The Academy of Medical Sciences' response to the Science and Technology Committee's inquiry into the Science Budget

August 2015

Summary

- The Government should use the Science Budget, and platforms such as the Science and Innovation Strategy, to provide a stable and long-term vision for the community. Public funding plays a central role in inducing confidence within the science and innovation sector, and in leveraging investment from private and charitable sources.

- We draw the Committee's attention to the joint Academies statement, *Building a Stronger Future*, which sets out a vision for Government on how to make the UK the best place to do research and innovation.

- The Government should address the real-term decline in public funding of the UK's science and innovation base by placing public investment on a trajectory that aligns with our key international competitors.

- In our sector, medical research continues to be a first-rate investment opportunity, both in terms of supporting the wider UK economy and delivering an innovative and efficient healthcare service.

- Departmental research spending should be protected, with the National Institute of Health Research demonstrating the value of embedding research within departments.

- Government may wish to consider extending the model established by the Office for Strategic Coordination of Health Research, to maximise the synergies between departmental budgets and other sources of public funding such as the Research Councils.

- The Government must consider how to coordinate broader policy decisions to best support the research base, and how the experience of UK researchers and wider stakeholders can best inform these decisions.

Introduction

1. The Academy of Medical Sciences promotes advances in medical science, and campaigns to ensure that these are translated into healthcare benefits for society. Our elected Fellowship includes the UK's foremost experts drawn from a broad and diverse range of research areas.

2. We welcome the opportunity to respond to the Science and Technology Committee's inquiry into the Science Budget. Given the contribution of research and innovation to long term growth it is vital that the Science Budget supports and grows the sector, and works alongside wider government to ensure the UK is the best place to do research and innovation.

3. Our response to the questions provided builds on the evidence provided by our President, Professor Sir John Tooke PMedSci during the Committee's oral session on 15 July 2015, and

expands on the joint Academies' statement, *Building a Stronger Future*.[1] Our written evidence has been informed by the expertise of our Fellows, from across the disciplines and sectors we represent. We would be pleased to provide further evidence if required.

Q1. The extent to which the ring-fence, and separate arrangements for setting 'resource' and 'capital' allocations, have produced coherent investment.

4. By continuing to protect the ring fence around the science budget and maintain it in cash terms in recent years, the Government has provided stability and reassurance to the sector, helping to maintain confidence during challenging times.

5. However, these settlements have still resulted in a 6% real-terms budgetary decline since 2010/11. Whilst the community has actively pursued efficiency gains to maintain excellence, the capacity for further savings is rapidly diminishing and the sector risks breaching the lower limits of sustainability.

6. For capital spending, the Government has set out an inflation-linked capital budget of £1.1bn per year, running through to 2021.[2] Whilst this protects capital spending from short-term cuts, both existing and planned capital investments must be coupled with long-term resource commitments to ensure these investments are fully utilised.

7. It has been demonstrated that public investment creates a 'crowding in' effect, with long and short-term benefits. The protection of the ring-fence in 2010 is estimated to have leveraged an additional £1.2bn of private investment which would otherwise have been lost.[3]

8. A commitment of long-term public support to the sector is vital to induce confidence among private and charitable investors. Private investment is known to be particularly sensitive to public expenditure.[4]

Our recommendations

9. The Government must provide stability and long-term vision, recognising its unique role in securing confidence across the sector. This is central to attracting globally-mobile private investors, retaining talent, and engaging the public who support research through their charitable donations.

10. Even short-term funding restrictions put at risk promising research areas and expertise being lost from the UK research base, even if funding is later reinstated.

11. The Government should work in partnership with the research community and the public, to use the science budget and platforms such as the 2014 Science and Innovation Strategy to set out a clear vision for the community, coupled with appropriate resource.

12. Capital allocations must be tied to resource spending, alongside wider investment in infrastructure and skills, to ensure that value for money is achieved.

[1] http://www.acmedsci.ac.uk/policy/policy-projects/joint-academies-statement-building-a-stronger-future/
[2] March Budget, HM Treasury, 2015
[3] What is the relationship between public and private investment in R&D, April 2015, BIS
[4] *Ibid*

Q2. The extent to which research spend in Government departments (outside the Science Budget) complements or competes with the Science Budget.

13. Across the course of several decades, departmental spending on research has been declining.[5] This erodes the capacity to generate tailored evidence for policy making, and fails to capitalise on the research potential of front-line experience within departments.

14. This decline has resulted in increasing reliance on the science budget. Rather than complementing departmental spend, the science budget is increasingly compensating for insufficient investment elsewhere, wasting opportunities for synergy.

