Clusters
Investing for impact

How governments can maximise the potential of UK research and innovation

Policy report, March 2025

CANCER RESEARCH UK

Together we are beating cancer

Contents

Executive Summary

A thriving UK research and innovation ecosystem is vital to make progress towards our vision for more people to live longer, better lives, free from the fear of cancer.[1]

This year is crucial to the UK Government's ambitions to kickstart economic growth and build an NHS fit for the future. The development and delivery of the industrial strategy, life science sector plan, 10 Year Health Plan and National Cancer Plan, alongside local and devolved growth plans, is an opportunity for governments to cement the UK as a globally leading research environment.

As the second largest independent funder of research and innovation in the UK, we have invested over £4 billion in the last decade.[2] Every pound we spend on research has come from the generosity of the public and our donors. We have a responsibility to use their money in the most impactful way possible, so we take a strategic approach to deliver the best outcomes.

As we set out in this report, we have committed diverse and long-term investments to advance ecosystems to deliver the capabilities needed to tackle the biggest challenges in cancer. This includes around £125m investment, almost a third of our annual research spend, in our four research institutes.[3]

This has helped develop some of the world-leading life sciences clusters in the UK and built places where cancer research can thrive. And we have seen the benefit: more than 8 in 10 people who receive cancer drugs on the NHS receive a drug developed by us, or with us – and our science helped bring around 50% of the world's essential cancer medicines to life.

Through investing in clusters, we have learnt they boost R&D activity, accelerate developments for cancer research and strengthen the economy – so as well as helping meet our vision, they will be key to making progress towards the UK Government's health and growth missions. Commitment to the Oxford-Cambridge Growth Corridor shows the UK Government sees the value of clusters in meeting these ambitions - and understands the steps needed to achieve this.[4]

The success of a cluster is not inevitable. This report sets out what we have learned from our experience, as Criteria for Clusters, with high-level recommendations. Governments can use this to shape strategies to develop globally leading ecosystems. A targeted and strategic approach is needed, focussed on providing tailored support to high-potential city regions and clusters. This is particularly key in a challenging fiscal environment to avoid spreading efforts too thinly.

To support the successful creation of world-class clusters the government needs to:

- **Be prepared to take calculated risks and support leaders who have a visionary approach to the development of thriving clusters** – See the success of a visionary approach in our case study of The Francis Crick Institute and London Knowledge Quarter (page 6).
- **Work with partners who understand what their sectors and local areas need to constantly curate clusters over the long-term** – See the importance of the ongoing partnership approach required in driving research and innovation in our case studies of CRUK's investments in Cambridge (page 9) and Manchester (page 12).
- **Use the Criteria for Clusters set out in this report as a framework to create the globally leading environments of the future** – See an example of a potential new cluster of research and innovation across Scotland and the North-East (page 13).

Next steps: Over the next 6 months we will:

- Continue to share our experience of supporting clusters with the Department for Science, Innovation and Technology and the Department for Business and Trade as they work to develop and deliver the Industrial Strategy.
- Work with governments, funders, university groups and cluster leaders to determine what actions are needed to deliver on these recommendations across the UK.

Summary: Criteria for Clusters and recommendations

1 **Political will with a strategic and visionary approach** Page 18

National, devolved and local governments must assess the potential of places for cluster development and take a calculated, and tailored risk in delivering strategic partnerships with charities, academia and industry – to empower research leaders to enact their vision. This must be accompanied by long-term investment so clusters are supported to the stage where they can be self-sufficient and sustain research and growth.

2 **Proximity of diverse research-performing organisations at all stages of the research pipeline** Page 20

National, devolved and local government should work together to coordinate local research leaders and industry to encourage a critical mass of research-performing organisations in an area. They should leverage private and philanthropic investment and establish partnerships to maximise outcomes of investment and drive collaboration.

3 **Opportunities to create connection and collaboration to spark innovation and accelerate research pipelines and impact for people affected by cancer** Page 22

Local and national governments should enable collaboration by supporting networks, partnerships and cluster organisations that can take a cluster from co-located research organisations to a connected ecosystem that is greater than the sum of its parts. This will deliver better outcomes for patients by ensuring the interactions and spillovers that enable discovery research can be translated through clinical trials and into practice.

4 **Access to finance, research infrastructure and talent** Page 23

Governments should preserve and strengthen the availability of diverse sources of R&D investment at all stages of research pipeline at a UK-wide and local level.

Governments must drive forward strategic major infrastructure investment to catalyse cluster development and enable capacity to increase laboratory space, including through partnerships with private and charitable investors and research funders.

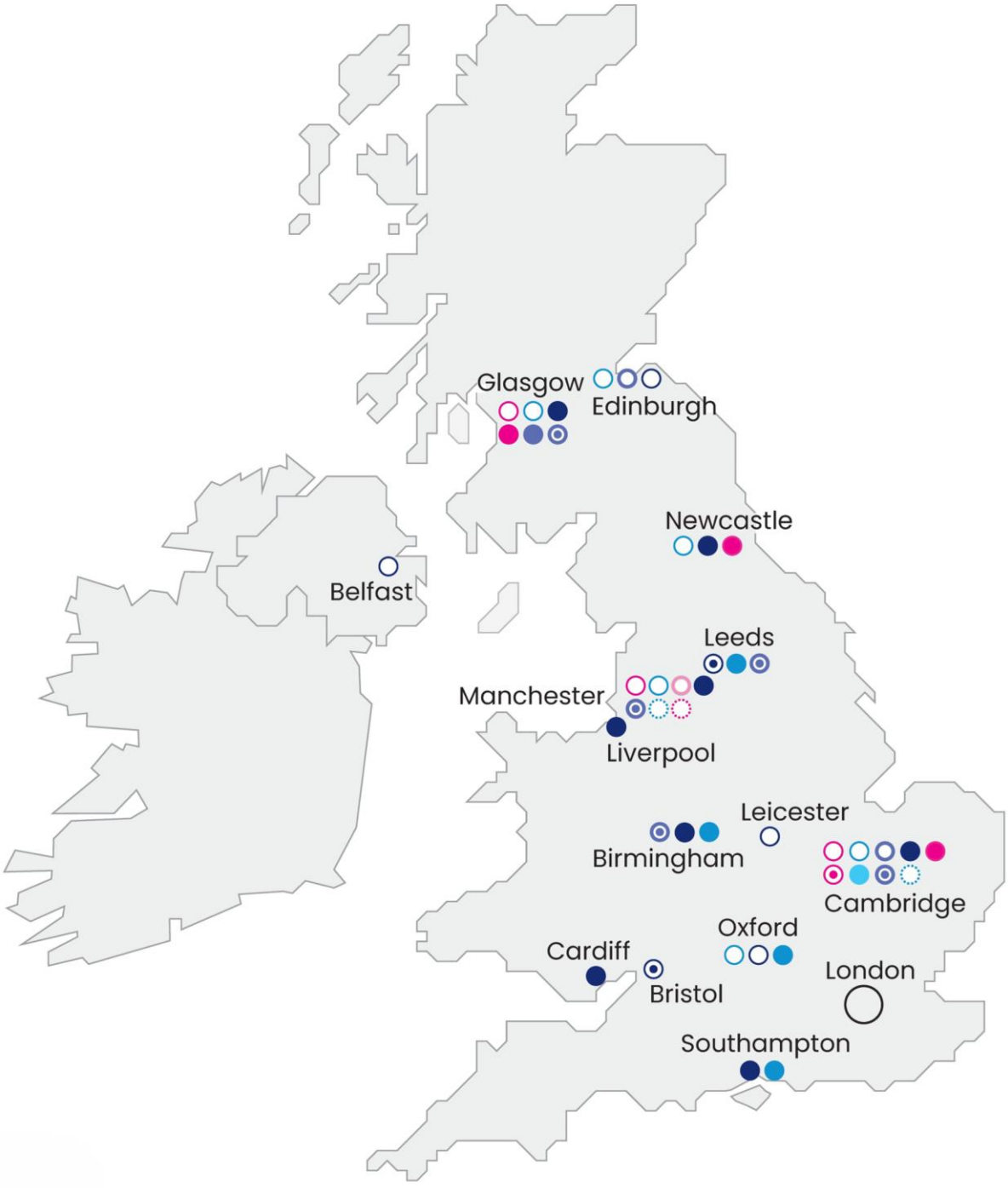
The UK Government should support access to talent, particularly on a international level.

