Appendix 4

# Life Science Strategy for the Cambridgeshire and Peterborough Combined Authority

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# 1. Introduction

Life sciences in the UK has gone from strength to strength over recent years. Against challenging headwinds, UK life sciences firms posted revenues of more than £80 billion in 2019. More than a quarter of a million scientists and other professionals are now employed in the sector. The publication of the Life Sciences Industrial Strategy in 2017, and the subsequent Sector Deal, has unlocked billions of pounds of funding for research, data and other innovation to further strengthen the sector. Scientists in the UK are working at the forefront of research across all areas of healthcare – including the critically important task of developing a vaccine for COVID-19.

The Cambridgeshire and Peterborough Combined Authority, as the home of one the world's foremost clusters for life sciences research and innovation, plays a key role in the UK's life sciences ecosystem. Initiatives undertaken by the UK government to support the life sciences sector will have a strong focus on the Combined Authority area. Likewise, efforts by the Combined Authority will reverberate around the country and play critical role in bolstering the UK's competitive position internationally.

This report sets out a programme of recommendations to grow the life sciences sector. It follows from the publication of the Combined Authority's own Local Industrial Strategy, which identified life sciences (along with agri-tech, digital and information technologies, and advanced manufacturing and materials) as a strategic growth sector.

It is important to recognise that in recommending policies for the Combined Authority, the area is home to currently the most mature centre of life sciences outside the United States. However, the growth in its cluster is already being significantly outpaced by that of the cluster in Oxford, which is expanding at a compound annual growth rate of 14-15%, compared to Cambridge's 5-6%. This threatens to eclipse Cambridge as the UKs centre and contest the future opportunity to become the global centre. Unless bold steps are taken to remove the current constraints on growth in the Cambridge cluster, the threat to its UK dominance will grow over the next decade, potentially, leading to an outflow of major companies and employment to Oxford in the following decade. In particular, there are transport, skills and planning constraints that hold back growth of the Cambridge cluster in ways that do not exist or are less prevalent for the Oxford cluster.

We have therefore focused our recommendations on a handful of impactful areas that could mitigate the risks presented by the growth in mass and dominance of the Oxford cluster and move the Cambridge cluster to the next level in contesting the position for the premiere global cluster. We have done this rather than suggesting multiple minor improvements to an already successful model.

We have also avoided focusing on the role of the NHS and local hospitals. While undoubtedly there is huge potential for greater integration between the world-class hospitals in the area and the life sciences sector, the opportunity has been highlighted in life science strategies for decades and it has proven extremely difficult to progress. Moreover, we are aware that Cambridge University Health Partners (CUHP) is also developing a life science strategy, which will no doubt approach the challenge from its particular perspective. CUHP's level of insight and access to information in this area means it is far better positioned to address this particular aspect of the sector.

Our conclusions and proposals are drawn from many interviews with leaders in industry, academia and the public sector, as well as an extensive review of existing literature and data. We believe these recommendations provide a considered and evidence-led set of proposals that will

help to safeguard the clusters future and make Cambridge an *even* more successful cluster going forward.

# 2. Executive Summary

As the novel coronavirus first began to spread in March 2020, the life sciences sector was thrust into public attention due the efforts of governments, universities and companies in the sector to develop a vaccine. While the profile of the life sciences sector was undoubtedly growing before the pandemic, the essential work done by scientists and other professionals in the sector rarely received the recognition and support that their peers in the technology, financial services or automotive sectors did. This strategy, therefore, comes at a critical time during which there is widespread agreement in the UK that more should be done to bolster the life sciences sector – both for the benefit the nation's public health, but also to support the longer-term economic ambitions of the UK as we move through the pandemic.

The Cambridgeshire and Peterborough Combined Authority will have a pivotal role in this. As the home of one of the world's preeminent centres for life sciences, national efforts to support and grow the sector will undoubtedly be felt in and around the Combined Authority area. This report provides a programme of recommendations that will best direct such efforts, as well as providing practical measures that can be implemented by the Combined Authority itself.

### The Global life Sciences Sector

Unlike many other sectors of the economy, the outlook for the life sciences sector is broadly positive. Notwithstanding the immediate impact of the Covid-19 pandemic, long term macro-economic and demographic trends, such as the ageing of the world's population and the growth of the consumer class in many emerging markets, are creating new opportunities for life sciences firms. According to estimates from Accenture, the sector is expected to reach more than $2 trillion in gross value by 2023.[1]

While the outlook for the industry is positive however, companies within it are currently navigating a period of transformation. The onward march of emerging technologies, particularly artificial intelligence (AI), is reshaping processes such as drug discovery, diagnostics and the design of clinical trials. The financial challenges of developing new medicines are intensifying as the costs of research rises while the revenues derived from new treatments falls. For the large pharmaceutical companies, the expected return on investment for a new drug has fallen from 10.1% in 2010 to just 1.8% in 2019.[2]

The competitive landscape for life sciences firms is also becoming more complex and nuanced. New entrants from the technology sector are making inroads into life sciences, while greater flows of venture and private funding into life sciences start-ups and SMEs is creating a buoyant ecosystem of young firms pursuing novel forms of treatments and capable of competing with larger incumbents. Participants in the sector are consequently finding new ways to collaborate and to compete, as well as expanding their stock of technical and digital talent.

