022). *'Levelling Up the United Kingdom' White Paper*. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1052706/Levelling_Up_WP_HRES.pdf

[2] Prime Minister's response to Council for Science and Technology letter (2021). https://www.gov.uk/government/publications/prime-ministers-response-to-cst-letters/prime-ministers-response-to-recent-cst-letters

[3] Universities UK (2022). *Media release: Visa changes could help realise research superpower ambitions.* (accessed August 2022), https://www.universitiesuk.ac.uk/what-we-do/creating-voice-our-members/media-releases/visa-changes-could-help-realise-research

[4] The Academy of Medical Sciences (2020). *President's response to Global Talent visa.* https://acmedsci.ac.uk/more/news/presidents-response-to-global-talent-visa-

[5] UK Government, Skilled Worker visa, accessed 31/8/2022. https://www.gov.uk/skilled-worker-visa/when-you-can-be-paid-less

[6] UK Government, Skilled Worker visa, accessed 31/8/2022. https://www.gov.uk/skilled-worker-visa/when-you-can-be-paid-less

[7] The Academy of Medical Sciences (2021). *Academy of Medical Sciences representation to spending review 2021.* https://acmedsci.ac.uk/file-download/5715633

[8] The Academy of Medical Sciences (2021). *Joint Statement on UK visa costs.* https://acmedsci.ac.uk/file-download/36324703

[9] The Academy of Medical Sciences (2019). *Joint letter from the Presidents of the four UK National Academies to the Home Secretary on salary thresholds for skilled worker visas*. https://acmedsci.ac.uk/file-download/31071223

4. Equality, diversity and inclusion (EDI) must continue to be embedded in research strategies and working cultures, to ensure STEM workers moving to the UK are welcomed and can thrive.

*Is the UK's post-Brexit visa system, including the criteria applied, appropriate to attract the STEM talent the UK needs?*

5. As noted above, under the UK's new Global Talent Visa system a skilled worker must pay considerably more than they would in other leading scientific nations. For example, in 2019 the upfront cost of obtaining a five-year UK Global Talent Visa (exceptional talent) was £2608 for the employee, whereas a Research Visa in Japan costed nothing (Table 1).[10] Current application fees are typically £1247 per person.[11] Similarly, the total average upfront cost for the Tier 2 skilled worker visa was £8,419, 540% higher than the average cost in other leading scientific nations at the time (£1,316).[12] High costs are still associated with the replacement Skilled Worker visa, where standard application fees range from £1248-£2046 per person.[13] Researchers are also faced with high fees when applying for indefinite leave to remain, costing a family of four nearly £10,000.[14] Combined barriers of high initial visa costs and high costs to remain risk deterring global talent and their families from applying to and staying in the UK. The Government should review the high costs applied in the visa system and aim to reduce them in line with other leading science nations.[15]

6. Onerous bureaucracy associated with visa applications and renewals has also been highlighted by researchers looking to move to the UK, for example restrictions on travel during the visa period and repetitive language tests.[16] The Government should review the impact of visa criteria applicants must adhere to on STEM workers who want to come to or remain in the UK.

## What STEM skills is the UK lacking and what skills are likely to be in high demand in future?

*What is being done to allow for people to develop STEM skills across multiple disciplines throughout their career? What could improve this?*

7. Skills and knowledge gaps and future training needs must be identified and regularly reviewed, to keep up with developments in technology and workforce requirements. The Academy has noted emerging skills gaps, for example changing technologies will create new skills requirements for clinicians in bioinformatics, statistics, clinical pharmacology, pharmaceutical science, AI and genomics with advances in these

[10] The Academy of Medical Sciences (2021). *Joint Statement on UK visa costs.* https://acmedsci.ac.uk/file-download/36324703
[11] UK Government, Global Talent visa, accessed 31/8/2022. https://www.gov.uk/skilled-worker-visa/how-much-it-costs
[12] The Royal Society (2019). *UK Science and Immigration: Why the UK Needs an Internationally Competitive Visa Offer.* https://royalsociety.org/-/media/policy/Publications/2019/international-visa-systems-explainer-july-2019.pdf
[13] UK Government, Skilled Worker visa, accessed 31/8/2022. https://www.gov.uk/skilled-worker-visa/how-much-it-costs
[14] The Academy of Medical Sciences (2021). *Joint Statement on UK visa costs.* https://acmedsci.ac.uk/file-download/36324703
[15] *Ibid.*
[16] The Royal Society (2019). *UK Science and Immigration: Why the UK Needs an Internationally Competitive Visa Offer.* https://royalsociety.org/-/media/policy/Publications/2019/international-visa-systems-explainer-july-2019.pdf

fields.[17,18] Government, the NHS, industry and academia could do more to ascertain staff numbers and skills in every area to identify gaps, as noted by those present at an Academy workshop on the future training and employment environment for clinical research.[19]