5 **Attractive local environment** Page 25

Governments must consider how effectively a local environment can host a major research site and assess where improvements in public services, transport, housing and the broader local environment would help attract and retain talent and research organisations in an area. Coordination is needed to ensure that local government have the levers and funding to do so, either from a national level or devolved to them to deliver.

Figure 1

Our world-class research network, with investments in leading UK clusters. Locations where we support research infrastructure as of January 2025, with our most significant investment seen in London, Cambridge and Manchester.



- Institutes (4)
- Centres (7)
- Lung Cancer Centre of Excellence (1)
- Brain Tumour Centre of Excellence (2)
- Experimental Cancer Medicine Centres (ECMCs) Adult and Paediatric (10)
- Experimental Cancer Medicine Centres (ECMCs) Adult (7)
- Experimental Cancer Medicine Centres (ECMCs) Paediatric (2)
- Clinical Trials Units (7)
- Cancer Research Horizons Drug Discovery Sites (6)
- Cancer Research Horizons-AstraZeneca Antibody Alliance Laboratory (1)
- Cancer Research Horizons-AstraZeneca Functional Genomics Centre (1)
- Manufacturing Facility (1)
- RadNet (7)
- International Alliance for Cancer Early Detection (ACED) (3)
- National Biomarker Centre (1)

London

Barts
- ECMC

CRUK City of London Centre (KCL, UCL, Barts, the Crick)
- Centre
- RadNet

CRUK Convergence Science Centre (ICR-Imperial)
- Centre

Imperial
- ECMC
- NCITA

Institute of Cancer Research
- Brain Tumour Centre of Excellence (joint with Cambridge)
- Clinical Trials Unit
- ECMC
- RadNet
- NCITA

King's College London
- NCITA

King's Health Partners
- ECMC

The Francis Crick Institute
- Institute
- Cancer Research Horizons Drug Discovery Site

Queen Mary University of London
- Clinical Trials Unit

UCL
- Lung Cancer Centre of Excellence (joint with Manchester)
- Brain Tumour Centre of Excellence (joint with Edinburgh)
- ECMC
- Clinical Trials Unit
- ACED
- NCITA

Case studies

Our long-term investments in diverse research infrastructure have helped develop some of the leading life sciences clusters in the UK. These case studies give examples of how being located in these ecosystems has benefited our research, and how our investments have impacted cluster development.

These give examples of how the Criteria for Clusters and our recommendations (which can be found in full from page 18) work in practice. We define clusters and their benefits on page 14.

Success of a visionary approach

The Francis Crick Institute and London Knowledge Quarter

The Francis Crick Institute and surrounding Knowledge Quarter in London are a demonstration of what is possible when a visionary approach is taken to research cluster development. The Crick has not only boosted life sciences capacity in the local area, but elevated UK research and innovation as a whole.

Combining strong foundations for research and innovation, transport links, UK and local government support, diverse investment and major partnerships, the square mile around King's Cross is London's fastest growing knowledge-driven innovation economy.[5] It is attracting globally leading talent and industry, with a strong focus on life sciences and AI. Through our support for and investment in the Crick since its inception, we're contributing to this growth and seeing the impact this has on driving our research and innovation.

A calculated risk taken in partnership between government, research charities and academia

The Crick was established to be a leading biomedical research institute, at the centre of local, national and international networks, where curiosity-driven research and collaboration could benefit human health.[6,7] During early discussions in the 2000s, the area surrounding King's Cross was not the thriving life sciences hub that it is today. But it had potential – with strong foundations for research, density of talent, proximity to London's universities and research hospitals, and national and international transport links.

"The success of the Crick has contributed to the development of a thriving life-sciences ecosystem around King's Cross and Euston, with the potential to position London as a global science and technology leader."

Stephen Mayhew, Chief Business Officer, The Francis Crick Institute

A partnership between CRUK, the Medical Research Council, Wellcome, Imperial College London, King's College London and University College London, major combined investment of £650m and government support to provide access to land enabled the building of advanced facilities in an open-plan, multidisciplinary, highly collaborative environment.

As a result, the Crick has established itself as a globally significant pillar of excellence with over 1200 researchers. Partnerships with universities and industry enable pooling of knowledge, ideas and resources and create an entrepreneurial culture.[8] In the 8 years since opening its researchers have published nearly 5000 research papers, collaborated with 84 countries and launched 12 spinouts that have raised over £1bn, driving advancements across fields of health.[9,10]

And beyond its own labs, the Crick's success has helped snowball the transformation of the square mile around King's Cross since the early 2000s. Since then, there has been an influx of innovative, knowledge-creating organisations, including The Alan Turing Institute and Google. The Crick is seen as a major pillar in the cluster, and companies including GSK and McKinsey have quoted its presence in their reasons for moving to the area.[11,12]

GSK highlighted the draw of proximity to the "fast-growing global Life Sciences hub […] and GSK's existing collaboration partners including the Francis Crick Institute" when announcing their new global headquarters in the Knowledge Quarter.

"As a global biopharma company, we […] look forward to the opportunities for even closer collaboration with the city's world-class science, academic and healthcare institutions."

Emma Walmsley, CEO, GSK[1111]

By 2019, the area was already one of the highest densities of knowledge-based businesses and science organisations in the world, competing economically with leading innovation districts such as Kendall Square in Boston, USA.[13] The cluster had higher productivity and economic output growth than the City and Canary Wharf in 2011-2019, and contributed £34bn to the UK's GVA in 2021.[5] By 2015, there were over 100,000 science and technology jobs in Camden, the highest concentration in any local authority in the UK.[14]

The Knowledge Quarter consortium brings together over 100 academic, cultural, research, scientific and media organisations in the area and local councils. It has helped advocate for the cluster and enables knowledge-exchange, while also supporting participation of patients and the local community to ensure they can contribute to and benefit from cluster development.[15]

This success of the Knowledge Quarter wasn't a given. While it can't be entirely orchestrated, it has shown that when the Criteria for Clusters (page 18) come together, this can instigate a positive feedback cycle to result in a world-leading cluster. Government investment and support enabled the foundations to be built on, and researchers were left to carry out their vision of what the research environment could be. This can be used as a model to translate this success to create other world-leading clusters in the UK.