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[1] Transforming healthcare with AI: The impact on the workforce and organizations, McKinsey. https://www.mckinsey.com/industries/healthcare-systems-and-services/our-insights/transforming-healthcare-with-ai

[2] Ten Years On: Measuring the Return from Pharmaceutical Innovation 2019. https://www2.deloitte.com/content/dam/Deloitte/uk/Documents/life-sciences-health-care/deloitte-uk-ten-years-on-measuring-return-on-pharma-innovation-report-2019.pdf

Lessons could also be learned from the development of the life sciences sector in the US where, 20 years ago, the San Francisco Bay area was undoubtedly the world's leading life science cluster. However, its crown was stolen by Boston, through a combination of large scale public sector interventions and corporate decision-making. It is possible that Cambridge today equates to San Francisco in the 1990's and Oxford is Boston.

**Life Sciences in the UK**

The UK is home to one of the world's most mature and productive life sciences sectors. There are more than 6,000 life sciences firms based in the UK, which collectively generate annual revenues of around £80 billion. More than a quarter of a million scientists and other professionals are also employed in the sector.

Life sciences in the UK benefits from the country's world-leading research landscape and science base. Four of the world's top 20 universities are located in the UK. The proportion of students enrolled at UK universities studying programmes in natural sciences, mathematics and statistics is approximately double the proportion in the United States, France and Italy. Moreover, the UK government spends more on health research and development than any other European nation[3] - a competitive strength that will be bolstered by the recent government commitment to boost overall R&D spending to 2.4% of GDP by 2027.

The preeminent centres for life sciences within the UK are the areas in and around Cambridge, London and Oxford – often referred to as the 'golden triangle.' These areas represent one of the foremost centres for innovation and research, encompassing world leading universities, a highly skilled workforce and a broad base of companies across both the life sciences and high-tech sectors. There are around 1,500 life sciences firms within the golden triangle, which collectively generate a Gross Value Added worth more than £8.4 billion per annum to the UK economy.[4] Beyond the golden triangle, other centres for life sciences are located across the UK. The sector is particularly strong in the North West of England, where firms such as AstraZeneca and Unilever still have a major presence; and along the Edinburgh-Glasgow corridor, which is home to several global firms including Thermo-Fisher.

**Cambridgeshire and Peterborough: A world-class Life Sciences Cluster**

This strategy has been written with the objective of identifying tangible proposals that will help enhance and grow the Combined Authority's life sciences sector. This is no simple task because, as is repeatedly made evident throughout this report, the Combined Authority is already home to arguably the most successful life science cluster outside of the United States. The University of Cambridge, the preeminent higher education provider in the Combined Authority, is consistently rated as one of the best universities in the world. It produces some of the most impactful research

[3] Life Science Competitiveness Indicators, Office for Life Sciences. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/811347/life-sciences-competitiveness-data-2019.pdf

[4] Cambridge: Driving Growth in Life Sciences, AstraZeneca. https://www.astrazeneca.com/content/dam/az/media-centre-docs/article_files/articles-2018/Astrazeneca-Clusters-Report-Exec-Summary%20FINAL%202.pdf

in life sciences: More than a fifth of Cambridge University's academic publications in the field of biomedical and health sciences are in the top decile of number of citations.[5] The area's research institutes, such as the Wellcome Sanger Institute, are revered internationally. The Cambridge Biomedical Campus is the largest medical research and health sciences centre in Europe, and is home to three excellent hospitals.

There are around 470 life science companies based in the Combined Authority, which is currently just under 8% of those in the UK as a whole. These include currently global behemoths like AstraZeneca, Amgen, Pfizer and GSK. Local champions like Abcam and Bicycle Therapeutics have grown from fledgling start-ups to recognised global brands in recent years. These and other firms based in and around Cambridge itself are estimated to contribute £2.9 billion annually to the UK economy[6] Making up around 3.6% of the UK sector's economic contribution, and demonstrating the clusters reliance and potential vulnerability on very large players and their future mobility. Many of these companies are commercialising research in areas at the cutting edge of advances in medicine and technology – including cell and gene therapy, immuno-oncology and AI. They're also attracting record levels of investment: Between 2015 and 2020, $950 million of venture funding was invested into life science start-ups and scale-ups around Cambridge – more than Dublin, Berlin and Barcelona combined.[7]

However, in the same period the Oxford cluster attracted $990 million, and in 2020 life science companies in the Oxford cluster attracted double the investment of those in the Cambridge cluster.