8. Investment in STEM training and research skills for undergraduate and postgraduate courses and for workforces should be increased to address skills gaps.[20] Participants in an Academy meeting on bridging the preclinical-clinical boundary felt that STEM education in schools needs to be strengthened, with strong emphasis on mathematics and digital science.[21]

9. Continuous professional development will also be critical to ensuring our research workforce remains able to engage with new technologies, such as AI and genomics, that significantly affect ways of working. For example, the TOPOL review provides a comprehensive strategy on how to digitalise the NHS and its workforce ethically and sustainably.[22]

10. Permeability across sectors, disciplines and borders should be increased to enable people to gain new STEM skills, which will underpin the success of the whole S&T community. Organisations must promote flexible career paths to allow this, for example 'step out and step in' postgraduate training for healthcare professionals.[23] Opportunities for retraining in STEM careers should be provided to facilitate cross-sector movement, as well as to meet demand for STEM jobs. Participants in an Academy workshop observed that clinical workforce research capabilities could be improved through embedding of research exposure in training programmes, or via apprenticeships, credentialing and external secondments to develop skills 'on the job' as appropriate.[24]

11. Fostering cross-sector permeability will also promote 'Team Science' interdisciplinary projects, which are increasingly being pursued to tackle complex scientific challenges. Scientific challenges benefit from combining expertise from multiple disciplines, for example economics, policy and sociology; STEM professionals will benefit from access to training in the skills needed to work in interdisciplinary teams.[25] Training through schemes such as the Academy's Future Leaders in Innovation Enterprise and Research (FLIER) programme can provide this.[26]

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[17] The Academy of Medical Sciences (2018). *FORUM report: Bridging the preclinical-clinical boundary.* https://acmedsci.ac.uk/file-download/36971834
[18] Academy of Medical Sciences (2019). *Clinical Academia for the Future: Research Leaders and Innovators.* https://acmedsci.ac.uk/file-download/93305577
[19] The Academy of Medical Sciences (2019). *FORUM report: Shaping the future training and employment environment for clinical research.* https://acmedsci.ac.uk/file-download/42028567
[20] The Academy of Medical Sciences (2022). *Written submission: Delivering a UK science and technology strategy.* Lords Science and Technology Committee. https://acmedsci.ac.uk/file-download/81999734
[21] The Academy of Medical Sciences (2018). *FORUM report: Bridging the preclinical-clinical boundary.* https://acmedsci.ac.uk/file-download/36971834
[22] Health Education England (2019). *The TOPOL Review: preparing the healthcare workforce to deliver a digital future.* https://topol.hee.nhs.uk/
[23] The Academy of Medical Sciences (2020). *Transforming health through innovation: Integrating the NHS and academia.* https://acmedsci.ac.uk/file-download/23932583
[24] The Academy of Medical Sciences (2019). *FORUM report: Shaping the future training and employment environment for clinical research.* https://acmedsci.ac.uk/file-download/42028567
[25] The Academy of Medical Sciences (2016). *Improving recognition of team science contributions in biomedical research careers.* https://acmedsci.ac.uk/file-download/6924621
[26] The Academy of Medical Sciences. *FLIER scheme*. https://acmedsci.ac.uk/more/news/flier-future-leaders-will-transform-the-landscape

## What major challenges face those in academic scientific careers at present, and in the recent past?

*How should the Government encourage a wider range of people to pursue STEM academic careers?*

12. Lack of diversity within the STEM workforce has detrimental consequences for the sector and the society it serves. Diverse research teams contain varied perspectives, backgrounds and experiences and are more likely to ask different questions and develop innovative solutions;[27,28] in turn, these teams are better at problem solving.[29] Underrepresentation of any group in STEM roles limits diversity of thought which has implications for idea generation and the applicability of research to society's needs.

13. Data collection is an important tool towards understanding the extent of underrepresentation in STEM and its causes, and to inform best practices to increase diversity by ensuring that what we do is driven by a solid evidence base. The Academy and organisations across the sector must improve data collection, analysis and transparent publication in accessible ways. 'Harmonised diversity data' – where data collected on sex, age, ethnicity and disability is shown against the value, rate, and proportion of successful applications across all levels – should be collected, following UKRI's example.[30]