Symbiosis of the Crick and the Knowledge Quarter

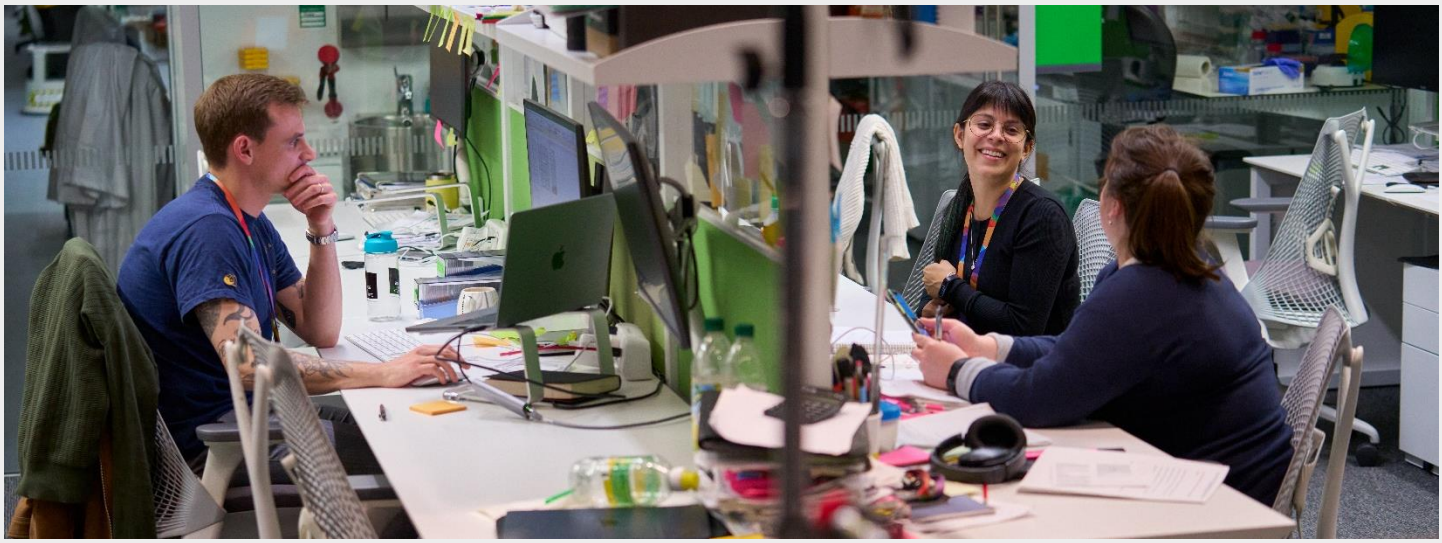
The Crick sees the strong, hyperlocal impact of being in the Knowledge Quarter. It creates easy opportunities for people to collaborate, allowing their ideas and science to evolve, and create spinouts supported by local incubators. The Crick has established partnerships to maximise these connections and further strengthen the local environment.

The Crick works with its partner universities through research collaborations, secondments, the joint PhD programme and satellite groups, increasing opportunities for multidisciplinary innovation.

Thanks to a longstanding strategic collaboration, the Crick are accommodating up to 100 MSD (Merck) researchers in 1000m^2 of state-of-the-art labs and office space, for three years from September 2024, while MSD build their own discovery labs in the Knowledge Quarter.[16] Companies see the value in this access, not only to lab space, but to work with Crick researchers, and tap into specialist facilities, high-tech platforms and expertise.

More broadly, in view of the growth in demand for lab space in the Knowledge Quarter, the Crick's expertise in developing and operating high-quality spaces for research and innovation in a densely populated urban environment has become increasingly sought after. This has led to pilot partnerships with British Land and with BlackRock and Reef Group, to deliver premium-quality lab space for companies within a 10-minute walk of the Crick.[17] People based in these new lab spaces can join lectures and participate in interest groups at the Crick and tap into the expertise across the institute. The Crick benefits as these initiatives support their own researchers to translate their work, and further transforms the area into a globally competitive location.

In an area of London with high inequalities, the Crick takes a proactive approach to embedding itself in the local community, helping ensure local residents benefit from its presence in the area and contributing to social mobility. Public engagement is one of the five pillars of their strategy, with the objective to strengthen their research and improve scientific literacy on a local, national and international scale.[18] The Crick holds open events and exhibitions, and runs outreach to engage every school student in the London Borough of Camden. It also hosts the Living Centre, run in partnership with community organisations, to help local people to deliver projects that tackle their own health, wellbeing, economic and social issues.[19]



Proximity and partnerships driving a global research powerhouse

Europe's largest biomedical research cluster in Cambridge

Built around its historic university, Cambridge is renowned for its research, attracting world-leading talent, investment and research organisations. As a result, we make significant investments in research in Cambridge - £49.3m in 2023/24 – through infrastructure, networks, partnerships and response mode funding.[20] This includes the CRUK Cambridge Institute, CRUK Cambridge Centre, brain and lung centres of excellence, an Experimental Cancer Medicines Centre and the Cancer Research Horizons-AstraZeneca Functional Genomics Centre.

Their location in Cambridge allows them to benefit from the outstanding research and innovation environment in the city, helping them attract talent and enabling close collaboration. Our infrastructure in Cambridge is integrated, thanks to proximity and partnership, with the university, research hospitals and pharmaceutical and biotechnology industries in sites like Granta Park and the Cambridge Science Park. The CRUK Cambridge Institute's connections across the University's departments enable multidisciplinary science and the CRUK Cambridge Centre connects researchers across Cambridge University Hospitals NHS Foundation Trust and the Cambridge Experimental Cancer Medicine Centre. This maximises the impact and translation of our research.

The strength of the life sciences environment and impact of our investment in the cancer ecosystem in Cambridge results in a positive feedback loop where Cambridge researchers also strongly leverage competitively awarded research grants. Our core investment of £23.5m in 2024/25 enabled the CRUK Cambridge Institute to secure £19m in additional grants from UK and international funders, almost doubling the funding available for research and innovation.[21]

But the success of this environment was also not inevitable. It has come from investment and partnership over years. Learnings from this fed into our Criteria for Clusters (from page 18) and can be translated and tailored to developing other promising research ecosystems in the UK.

Strategic investment in the largest biomedical cluster in Europe

The CRUK Cambridge Institute hosts over 300 scientists and sits within the Cambridge Biomedical Campus. This is the largest biomedical cluster in Europe, with over 22,000 employees, bringing together diverse research organisations and leading clinical centres in a collaborative environment to solve major health challenges.[22]

Organisations are connected through networks, partnerships and the University of Cambridge, and can meet and socialise through events held on Campus. This has enabled it to maximise impact for its mission, add £4.2bn gross value to the UK economy and win 12 Nobel prizes.[22] As seen below, this has helped drive success of our research investment through the CRUK Cambridge Institute. This is reflected in our renewed investment of £173m over the next 7 years.[23]

"In a golden era for life sciences, this funding bolsters Cambridge as a major global hub for cancer research on an increasingly competitive worldwide stage and will greatly aid the recruitment of top-tier international talent. The institute serves as a foundation for the entire Cambridge cancer research community through access to cutting-edge equipment and technical expertise."

Professor Greg Hannon, Director of the Cancer Research UK Cambridge Institute
On the announcement of £173m of funding for the institute[23]

Co-location driving collaboration on the Campus

This environment attracted AstraZeneca to build its new headquarters and global R&D facility in Cambridge, which has a strong oncology research focus. For almost a decade while this was being built, the CRUK Cambridge Institute hosted 90 AstraZeneca cancer researchers. This resulted in over 700 collaborative studies investigating tumour drivers, DNA damage response and immuno-oncology, culminating in 10 candidate cancer drugs now in clinical testing.