15. The potential of departmental spending is well demonstrated by the National Institute for Health Research (NIHR) within the Department of Health. Since its inception in 2006, NIHR has rapidly become a pre-eminent funder for medical research, supporting innovation within the traditionally 'service-led' department.

16. The protection of the NIHR budget under the previous Government acknowledged the value of this funding source, and the importance of building and protecting a research base close to front-line service delivery.

Case study – **Office for Strategic Coordination of Health Research**

17. In the 2006 Cooksey report, it was recommended that an Office for Strategic Coordination of Health Research (OSCHR) be established. [6] Its objective was to coordinate the funding of health research between NIHR and the Medical Research Council (MRC).

18. Subsequently established in 2007, OSCHR reports jointly to the Secretaries of State for Health and Business and has a board composed of representatives from academia, government, MRC, NIHR, HEFCE, medical research charities and industry.

19. OSCHR has been extremely successful in coordinating funding across the two research bodies – NIHR channelling departmental spend, and MRC operating within the science budget. OSCHR's work has allowed each funder to utilise its distinct advantages as a separate entity, but also work in a highly complementary way to support the whole pipeline of research.

20. Since being founded, OSCHR has supported the development of projects which have improved NHS electronic data capabilities for research, created a research programme for public health, and enhanced translational science.

Our recommendations:

21. The Government should acknowledge that effective use of Departmental R&D budgets can support evidence-based decision making and identify efficiency gains. Departmental research funding can more effectively respond to the front-line delivery priorities of departments and their stakeholders than other funding streams. NIHR, within the Department of Health, provides a leading example of this in action. Its research funding evaluates the effectiveness and impact of new and existing healthcare treatments, finds new ways of preventing,

[5] Building a Stronger Future, joint National Academies statement, February 2015
[6] A review of UK health research funding, Cooksey and HMT, 2006

identifying and treating ill health, and makes this evidence widely available to ensure that decisions about health and social care are being informed by the best possible evidence.

22. Valuing and protecting this spending within Whitehall is essential to embedding an innovative culture across all Departments.

23. The value of extending the OSCHR model to other streams of public funding should be explored. A wider coordination of spending could build on existing links such as between RCUK and the Defence Science and Technology Laboratory, or between the Department for Defence and NIHR.[7,8]

Q3. The need for, and rationale for, any adjustment to the trajectory of future Government expenditure on research, and what would be gained from an increase (or lost from a reduction) compared with current expenditure.

24. As set out in our joint Academies statement, *Building a Stronger Future*, UK investment in research lags significantly behind our global competitors.[2] This trajectory is set to worsen as emerging economies make research and development a national priority.

25. Public investment is known to leverage additional private investment from industry and charities, with an approximate ratio of 1:2 being common across developed nations.

26. The commitment of extra resource would be highly productive and represents one of the most cost-effective ways to boost growth. In contrast, funding cuts risk damage which cannot be easily reversed, with novel and emerging fields and globally mobile researchers likely to be most vulnerable.

27. Any changes to funding should be developed and implemented in discussion with the sector and wider stakeholders, to ensure that risks and opportunities are appropriately monitored and managed.

Case study - **1980's research funding cuts**

28. Cuts introduced in the early 1980's saw major budget reductions for universities and funding councils, resulting in cancelled programme grants and the loss of thousands of science positions from 1980-1982.[9]

29. This period saw a decline in the UK's share of recent global research citations, falling from 10.9% in 1976 to 8.9% in 1982, against a background of rising shares for key competitors.[10]

30. This decline in international standing fed into concerns around researcher migration. A 1987 report from the Royal Society noted that although net researcher migration was low, there were concerning trends which indicated a disproportionate loss of world-class, senior scientists, particularly in emerging research areas.[11]

[7] http://www.rcuk.ac.uk/media/news/130204/
[8] http://www.srmrc.nihr.ac.uk/
[9] Universities Statistical Records, staff data 1972-1993
[10] National Performance in Basic Research, Nature, 1986
[11] The migration of Scientists To and From the UK, Royal Society, 1987

31. The data suggested that key individuals were being lost from the UK research base, increasingly on a permanent basis, driven by improved career opportunities and superior facilities abroad. These individuals were vital to anchoring entire research communities in the UK, and the report's authors worried their loss would have a 'debilitating effect' on UK research.

Our recommendations

32. There should be a long-term and concrete commitment to raising public research spending to align with competitor nations, a goal which would place the UK on a trajectory to roughly double current public spending to ~1% of GDP. A similar target has been suggested by other organisations, including by the Council for Science and Technology.

33. A pledge to achieve this vision would help fuel the growth of the UK's knowledge economy, and recognise the value of investing in the entire research pipeline in order to deliver long-term returns for society.