14. There are no EDI principles dictated by law and it is therefore the responsibility of individual institutions to ensure that EDI is upheld for the benefit of underrepresented STEM professionals, the wider STEM sector and the society it serves.[31] Many organisations have produced and enact EDI strategies and 'Action Plans' to actively increase diversity and inclusion and reduce barriers for participation, embedding EDI throughout organisational policies, for example the Trans Inclusion Policy introduced by the Wellcome Trust.[32] Diverse representation in organisational governance and decision-making committees can be implemented, such as electing EDI-specific representatives. Historical and structural bias against underrepresented groups needs to be accounted for, for example with unconscious bias training for selection and funding committees.[33] Wider criteria for research 'excellence' can also be used so as not to disadvantage groups that have had fewer opportunities earlier in their careers.[34] Established support schemes, such as the Academy's SUSTAIN programme for women in research, provide examples to follow

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[27] Garcia DG, *et al*. (2013). *Gender diversity within R&D teams: Its impact on radicalness of innovation.* Innovation, 15(2), 149-160, https://www.tandfonline.com/doi/abs/10.5172/impp.2013.15.2.149
[28] Nathan M, Lee N (2013). *Cultural Diversity, Innovation, and Entrepreneurship: Firm-level Evidence from London.* Economic Geography, 89(4), 367-394, https://www.tandfonline.com/doi/abs/10.1111/ecge.12016
[29] Hong L, Page SE (2004). *Groups of diverse problem solvers can outperform groups of high-ability problem solvers.* Economic Sciences, 101(46) 16385-16389, https://www.pnas.org/content/101/46/16385
[30] UKRI, Harmonised Diversity Data reports. https://www.ukri.org/what-we-offer/supporting-healthy-research-and-innovation-culture/equality-diversity-and-inclusion/diversity-data/
[31] The Academy of Medical Sciences (2022). *Response to the Science & Technology Committee written consultation on Diversity in STEM*. https://committees.parliament.uk/writtenevidence/42527/pdf/
[32] Wellcome Trust. https://wellcome.org/news/our-trans-inclusion-policy-latest-step-making-wellcome-more-inclusive
[33] The Academy of Medical Sciences (2018). *Briefing note: Unconscious bias*. https://acmedsci.ac.uk/file-download/77596321
[34] The Academy of Medical Sciences (2022). *Response to the Science & Technology Committee written consultation on Diversity in STEM*. https://committees.parliament.uk/writtenevidence/42527/pdf/

to increase inclusion of other underrepresented groups.[35] Enacting EDI policies such as these will increase the range of the people pursuing STEM academic careers.

15. More generally, the promotion of a good working environment for all will encourage a wider range of people to pursue STEM careers. The Academy advocates for open, inclusive, healthy and fulfilling research careers, which will be crucial for interdisciplinary Team Science projects.[36] Reducing the precarity of research careers will also help attract more people of different backgrounds to STEM careers.

*What more could be done to address the precarity of STEM academic careers, particularly in the early stages?*

16. *Recognition of researcher contribution:*
Increasing prevalence of 'Team Science' interdisciplinary STEM projects is beneficial for research, however there is concern over providing sufficient recognition for all the researchers involved. The lack of structured information on the contribution of individuals to research outputs and grants renders the allocation of credit, and accountability for the roles and activities critical to team science, impossible. When evaluating researchers' track records, the focus is currently on their first and last author publications and whether they have been 'lead' principal investigator on grants, both of which are relatively difficult for individuals to secure when working in teams or for early career researchers. This can discourage people from staying in research as they don't feel valued. The Academy has produced 10 recommendations to improve recognition in team science biomedical projects, focussing on recognition of contribution, funding, researcher behaviour, training, and skills specialists, which could help with researcher retention.[37] Appropriate recognition and reward for individuals contributing to research should also be included in future research assessment programmes, as well as broader criteria for 'high quality' research to ensure inclusion of underrepresented groups' research.[38]

17. *Clinical academic careers:*
The clinical academic profession faces multiple risks, with a steady decline in the number of clinical academic posts across healthcare professions: the proportion of clinical academic NHS medical consultants and clinical academic general practitioners in England has declined from 7.2% in 2004 to 3.8% in 2020.[39] Research benefits the health and care workforce, with evidence suggesting that engaging in research may improve clinicians' job satisfaction, boost morale, and

[35] The Academy of Medical Sciences. *SUSTAIN programme.* https://acmedsci.ac.uk/grants-and-schemes/mentoring-and-other-schemes/sustain
[36] The Academy of Medical Sciences (2016). *Improving recognition of team science contributions in biomedical research careers.* https://acmedsci.ac.uk/file-download/6924621
[37] *Ibid*.
[38] The Academy of Medical Sciences (2022). *Response to the Future Research Assessment Programme Consultation.*
[39] The Academy of Medical Sciences (2022). *Response to the General Medical Council's Good Medical Practice Consultation*. https://acmedsci.ac.uk/file-download/38802005

reduce burnout.[40,41,42,43,44] Clinical research must be prioritised and the Academy has called for protection and expansion of time for clinicians to engage in research, including in undergraduate training programmes, and further embedding of research in organisational strategies.[45,46] Clinical research should be strengthened through increased funding for the National Institute for Health and Care Research.[47] Flexibility in clinical careers must be built in to allow clinicians time for research, especially in under-recruiting specialities, as well as increasing the number of clinical academic posts. Job plans and contracts should recognise the need for flexibility and facilitate cross-sector working as clinicians' careers progress.[48] Reducing understaffing in the NHS will allow clinicians more time to engage in research and reduce work pressure.