The CRUK Cambridge Institute, the AstraZeneca Discovery Centre and MRC Laboratory of Molecular Biology now sit around the same roundabout on the Campus (Figure 2). Building on their early relationship, this proximity has allowed continued collaboration between our institute and AstraZeneca, developing new capabilities to better understand cancer and drive forward treatment discovery. This includes joint participation in the Cancer Grand Challenges ROSETTA project to map cancers using advanced imaging.[24] The Cancer Research Horizons-AstraZeneca Functional Genomics Centre, hosted in AstraZeneca's new site, was established in 2017 to be a national resource. It delivers best-in-class genetic screening where our researchers can work together to develop personalised cancer medicines.[25]

Proximity to clinical research driving translation of discoveries

The institute is a department of the University of Cambridge School of Clinical Medicine and has established an Affiliated Clinical Faculty (ACF), strengthening links to clinical research across Cambridge. This enables discoveries at our institute to translate rapidly to improvements in cancer practice. The Personalised Breast Cancer Programme, which uses real-time genomic sequencing to guide patient care, was developed at the institute with an ACF at the Department of Oncology. It was shown to be effective in Addenbrooke's Hospital and is being rolled out nationwide. To take this further, a new Cambridge Cancer Research Hospital is being built on the Campus. This is being driven by Professor Richard Gilbertson, a CRUK Cambridge Institute group leader. It aims to break down barriers between fields, by bringing together the clinical excellence of Addenbrooke's Hospital, the scientific expertise of the university and Cancer Research UK, and the translational power of industry partners like AstraZeneca.[26] It will incorporate genomics and AI into clinical treatment pathways, enabling novel and cutting-edge care to new patients.

"Moving to the Cambridge Biomedical Campus means our people will be able to rub shoulders with some of the world's best scientists and clinicians carrying out some of the world's leading research – that's a really exciting prospect."

Pascal Soriot, Chief Executive Officer of AstraZeneca,
Announcement of AstraZeneca's move to Cambridge in 2013

"[…] This early collaboration with the CRUK Cambridge Institute is so exciting, as it represents another step in our efforts to create a permeable research infrastructure, building strong relationships with the vibrant bioscience community in the city as we work on developing the innovative medicines of the future."

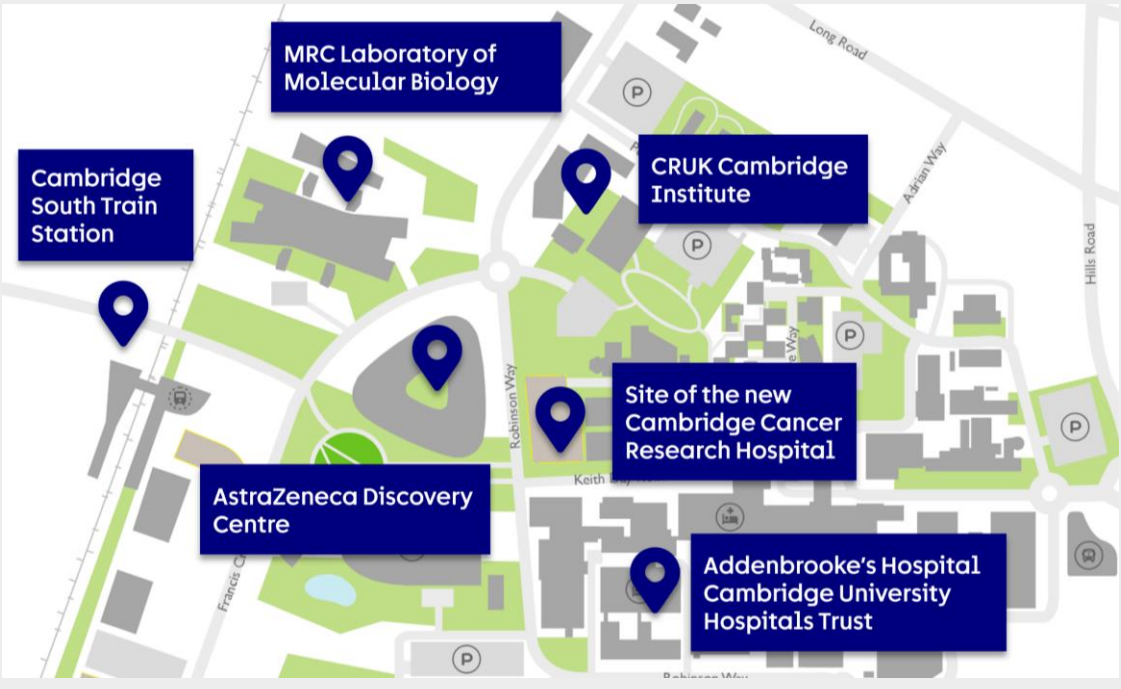
Mene Pangalos, Executive VP, Innovative Medicines & Early Development, AstraZeneca
Announcement of CRUK Cambridge Institute hosting AstraZeneca in 2014

Back to basics; transport and housing

Cambridge is a victim of its own success and is currently facing challenges with transport infrastructure and access to affordable housing. As set out in Criteria 5 of the Criteria for Clusters, clusters need an attractive local environment, so government support is needed to ensure it continues to thrive.

Upcoming transport developments including the Cambridge South train station on the growing Campus, and the renewed UK Government commitment to East-West Rail are strongly welcomed by the CRUK Cambridge Institute, as well as the announcement of the further development of the Oxford-Cambridge Growth Corridor.[27,4]

Figure 2
Location of major cancer research infrastructure in the Cambridge Biomedical Campus



Connecting and accelerating the full life cycle of research

Cancer Research UK's impact in Manchester

The CRUK Manchester Institute is a world-leading research facility, based in its recently opened £150m site. It is closely partnered with The Christie NHS Foundation Trust, the largest single site cancer centre in Europe.[28,29]

Proximity and partnerships between research organisations in Manchester have helped develop a biomarker for pro-tumourigenic inflammation which is now being tested in clinical trials. Through discovery research into tumour inflammation, researchers at the CRUK Manchester Institute identified a biomarker in mouse models could detect whether the type of inflammation in a tumour would help or hinder the effectiveness of immunotherapy.

Understanding that this could help doctors choose the right course of treatment for someone's cancer, the team accessed patient samples to identify the human version of the biomarker with support from the biobank at the Manchester Cancer Research Centre (a world-leading research partnership between CRUK, the University of Manchester and the Christie Hospital, which coordinates and drives research from the laboratory to the clinic). Realising it had clinical potential, they worked with the CRUK National Biomarker Centre and the Manchester Experimental Cancer Medicines Centre (a clinical facility which specialises in responses to treatments, and clinical trials at the Christie) to refine the biomarker to trial its effectiveness as a test for patients' responsiveness to immunotherapy.

Additionally, through the CRUK Lung Cancer Centre of Excellence (a network connecting researchers in London and Manchester to advance progress in lung cancer) research leaders at the Francis Crick Institute discussed potential uses, as inflammation is important in early-stage lung cancer. By working across the CRUK National Biomarker Centre (which has integral links with a Manchester community lung cancer screening programme) and Manchester Cancer Research Centre, the team had access to the expertise and samples to demonstrate that the biomarker was strongly predictive for relapse after surgery in early-stage lung cancer. The biomarker is being included in trials to test both these uses, including DETERMINE, LION (at the Christie Hospital), MANIFEST and TRACERx Evo.

Cancer Research Horizons, CRUK's innovation accelerator, have on-the-ground staff based at the University of Manchester's technology transfer office, the Manchester Innovation Factory, to identify opportunities for our investment. As a result of this we have protected the IP for the biomarker. It has also gained interest from a pharmaceutical company, who are now funding a research project with the team that made the original discovery.

The Manchester life sciences research and innovation ecosystem

This example shows how proximity of research and innovation organisations, facilities and clinical settings connects the lifecycle of research and how connections between clusters can help boost both of their work. Manchester has elements set out in our Criteria for Clusters such as leading universities, strong links between the NHS and universities and local political will, so has the potential to take off. But Cancer Research UK investment makes up a high proportion of cancer research and investment in the area, and as we set out in Criteria 2 and 3, a greater diversity of funding increases opportunities for collaboration and innovation. A strengthened translational environment and improved transport links could also take this ecosystem further to enable it to be an internationally competitive cluster for life sciences.