34. This commitment should be complemented by greater support for the career pathway, starting with improved science education to ensure a broad base of scientific literacy and enthusiasm, through to the professional development of talent needed for future growth.

Q4. Whether the current budget distributions between particular types of expenditure and between different organisations are appropriate for future requirements, and appropriately balance pure and applied research.

35. The UK research base is a uniquely diverse ecosystem of public, industry and charitable funders. To function optimally, the commitments of the different players must remain balanced so that they can work together synergistically to tackle research priorities.

36. There is a pressing need to ensure that the research base is aligned with (and helps to identify) future challenges and opportunities. Academy projects such as *Health of the Public in 2040* are addressing this need.[12] Challenges and opportunities will increasingly occur across interdisciplinary boundaries, and the funding landscape must be dynamic in order to respond to these trends as they emerge. The Academy's working group on Team Science seeks to identify improvements in the reward and recognition structures for researchers working across interdisciplinary boundaries.[13]

37. The Academy has also submitted a response to the Nurse Review, which is examining Research Council strategic coordination, noting the importance of agility.[14] Further consideration of cross-Council working can be found within this evidence submission.

Case study – **Life Study project**

38. The Life Study project is co-supported by MRC and ESRC, and aims to create a research database on the growth, development, health and well-being of over 80,000 babies and their parents.[15]

[12] http://www.acmedsci.ac.uk/policy/policy-projects/health-of-the-public-in-2040/
[13] http://www.acmedsci.ac.uk/policy/policy-projects/team-science/
[14] http://www.acmedsci.ac.uk/policy/policy-projects/review-of-the-research-councils-by-sir-paul-nurse/

39. This project represents one example of coordination across Research Councils on interdisciplinary topics, and builds on the strengths of both communities.

Our recommendations

40. The Government should continue to support horizon scanning as part of strategic research planning, the importance of which continues to be recognised and supported by the Government's Chief Scientific Advisor.

41. The value of the existing Research Councils in assessing and shaping their individual research areas should be noted, and further support provided for collaboration at their boundaries.

42. We recognise that medical advances are best achieved and implemented as part of a broader community of research excellence – for example, sociological research can be critical to delivering impact, and sectors should be joined-up at all levels.

43. The Government should continue to engage the research community and wider stakeholders including the public, so that funding priorities are informed by on-going discussion. This approach can help shape efficient choices and ensure public support, with recent successful examples including the 2014 Longitude Prize, which generated a high level of public awareness.

Q5. What level of Government expenditure on science and research is needed:

a) to significantly drive the overall level of such expenditure in the economy, through synergies between government and private sector investment (including overseas investment).

44. The role of public investment in driving broader private and charitable investment has been already been highlighted, and the UK would be better placed to leverage this if overall investment was more closely aligned with competitor nations.

45. This goal would place the UK on a trajectory to roughly double current public spending to approximately 1% of GDP. However, it should be noted that the unique economic profile of individual nations means that the degree of leverage varies considerably, reducing the ability to generalise.

46. Government analysis suggests that each £1 of public funding leverages an increase in private funding of £1.13-1.60.[16] Data suggest that 'medicine, dentistry and health' and 'engineering and technology' deliver the highest leveraging ratios.

47. A world-class research base also supports the UK's success in attracting a high level of funding from overseas, including a disproportionate amount of EU research funding, which is awarded on the basis of excellence.

[15] http://www.lifestudy.ac.uk/homepage
[16] What is the relationship between public and private investment in R&D, April 2015, BIS

Case study – **GE Healthcare**

48. The diagnostics and life sciences firm Amersham Ltd developed from a publicly-funded national laboratory, which was privatised in 1982. After General Electric's (GE) purchase of Amersham Ltd in 2004, a decision was taken to relocate the GE Healthcare subsidiary to the UK.

49. This move marked the first ever GE subsidiary headquartered outside the US, demonstrating the value of a strong science base in not only attracting foreign investment in existing assets, but also the deployment of greater long-term investment centred in the UK.

Our recommendations

50. The UK continues to outperform international competitors, but we have already highlighted the risk of continued flat cash settlements, including the reduction in the UK's ability to leverage additional sources of funding. An informed and long-term commitment should be made to reverse recent cuts in funding and raise research spending to a level that is closer to that of competitor nations.

51. This goal should be coupled with ongoing dialogue and evaluation to ensure that funds are disbursed sustainably. This avoids the situation faced by the US National Institute of Health, which received a windfall from economic stimulus spending in 2008 but was forced to make a damaging retreat from commitments after funding was not maintained in subsequent settlements.[17]

52. Government should recognise that the support of public funding nurtures excellence, through which the UK attracts investment from EU and international funding platforms.