**Why does the Combined Authority need a Life Sciences Strategy?**

Cambridge and especially South Cambs is evidently already home to a world-leading life sciences cluster – something that has been achieved without a public sector coordinated strategy. Why, it might reasonably be asked, does the CPCA need a strategy now?

While Cambridge is without question one of the world's most advanced centres for life sciences, this report shows that the local sector faces a number of headwinds. Other centres within the UK – particularly London and Oxford – are rapidly developing their own local ecosystems of a size and sophistication that could easily eclipse that of Cambridge and South Cambs. MSD's recent decision to build its new £1bn research hub in London's King's Cross shows Cambridge is no longer the de facto location of choice for global life science firms – even for those that are setting up specialist research and development facilities.

Advances in technology are transforming all stages of healthcare. This presents an enormous opportunity for new firms in the Combined Authority, as Cambridge is home to some of the sharpest minds in the technology sector, as well as a large community of global firms. However, technological progress also carries the threat of creative destruction that has the potential to upend slower-moving firms and industry incumbents. Furthermore, the Cambridge cluster's

[5] CWTS Liden Ranking 2020, https://www.leidenranking.com/downloads
[6] Cambridge: Driving Growth in Life Sciences, AstraZeneca and Development Economics. https://www.astrazeneca.com/content/dam/az/media-centre-docs/article_files/articles-2018/Astrazeneca-Clusters-Report-Exec-Summary%20FINAL%202.pdf
[7] JLL analysis of data from CrunchBase. https://www.crunchbase.com/

predominance of very large firms acts as both an advantage in attracting smaller innovators around them, but also a disadvantage, in the way in which such firms tend to be mobile and attracted to centres where the greatest innovation is happening and growth in skills and activity is fastest.

As with other sectors, the Combined Authority's life sciences companies are also adjusting to a new operational reality – both due to the coronavirus pandemic, and because Britain is preparing to take up a new position on the international stage independent of the European Union. At the time of writing, the longer-term outlook for firms in the UK is fraught with uncertainty.

In addition, life sciences within the Combined Authority is now reaching a size and maturity at which the existing informal social infrastructure and ad hoc approaches to supporting the sector will no longer be effective. Throughout our interviews with those working across the sector, a common comment was that the Cambridge ecosystem is 'like a village'. These comments were not intended as a slight on the area's impressive credentials, but they're not a flattering description for an innovation centre that should be aiming to enhance its competitive position via-a-vis the likes of London, Oxford, Boston, San Francisco and Beijing.

**Recommendations**

This report makes 11 recommendations to the Combined Authority, based around three themes: Building companies of scale; optimising the network; and enhancing talent and skills. Undoubtedly, the second and third themes also support the first but have been separated here for ease.

The report suggests alignment and contribution to the National Life Sciences Strategy, in particular adopting the goal of delivering two of the Strategy's proposed four £20B life science companies in the next decade. This is without doubt an incredibly ambitious target but it offers a simple way to attain focus and galvanise efforts in the right direction and even partially achieving it would result in a step-change in the scale of the life science sector in the area.

| Theme | Description | Recommendations to address |
|---|---|---|
| **Building the Financial and Management Capacity for Growth** | Cambridge and South Cambs are home to a world-leading community of start-up and scale-up firms, but very few home-grown global companies. To better support the life sciences ecosystem, the Combined Authority must prioritise policies that help firms to scale, rather than simply be acquired early in their life cycle and subsumed into a parent company. | Establish a new £1 billion Life Sciences Innovation Fund. |
| | | Lead on the drive to improve UK public equity markets for life sciences companies |
| | | |
| | | Create a "Future Leaders Programme" to build commercial management skills of the sector |
| | | Support the development of a culture that aspires to scale |
| **Building Network Capacity for Growth** | While the Combined Authority is home to a fantastic network of firms, entrepreneurs, scientists and advocacy | Develop a coordinating body for the strategic initiatives and appoint a "Life Sciences Strategy Director" to drive |