Future opportunity for a visionary approach

A new cluster of innovation across Scotland and the North-East

We have identified the need and potential for a world-leading new biomedical research institute - a cluster centred in Scotland but bridging out to the North East of England. We are working closely with a range of stakeholders in Scotland and the North of England on developing a new partnership, led by the Universities of Edinburgh and Glasgow. This proposal is for a new multi-disciplinary, multi disease-focussed biomedical institute in Edinburgh, with new facilities in Glasgow.

The objective is to drive new pathways to translate discoveries into innovative patient interventions across ageing-related multiple disease areas and deliver outstanding training opportunities. The new biomedical institute – a cluster based on expanding the best of our science - would act in the same way that some of the most innovative institutes in the world operate, acting as a magnet for talent, investment and industry collaborations from around the world, into the broader Scottish life sciences environment.

Clusters help research thrive and drive growth

What are research clusters?

Research clusters bring together a density of talented people, institutions, infrastructure and technology, public and private investment and networks. These elements in proximity promote permeability of people and ideas, development of skills and expertise and access to finance and commercialisation opportunities.

Through co-location and connection, the components of a cluster become more than the sum of their parts, promoting collaboration and knowledge spillovers, resulting in more and better research outputs and innovation.[30]

Successful clusters are self-sustaining, with a positive feedback loop where the environment for research draws more talent, investment and research organisations to the area, further driving excellence, increasing this pull factor. However, the environment still needs to be supported to sustain this.

Why the UK, devolved and local governments should support them

The UK research ecosystem has long been internationally leading, particularly in life sciences, with world-class R&D infrastructure, a leading university sector, and a healthcare system well-placed to leverage the benefits of health data and clinical trials. However, there is concern that in an increasingly competitive global research environment, where other countries are investing more in R&D, the UK could lose its edge.

The UK must therefore strengthen its R&D ecosystem by building on areas of existing strength, and the globally competitive life sciences and cancer research system here is therefore an opportunity for this.

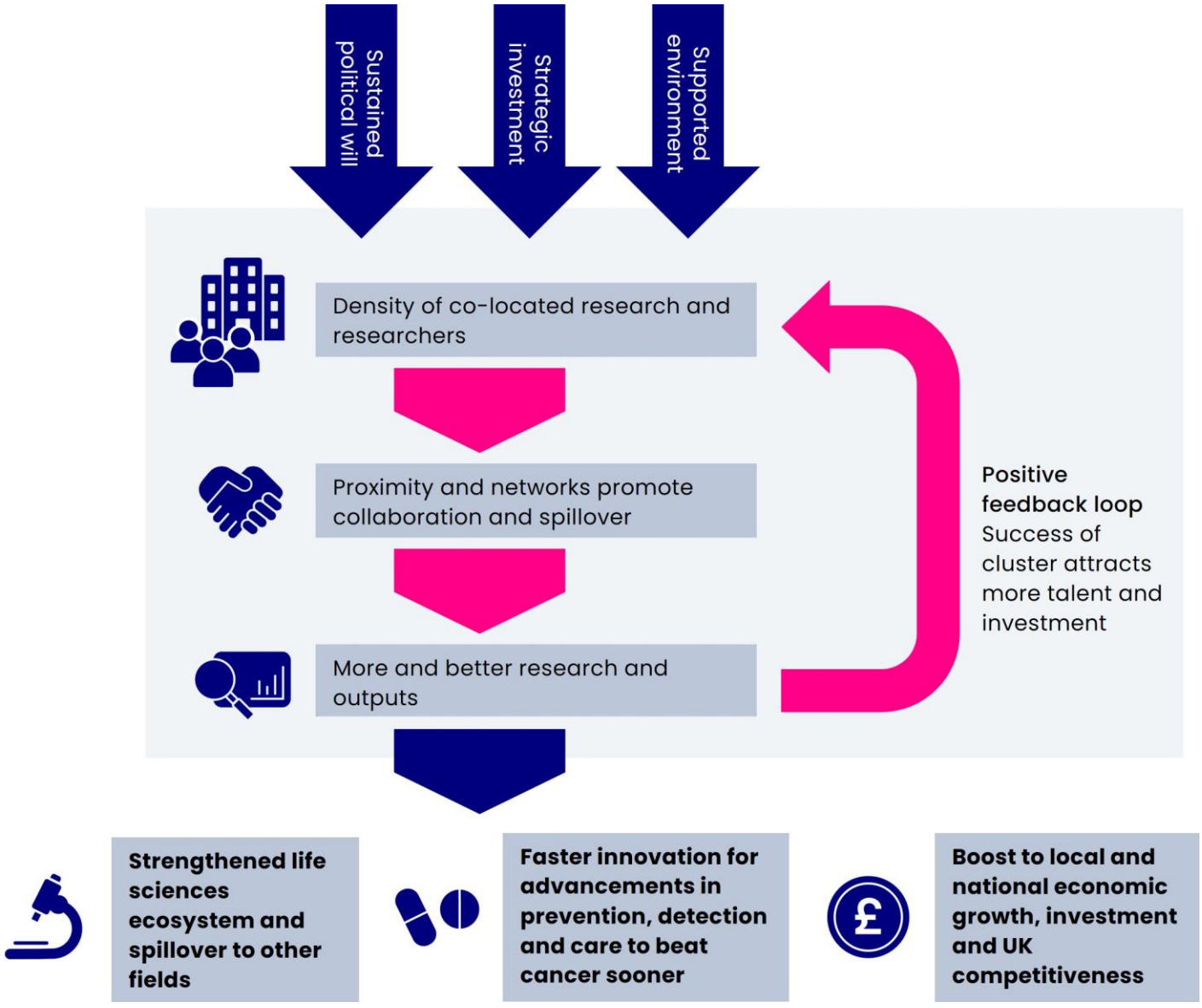
Supporting UK research clusters can help achieve this and can combat the risk, but also realise an opportunity to match world-leading locations for life sciences like in Boston and San Francisco. Rather than being about consolidation, a bold and visionary approach to set off positive feedback cycles of cluster growth can stimulate an increase in private and international investment to take UK research to new heights and achieve the scale needed to be world leading.

The new UK Government have set out their missions to drive the nation's health and growth, and our mission as a research funder is to beat cancer sooner.

We have seen that research clusters can boost R&D, accelerate developments for cancer research and strengthen the economy (Figure 3). We set out in this report how supporting this model for R&D can help realise our respective missions, and what action is needed to achieve this. Through the development and delivery of their industrial strategy, life science sector plan, 10 Year Health Plan and National Cancer Plan, alongside local and devolved growth plans, there is an opportunity for governments to cement the UK's position as a globally leading environment for research to meet these ambitions.

Figure 3

Connection, collaboration and positive feedback loops mean clusters are more than the sum of their parts. This improves research and strengthens the UK life sciences ecosystem, accelerating progress for cancer and wider fields, and strengthens economies. All these benefits can be felt at a local and national level, but input is needed to enable and sustain growth and impact.



Benefits of clusters for research and cancer

Driving research and impact

Collaboration is a key enabler for cancer research as it brings together people and ideas to answer complex scientific questions. We have seen that where our research infrastructure is close to other leading research, this creates opportunities for close collaboration. While it does happen at a distance, proximity has been shown to increase opportunities for research collaboration within and between academia and industry.[30]

Knowledge spillovers – when advances and developments by a research organisation enable others to further advance their research – boost innovation, resulting in more new-to-market innovations and patents, helping to translate research into progress.[31] A study of patent citations in the US found that spillovers occurred between closely located organisations and dropped off significantly beyond 25 miles.[32]

Bringing together densities of research performing organisations in clusters therefore amplifies these effects. Clusters that have a focus on life sciences and integrate local healthcare systems can connect the full life cycle of research, propelling research from discovery through to clinical trials, and enable translation to reach patient impact.