53. The Government can maximise the impact of leveraging by increasing support for SME-University collaboration, ensuring the UK's industrial landscape has a broad base to the pyramid. We welcome the Dowling Review consideration of this area, and encourage Government to review its findings.[18]

54. Actions in this area would help secure the future of 'big pharma' in the UK, the loss of which would significantly impact capacity. Academics should be supported to deliver increased innovation for industrial collaborations, with public funders empowered to take on high-risk projects.

b) to optimally balance its benefits against the opportunity cost of government expenditure foregone on other public services.

55. Research investment is known to yield high returns for society, both directly and through 'spillover' benefits to the wider economy.[19,20]

56. The medical science sector has a long-standing commitment to evaluating impact – a series of reports commissioned by the Academy and others have demonstrated that each £1 invested in

[17] http://www.nature.com/news/the-nih-faces-up-to-hard-times-1.11458
[18] http://www.raeng.org.uk/policy/dowling-review
[19] The Simple Economics of Basic Scientific Research, Nelson, Journal of Political Economy, 1959.
[20] The Economic Significance of the UK Science Base. 2014 Haskel *et al.* http://sciencecampaign.org.uk/UKScienceBase.pdf

research into cancer, cardiovascular disease and mental health returns respectively 10p, 9p and 7p each year in perpetuity.'[21] A fourth study, focussing on musculoskeletal research, is due to report in 2016.

57. These figures are then further boosted by a wider 'spillover' return, with imminent analysis expected to show this at least doubles the direct return figures.

Case study – **NHS efficiency**

58. NHS England needs to make £22bn of efficiency savings in the next four years. A recent King's Fund report noted that innovation has historically been a major contributor to NHS efficiency savings, of which more will need to be made.[22]

59. Medical research makes a direct contribution to reducing the burden of disease through prevention and treatment. The operation of NIHR within the Department of Health is a major step towards placing research at the heart of delivering affordable, cutting-edge and effective universal healthcare for the UK.

60. Alongside this, UK expertise is deployed against international health challenges – improving global health and mitigating external risks to the NHS from increasing international mobility. Research focussed on the development of treatments for low-resource settings are increasingly having relevance in high-resource settings, as healthcare systems across the world struggle to maintain standards in the face of growing societal challenges from ageing and disease.

Our recommendations

61. The Government should recognise that research represents a first-rate investment opportunity, and one that aligns with their stated goal to transition the UK towards a knowledge economy producing high-skilled and high-value jobs.

62. Investment in medical sciences must be made if our health and welfare system is to maintain standards in the face of future challenges. The medical sciences, supported by interdisciplinary cooperation, are central to delivering affordable and effective healthcare within the NHS and reducing the wider burden of ill-health on the productivity of the economy.

63. Government may wish to consider the Academy's outputs on topics such as stratified medicines, which highlight the need for rapid adoption and the embedding of an innovative culture throughout the NHS.[23] Achieving this harnesses the UK's universal healthcare system as a unique, national asset for supporting research – the outputs of which will be able to rapidly feed back into delivering improved care.

[21] Medical Research: What's it worth? Estimating the economic benefits of cancer-related research in the UK. 2014. Academy of Medical Sciences, Cancer Research UK, the Department of Health & Wellcome Trust. And references therein.
http://www.wellcome.ac.uk/stellent/groups/corporatesite/@policy_communications/documents/web_document/wtp056595.pdf
[22] Better Value in the NHS, King's Fund, 2015.
[23] Realising the potential of stratified medicines report, July 2013, AMS

Q6. Whether Government expenditure on aspects of research are consistent with other government policies, including the Industrial Strategies and the 8 Great Technologies and fiscal incentive policies for research investment.

64. The Academy recognises the value of the Haldane principle, and the importance of the Research Councils' independence from government, with an investment agenda set by scientists.[24] Whilst strategic vision from Government is both warranted and useful, this should develop from ongoing discussion with the sector and the public, and provide long-term and flexible goals within which the Research Councils can deliver.

65. Regarding fiscal policy, the Government should consider the disincentives created by restrictive VAT rules on joint academic-industry facilities, which are discussed further in the Academy's submission to the Dowling Review.[25]

66. The policy environment must also support the skills pipeline, to ensure that the UK's workforce retains its capacity for innovation. Mobility across sectors and disciplines must be maintained to ensure that skills generated within the research base are able to circulate both within and outside the sector to deploy talented individuals across areas of need.