18. *Impacts of COVID-19 pandemic:*
    It will be important to account for the long-term effects of COVID-19 on the careers of researchers in the UK. Disruption has compounded many pre-existing challenges and inequalities in research, such as funding bias, under-representation, lack of mentorship and networking opportunities, and caring responsibilities (such as childcare and home-schooling). Severe impacts have also been felt by early career researchers and those at career transition points, with increased uncertainty around progression and job security. The Academy has led work among funders to begin to account for this disruption.[49] In future, the design of research assessment exercises may also need to account for these disruptions.

19. Further development and embedding of EDI policies and programmes across organisations, will also help address the career precarity of researchers from underrepresented communities who face greater barriers to workforce participation and progression.

20. The Academy is currently producing a major report exploring the long-term sustainability of health research in the UK, in terms of both quality and also social and economic costs, bringing together experts from academia, industry, charities and the NHS.[50] The report will include examination of how to address precarity of health careers.

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[40] Lambert TW, Smith F, Goldacre MJ (2015). *Making clinical academic careers more attractive: views from questionnaire surveys of senior UK doctors.* JRSM Open. 6(8), 2054270415602644.
[41] Dale J, Potter R, Owen K, Parsons N, Realpe A, Leach J (2015). *Retaining the general practitioner workforce in England: what matters to GPs? A cross-sectional study.* BMC Family Practice, 16,140.
[42] Watson C, *et al*. (2015). *What does it take to be a successful pediatric surgeon-scientist?* Journal of Pediatric Surgery, 50(6), 1049-52.
[43] Community Research (2018). *Adapting, Coping, Compromising research*. https://www.gmc-uk.org/-/media/documents/adapting-coping-compromising-research-report-79702793.pdf
[44] Shanafelt TD, *et al*. (2009). *Career Fit and Burnout Among Academic Faculty*. Archives of Internal Medicine, 169(10), 990–995.
[45] The Academy of Medical Sciences (2021). *Response to Health Education England Strategic Framework Call for Evidence.*
[46] The Academy of Medical Sciences (2022). *Response to the General Medical Council's Good Medical Practice Consultation.* https://acmedsci.ac.uk/file-download/38802005
[47] The Academy of Medical Sciences (2022). *Written submission: Delivering a UK science and technology strategy.* Lords Science and Technology Committee. https://acmedsci.ac.uk/file-download/81999734
[48] The Academy of Medical Sciences (2019). *FORUM Report: Shaping the future training and employment environment for clinical research.* https://acmedsci.ac.uk/file-download/42028567
[49] The Academy of Medical Sciences (2022). *Cross-funder statement on COVID-19 in future grant applications.* https://acmedsci.ac.uk/file-download/76231283
[50] The Academy of Medical Sciences. *Long-term sustainability of health research in the UK Working Group*. https://acmedsci.ac.uk/policy/policy-projects/long-term-sustainability-of-health-research-in-the-uk

**Table 1: Upfront cost of obtaining a five-year UK Global Talent visa (exceptional talent) compared with other leading science nations (2019)[51,52]**

| Country and Visa Category | Total Cost to Employee |
|---|---|
| Japan – Researcher Visa | £0 |
| Spain – Residence Permit for Researchers | £64 |
| S. Korea – E3 Research Visa | £99 |
| Netherlands – Researcher | £145 |
| Australia - Temp Activity Visa - Research (408) | £154 |
| Australia - Research Student | £154 |
| Sweden - Residence Permit for Visiting Researchers | £160 |
| Germany - Scientific Visa for Researchers | £170 |
| Italy - Research Permit | £207 |
| US - J1 Research Scholar | £258 |
| France - Talent Passport - Researcher | £313 |
| India - Research Visa for all levels | £608 |
| ***UK – Global Talent Visa*** | ***£2608*** |

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[51] The Royal Society (2019). *UK Science and Immigration: Why the UK Needs an Internationally Competitive Visa Offer.* https://royalsociety.org/-/media/policy/Publications/2019/international-visa-systems-explainer-july-2019.pdf

[52] UK Government, Global Talent visa, accessed 31/8/2022. https://www.gov.uk/global-talent