Interdisciplinary clusters can stimulate innovation, where the frontiers of fields can come together to develop cutting-edge technologies. Fields like physics, engineering, chemistry and mathematics can help understand processes behind cancer, develop transformational new approaches or translate applications of technologies to cancer prevention, diagnosis and treatment. The same applies for clusters with a multi-disease focus, where advances and innovations in cancer, like genomics and personalised medicines, can be applied to other diseases and vice versa.

Together, this amplifies the outcomes of research – as more and better research takes place – accelerating our progress in beating cancer sooner.

The development of clusters in the UK with world-leading expertise, facilities, foreign direct investment and talent can benefit research across the UK, as it raises the capabilities of UK research as a whole and creates opportunities for collaboration between clusters or with areas with lower density R&D but niche expertise, so also benefiting research outside the cluster.

Boosting the economy on a local and national level

Along with the transformative impact on cancer outcomes, cancer research plays a central role in driving growth across the UK.

Overall, the £1.8bn invested in cancer research in 2020/21 generated more than £5bn of economic impact.[33] This investment not only contributes to the national economy but is also felt on a local level through the creation of high-paying, highly skilled roles in R&D. Cancer research investment generates £3.6 billion in GVA from 47,000 jobs, and an estimated additional 30,673 indirect and induced jobs, for example in the supply chain, equivalent to a GVA of £1.8 billion. Average full-time salaries in cancer research are 25% higher than average salaries across the UK (Figure 4).[33] Both job creation and the attraction of talent to an area have induced benefits on local growth through

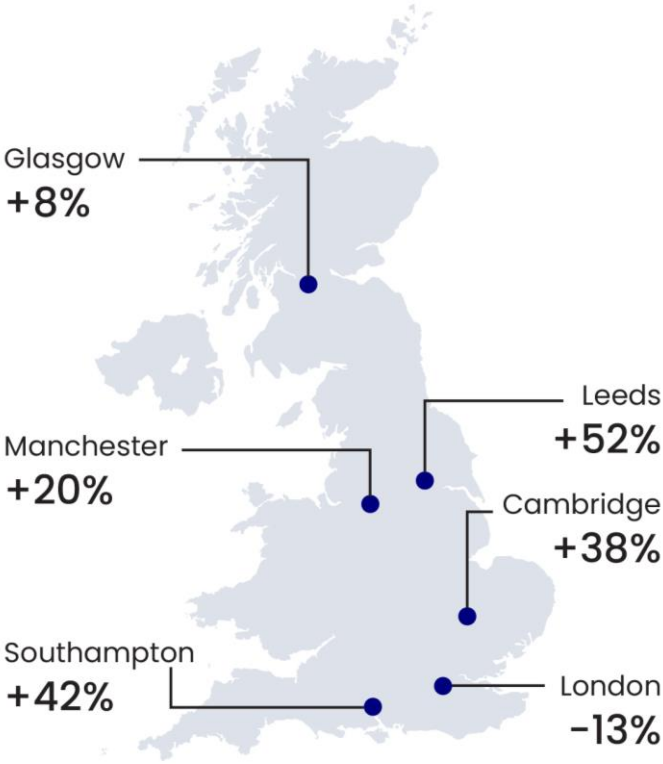
increased spending of earnings in the local economy.

Investing in UK clusters can maximise these economic impacts as they enable more and better research, through collaboration and knowledge sharing which amplifies spillover effects, spreading both information and innovation across industries and regions. Where clusters have a strong translational environment that supports spinouts this can add further economic value. For example, the 79 start-ups supported by Cancer Research Horizons have collectively raised over £3bn.[34]

Economic analysis of the Cambridge Biomedical Campus (where the CRUK Cambridge Institute is located) shows the impact of the Campus on a local and national scale. It contributes £4.2bn to the UK economy each year, with every £10 of GVA generated for the Campus generating another £10 for the UK economy, £5.32 of which is in the East of England, including £3.91 for the local area.[22] It is the largest employment site in Cambridge, with 22,000 employees who spend £721m in the regional economy, and it supports 15,000 additional roles across the region.[35]

Figure 4

Comparison of salaries in R&D compared to average regional salaries



Source: Analysis by PA Consulting

Industry is drawn to successful clusters by access to talent and collaboration opportunities, giving an area a competitive advantage to attract companies and investment to an area and enables the UK to compete for business investment on an international scale.[36] For example, as set out in the case study on the Crick and London Knowledge Quarter, major multinational companies like MSD and Google are taking strategic decisions to move their headquarters to London due to the density of research and innovation organisations.[37,38]

Supporting local communities

Beyond the provision of jobs and its positive impact on the local economy, R&D can benefit a local area through community engagement projects and partnerships with local schools. As we set out in the case study on the Francis Crick Institute and surrounding Knowledge Quarter (page 6), R&D can drive development of an area, and if done in conjunction with the existing local community, can help ensure they feel these benefits. Public opinion work by the Campaign for Science and Engineering found that 66% of people would support research labs being built in their local area, and a similar proportion would like to hear more about research happening near them.[39]

Criteria for Clusters

As a result of our long-standing involvement in developing research ecosystems, we have found that the following criteria enable clusters to grow and become more than the sum of their parts. These criteria and recommendations should be considered by national, devolved and local governments when making strategic investments. A region may be strong in a certain factor, but without all these together, is less likely to see success as a cluster. The diversity of what makes up a cluster means no singular approach will guarantee success, so it is important to ensure tailored support for the needs of clusters at different stages of development.

The case studies in this report (from page 6) illustrate these Criteria for Clusters work in practice and demonstrate how being in a cluster has benefited our research.

1 Political will with a strategic and visionary approach

While some UK clusters are world-leading, more places hold the potential to grow. Cluster development involves a broad range of actors, and long-term strategies and investment to instigate and sustain the positive-feedback cycle of growth.

Taking a visionary approach means identifying places with an opportunity to being world-leading and seeing the potential they could reach. The governance and direction of research clusters is for the people involved in research and innovation, but political will is needed to create an enabling environment, following these criteria and recommendations. Cluster development takes years and requires long-term commitments from all actors. Government, universities, industry associations and local organisations all have a role, so alignment is key to enable snowballing to reach critical mass. This will then enable research leaders within clusters to enact their vision.

To compete internationally, a strategic approach is needed. This means targeting investment to where there is potential for the largest impact on R&D, building on existing strengths. It requires a careful balance of committing long-term investment and evaluating when resources may not be used most effectively.[40] This is particularly important in the current challenging fiscal environment.

Support at a national level should come through increasing resources available for R&D, direct strategic research infrastructure funding, incentivising public-private partnership and funding transport and housing to enable places to attract and retain talent.

As local government is embedded within places, this gives opportunity for more tailored support. This can include helping to establish supporting organisations, facilitating partnerships between local university and industry, supporting access to local sources of finance and providing direct support to businesses, like incubator functions.[40] Local leadership can champion the research and innovation strengths of an area to help attract talent and investment. For example, Stevenage Borough Council are working with GSK and Airbus to draw attention to its thriving life sciences and biotech sector.[41]

Local government also has a role in enabling inclusion of the local community, to ensure they feel the benefits of cluster growth. This is central to the strategy of the London Knowledge Quarter, where local councils work with cluster organisations like the Francis Crick Institute on initiatives with schools and community groups.[15,42]

Case studies: The case study of Cancer Research UK's investments in the Francis Crick Institute and the impact on the surrounding London Knowledge Quarter (page 6) demonstrates the success of a visionary approach instigating a positive feedback loop of cluster growth that has transformed an area with potential into a world-leading research and innovation ecosystem. We also set out a future opportunity for a visionary approach with the development of a new cluster of innovation across Scotland and the North-East (page 13).