67. On an international level, the UK should avoid barriers (real or perceived) that may isolate it from the international talent pool. International connectivity and collaboration raise the prominence of UK output, attract foreign investment, and support our ability to rapidly identify and adopt innovation from abroad.[26,27]

68. The Science Minister recently spoke about mapping regional strengths to support recognition.[28] A joint Academy FORUM report to be published in September will explore how geographical clusters can drive medical innovation, and the Government may wish to consider the UK's potential as a 'macro-cluster' in which regional expertise can cooperate closely throughout the country.

Case study – **AstraZeneca**

69. AstraZeneca has chosen to relocate its global headquarters to the Cambridge Biomedical Research Campus, to be alongside significant public assets such as the new MRC Laboratory of Molecular Biology, Cambridge University Hospital, and world-leading research teams within the University's School of Clinical Medicine.

70. The features which make this site an attractive biosciences cluster are likely to provide a template for fostering similar regional centres of excellence elsewhere.

Our recommendations

71. The Government's vision for research should strive for long-term stability, coupled with flexibility for research organisations to adapt their portfolios to accommodate emerging trends.

[24] 2013 Triennial Review submission, Academy of Medical Sciences
[25] http://www.acmedsci.ac.uk/policy/policy-projects/consultation-by-dame-ann-dowling-on-business-university-collaboration/
[26] Building a Stronger Future, joint National Academies, February 2015
[27] International Comparative Performance of the UK research base, Elsevier, 2013
[28] One Nation Science, Jo Johnson MP, 2015 https://www.gov.uk/government/speeches/one-nation-science

72. The Government should avoid fiscal disincentives to improving academia-industry collaboration by addressing key concerns expressed within the community.

73. The skill base of the UK should be supported to ensure a high level of scientific literacy, forming the foundation for our future knowledge economy.

74. Policies relating to researchers from outside the UK should be co-ordinated across Government and carefully communicated to ensure the UK retains its strong connection to the international talent pool, and continues attracting and retaining talented individuals from across the world.

75. The Government should consider how best to capitalise and nurture regional centres of excellence, and how broader public investment can support these clusters to work more closely with each other.

76. Co-ordination across Government is required to improve synergy between different public funding steams and ensure that the impact of policies on researchers and the research endeavour is properly considered.

Q7. The extent to which any increase or reduction in Government expenditure on research will impact the UK's relative position among competitor states.

77. The UK retains a reputation as a world-leader for its academic outputs and research efficiency. However, our below average investment compared to competitors threatens this reputation.

78. Many advanced and innovative nations, including the USA, northern Europe and South Korea, are spending around 3% of GDP on research, whilst the UK currently ranks last among the OECD nations with 1.67% versus an OECD average of 2.36%.[29,30]

Our recommendations

79. The UK has a significant comparative advantage in research, particularly in key fields such as medical research. Government must recognise and protect this advantage as a national asset through adequate funding and effective policies.

80. Sustained underinvestment will have a detrimental impact on the science base and result in the UK becoming less attractive to global investors and talented individuals. If allowed to dissipate, that reputation may not be recoverable.

81. Within the UK, policy decisions which restrict the pipeline of trained researchers risk reducing the availability of highly-skilled workers who benefit the research base and the wider economy. This comes at a time when many competitors, especially emerging powers, are investing heavily in STEM graduates.

82. The Government must recognise that in a highly competitive and mobile world, the UK can prosper by building on our strengths, but that we will fall behind rapidly if we fail to invest adequately.

[29] ONS (2015) Gross Domestic Expenditure on Research and Development, 2013.
[30] OECD (2014) Main Science and Technology indicators.

Summary

83. We regard this as a critical time for research and innovation within the UK. Challenges facing our society will increasingly demand a strong and inter-connected research base, and short-term cuts now are likely to induce long-term costs later.

84. The UK has a world-class research base. We urge the Committee to hold Government to account for ensuring that it capitalises on its opportunity to invest in research and innovation for the future of the nation, and be the Government that backs rhetoric with resource.

Declaration of interests

85. Since April 2015, the Academy of Medical Sciences has received a funding allocation from the Science Budget for our activities that support evidence-based policy making.

86. In addition, many of the Academy's Fellows who contributed to this response are involved directly or indirectly as advisors to funding bodies mentioned in this response. Further details are available on request.

This response was prepared by Dr Ben Bleasdale (Policy Officer) and informed by members of the Academy's Council. For further information, please contact: ben.bleasdale@acmedsci.ac.uk; +44(0)20 3176 2158.

Academy of Medical Sciences
41 Portland Place
London, W1B 1QH
+44(0)20 3176 2150
info@acmedsci.ac.uk
Registered Charity No. 1070618 Registered Company No. 35202