Recommendations: National, devolved and local governments must assess the potential of places for cluster development and take a calculated, and tailored risk in delivering strategic partnerships with charities, academia and industry – to empower research leaders to enact their vision. This must be accompanied by long-term investment so clusters are supported to the stage where they can be self-sufficient and sustain research and growth.

2 Proximity of diverse research-performing organisations at all stages of the research pipeline

Successful clusters are made up of diverse organisations that contribute to the research lifecycle – including universities, institutes, industry and clinical research settings – making up the knowledge base, talent pool, and research capacity of a cluster.[43]

Contributions of research performing organisations in clusters	
Universities[43]	Universities are often central features of research clusters as they: • Drive discovery and applied research, • Attract and train research talent to an area, • Are highly connected with their local economies as large employers and land owners, so act as connectors between other cluster organisations, start their own collaborations, and provide access to infrastructure, lab space and specialised facilities for other local research including industry.
Research institutes[44]	Institutes can act as anchor points that help drive the development of a cluster as they: • They are often high-performing and prestigious, drawing talent and investment to the UK and their location, • Have a mass of diverse expertise, knowledge, technology and equipment, with long-term core funding, that can drive specific scientific objectives, • Can connect basic with applied research, often through interdisciplinary working, which enables innovation, • Often have close ties to universities and industry, for example through partnerships.
Industry[43]	Presence of industry of all scales in a cluster can fast-track translation of basic research: • Small- and medium-sized enterprises can take forward cutting-edge technologies and innovations. These can be supported by incubators and shared lab spaces in a cluster. • Spinouts from universities, often supported by university tech transfer offices, may stay in the local environment to benefit from access to support and talent. • Presence of major industry is important to enable large scale development of innovations and treatments.
Clinical settings	Proximity to clinical settings is of particular importance for health clusters, to complete the pipeline of research as they: • Provide easy local access to a clinical trials environment, • Enable access to patient data and samples for research, • Enable patient involvement in research.

Diversity of fields and organisation types promotes innovation within a cluster, but broad specialisations, such as life sciences, can increase the likelihood of organisations working together for shared goals and exchanging relevant skills, knowledge and approaches.

Clustering is more likely in areas that have strong foundations for research. Clusters often grow around an anchor point in an area, such as a well-established research-intensive university, clinical research settings or historical industry. For example, the MedTech cluster in the East Midlands has developed from pharmaceutical companies that were based in the region.[43]

Well-established, prestigious and sustainably funded universities draw investment and talent into areas (from across UK and internationally) that a cluster can then take advantage of. But successful clusters can also be developed from smaller universities through focused actions like tailored infrastructure, resources or training programmes that are relevant to the cluster.[43]

Evidence shows that SMEs prioritise co-locating with hospitals as this enables collaboration with clinical researchers, more opportunity for clinical trials and better adoption of innovations.[45]

Case studies: The case studies of Cancer Research UK's investments in Cambridge (page 9) and Manchester (page 12) demonstrate how proximity of research organisations enables collaboration and connection of different stages of the research pipeline, to accelerate developments for cancer.

Recommendations: National, devolved and local government should work together to coordinate local research leaders and industry to encourage a critical mass of research-performing organisations in an area. They should leverage private and philanthropic investment and establish partnerships to maximise outcomes of investment and drive collaboration.

3 Opportunities to create connection and collaboration to spark innovation and accelerate research pipelines

While the colocation of research organisations and a strong knowledge base is crucial to the research output of a cluster, the supplementary positive effects come from the flow of ideas and people within the region.[43]

Networks in a cluster enable the sharing of knowledge, connection between research organisations and coordination of activities to find more effective solutions to problems, creating opportunities for collaboration and innovation. For life sciences, this means connecting discovery, translational and clinical research to accelerate pipelines.

Cluster connections can be supported by establishing organisations to convene and support research organisations, oversee cluster strategy, foster shared identity and create networks for collaboration.[43]

Partnerships between public, charitable and private organisations within a cluster can facilitate collaboration and boost research capacity, including through co-funding of research projects or infrastructure.

The culture of a cluster also impacts the likelihood of collaboration and knowledge sharing. Clusters are most successful when there is a culture of creativity, collaboration, knowledge exchange, openness and healthy competition that are critical for innovation.[43]

While proximity promotes research on a local level, a critical mass can also be reached across a distance through established networks and partnerships. We have seen this in the case study on biomarker development in Manchester, where the Cancer Research UK Lung Cancer Centre of Excellence – a network between researchers in Manchester and London – identified new applications for the discovery (page 12). The recent partnership to connect the innovation ecosystems of Greater Manchester and Cambridge is a further example of how collaboration across sites can help capitalise on respective strengths to maximise research and inclusive growth.[46]

Case studies: The case studies of Cancer Research UK's investments in Cambridge (page 9) and Manchester (page 12) demonstrate how proximity of research organisations facilitates collaboration and connection of different stages of the research pipeline, to accelerate developments for cancer.

Recommendations: Local and national governments should enable collaboration by supporting networks, partnerships and cluster organisations that can take a cluster from co-located research organisations to a connected ecosystem that is greater than the sum of its parts. This will deliver better outcomes for patients by ensuring the interactions and spillovers that enable discovery research can be translated through clinical trials and into practice.

4 Access to finance, research infrastructure and talent

Access to investment for all stages of research is crucial in enabling research organisations to establish and grow. At a location-agnostic level, this means access to response mode funding, industry investment and a financially sustainable university sector.

Specific investment in cluster development can take the form of major infrastructure investment, or local access to venture capital funding for SMEs. Diversity in funding sources, including public, private and charitable, is vital for the sustainability of a cluster, and to ensure the success of all stages of research pipelines and translation.

For industry, sources of finance are particularly important to plug gaps in the funding landscape, including the 'valley of death' between early-stage public and later-stage venture capital investment, and for scale up companies. CRUK's innovation engine, Cancer Research Horizons, provides these functions and on a local level it delivers support by joining up with university tech transfer offices, for example the Manchester Innovation Factory.

A cluster must contain sufficient laboratory and office space, with specialised facilities and technological, data and digital infrastructure. Laboratory space is a limiting factor for expansion of UK research capacity, both in academia and industry, particularly in places like Cambridge.[47] The expansion of facilities such as incubators, to give access to spin-outs and startups to physical lab and office spaces in which to develop their businesses is vital.[43]

Major infrastructure investments to create world-leading facilities can propel cluster development by acting as an attractant and anchor point. The Francis Crick Institute case study (page 6) demonstrates how major infrastructure investment can spark the transformation of an area. Additionally, the Diamond Light Source is the UK's national synchrotron science facility, located at the Harwell Campus in Oxfordshire. This was an existing research cluster, but the location of Diamond has been shown to have a positive impact on research publications within a local radius – both due to direct effects of having greater access to the synchrotron but also through indirect impacts of knowledge spillovers from the concentration of researchers that the facility has attracted.[48]

Clusters must be able to attract and retain skilled people to carry out research, take leadership roles, and enabling knowledge exchange.[43] People act as vectors for ideas in a cluster by instigating collaborations between organisations, or moving between them. They are also the enablers for entrepreneurship in the cluster ecosystem, developing ideas and forming spin-out companies which can go on to bring innovations to patients.

Universities train highly skilled talent, and the presence of both universities and industry can attract and retain talent in a region, which builds the scientific capabilities and reputation of a cluster. Universities can also run specific training programmes in partnership with industry to meet the needs of the area.[43] Attracting world-leading talent to the UK is also vital for our clusters to compete on a global scale, but the high costs and barriers of the UK immigration system currently limit our ability to do so.[49,50]

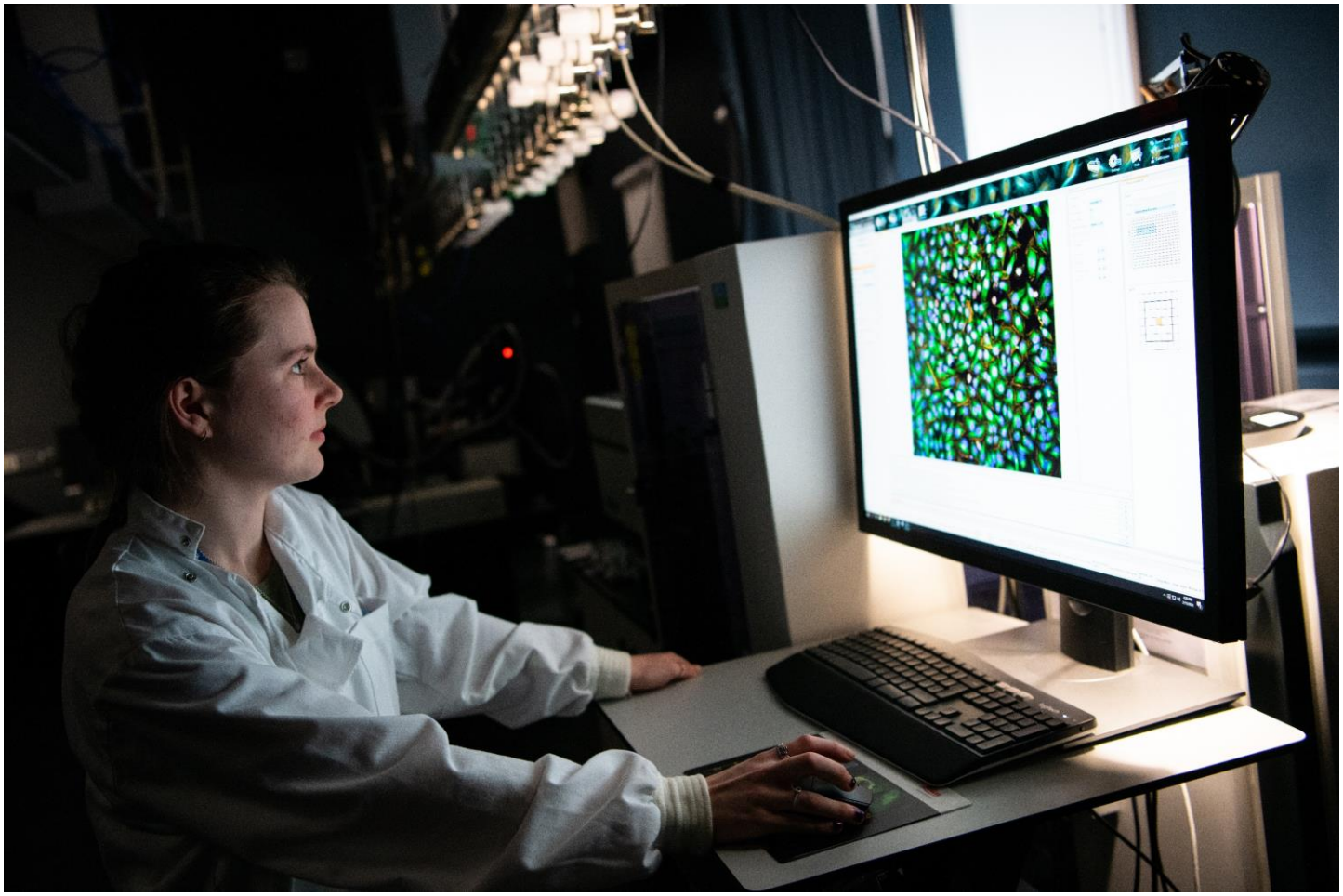
Case studies: The case studies of Cancer Research UK's investments in London (page 6), Cambridge (page 9) and Manchester (page 12) show examples of how major investment, diversity of research investment and access to talent are vital to cluster success.

Recommendations:

To enable the growth and development of UK research clusters, governments should preserve and strengthen the availability of diverse sources of R&D investment at all stages of research pipeline at a UK-wide and local level.

National, devolved and local governments must drive forward strategic major infrastructure investment to catalyse cluster development and enable capacity to increase laboratory space, including through innovative partnership models with major private and charitable investors and research funders.

The UK Government should support availability of talent on a national level, through support for domestic pipelines and access to an international pool of talent, in particular by reducing high immigration costs. Alongside this, devolved and local governments should support initiatives for clusters to provide training, retain graduates and attract new talent to their area.



5 Attractive local environment

For a cluster to be successful, the local environment needs to be able to attract and retain talented individuals, from across the UK and internationally, and diverse research organisations including industry.

Factors that impact the attractiveness and capacity for expansion of an area can limit the development of clusters even if the ingredients are present for excellent research, including public services like housing and transport. While a university might attract talent to an area, it can be difficult to retain graduates in a region due to salaries, quality of life, and diversity of future employment options, particularly in smaller cities and more rural areas.[51] It is vital that governments identify where these issues might be holding back the development of a cluster, and take action, so that research leaders can take forward visions for world-leading clusters.

Local leadership can also contribute to attracting relevant and specialised talent and businesses into the region. For example, Greater Manchester Combined Authority have initiatives such as MIDAS (the Manchester inward investment promotion agency) to encourage businesses into the region, particularly for life sciences, by demonstrating strength of existing facilities, expertise that would benefit the company (e.g. graduates, strong clinical trials environment), other success stories of major life sciences companies moving into the region and high connectivity and lower costs compared to London and the South East.[52]

Case studies: The case studies of the London Knowledge Quarter (page 6) and Cambridge (page 9) show how transport connectivity and a liveable local environment are central to a cluster being able to attract talent.

Recommendations: Governments must consider how effectively a local environment can host a major research site and assess where improvements in public services, transport, housing and the broader local environment would help attract and retain talent and research organisations in an area. Coordination is needed to ensure that local government have the levers and funding to do so, either from a national level or devolved to them to deliver.

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Acknowledgements

Cancer Research UK: Alex Pemberton, James Pegge, Brooke Lumicisi, Nick Jones, Frances Downey, Frederico Cardoso and Megan Zaman.

The Francis Crick Institute: Stephen Mayhew.

Cancer Research Horizons: Nathalie Dhomen.

About Cancer Research UK

We're the world's leading cancer charity dedicated to saving and improving lives through research. We fund research into the prevention, detection and treatment of more than 200 types of cancer through the work of over 4,000 scientists, doctors and nurses. In the last 50 years, we've helped double cancer survival in the UK and our research has played a role in around half of the world's essential cancer drugs. Our vision is a world where everybody lives longer, better lives, free from the fear of cancer.

Our values

Our values help guide our behaviour and culture in an ever-changing world, building on the best of what we do today and what we aspire to be in the future. They unite and inspire us to achieve our ambitious plans and our mission of beating cancer, together.

Our values are:

Bold
Act with ambition, courage and determination

Credible
Act with rigour and professionalism

Human
Act to have a positive impact on people

Together
Act inclusively and collaboratively

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