| | | |
|---|---|---|
| | groups, local efforts by these networks to promote and enhance the sector are often uncoordinated and overlapping – making them less effective. Policies should be adopted that help coordinate these efforts. | the implementation of these initiatives. |
| | | Support the establishment of a single agency to promote Cambridge around the UK and internationally |
| | | Leverage the Ox-Cam Arc, the UK Innovation Corridor (linking King's Cross to Cambridge) and the Golden Triangle |
| **Building Talent & Skills Capacity for Growth** | Realising the anticipated growth of the life sciences sector is dependent on addressing the dual challenges of both supplying enough scientists and other professionals to the sector, and also ensuring that these individuals are equipped with the right mix of skills. Policies should be adopted to address both challenges – encouraging greater uptake of life-science related subjects at all levels of education, creating new routes into life sciences employment, and upskilling workers in emerging tech-enabled roles. | Create new technical education programmes to support skills required by life sciences firms |
| | | Support for alternative routes into life sciences employment |
| | | Create new programmes to upskill in the tech- life science convergence |
| | | Improve the diversity and inclusion of the sector |
| **Building Physical Capacity for Growth** | Ensuring future provision is made for facilities for scale-ups, start-ups and inward investing companies is dependent on a transformation in planners' appetite and openness to growth in the sector. Given the established dominance of South Cambs (240 vs 150 firms), the more accessible property and rental prices, and the longer term and more difficult to resolve constraints to the expansion sites in Cambridge city around transport and space availability, much greater, and more coordinated, effort between the Combined Authority and both Cambridge City Council plus South Cambs District Council should be undertaken to expand out the existing South Cambs and Cambridge sites. However, this should be in a manner that minimises environmental and spatial impacts, by maximising the use of each sites' assets as laid out in the recommendations and in descending priority. | *Implementing* life science employment growth within site areas currently consented for new buildings but stalled |
| | | *Densifying* life science employment within site areas currently consented for new building but with the potential to be utilised more effectively |
| | | *Intensifying* life science employment within current buildings, by encouraging and incentivising firms from other sectors to relocate to alternative parks, freeing up space for life science firms and creating dedicated, and networked, life science villages |
| | | *Expanding* life science employment through new planning applications within current sites' established employment areas |
| | | *Expanding* life science employment through new planning applications adjacent to current sites' established employment areas |

There are many initiatives that we could propose to enhance the Combined Authority's life sciences ecosystem. However, in writing this report we have intentionally focused on a handful of impactful areas that could move the industry to the next level on the global stage, rather than suggesting multiple minor improvements to an already successful model.

It is our hope that this report provides the Combined Authority with an actionable and pragmatic programme of measures to ensure the continued success of life sciences in Cambridgeshire and Peterborough over the next decade and beyond.

**Defining Life Sciences**

The life sciences industry encompasses a broad range of disciplines, technologies and businesses.

Pharmaceutical and biotechnology companies utilise an understanding of biological processes to develop new treatments for diseases and disorders. These can include traditional small-molecule drugs (aspirin for example), immunobiological therapies using antibodies or, more recently, moderating the body's own immune response to fight cancer. These products have long development times of 15 years or more, require substantial investment and have a high failure rate, but a successful product could earn many $billions in annual sales.

Diagnostics is another rapid growth area, especially in the field of personalised medicine, in which sub sets of patients are identified for treatments based on their DNA or biomarker signature. This benefits from new data sources and techniques, such as the genome project.

The medical technology field is similarly wide, covering surgical tools and implants to healthcare equipment. Development of medical devices tends to require shorter timeframes and less capital than therapeutic products. The risk is often lower, but the rewards may be also reduced.

# 3. Life Sciences in the UK

The UK is home to one of the strongest, most productive life sciences industries in the world. There are more than 6,000 life sciences firms spread across the UK. The sector generates an annual turnover of more than £80 billion and directly employs more than a quarter of a million scientists and other professionals.[8]

Many of the sector's firms are pioneering the research and commercialisation of disruptive technologies such as genomics, synthetic biology and artificial intelligence. Unlike some other parts of the UK economy, the life science sector is also extremely productive. Each worker in the sector generates an average Gross Value Added (GVA) of £104,000 per year – more than twice the UK average.[9] Further background on the UK life science sector can be found in Appendix 2. This section will focus on comparing Cambridge in the UK and global context.

## 3.1 Comparing Key Centres for Life Sciences within the US, Europe & Asia

While the UK and many of the countries discussed above are home to an excellent infrastructure for life sciences firms, much of the activity within these economies tends to be concentrated in a small number of cities or clusters that house a strong base of commercial operations, universities, research institutions and hospitals.

To gauge of the sophistication the key UK centres, we have undertaken a comparison of the relative size and maturity of the clusters in the UK with those of the United States and continental Europe. We have undertaken the comparisons with the US and Europe separately, owing to the differences in the quality and depth of data available across the two geographies.

Owing to a lack of available data, we have been unable to undertake a cluster comparison for the markets of Asia. We have, however, included a brief discussion of the maturity of life sciences across the Asia Pacific region.

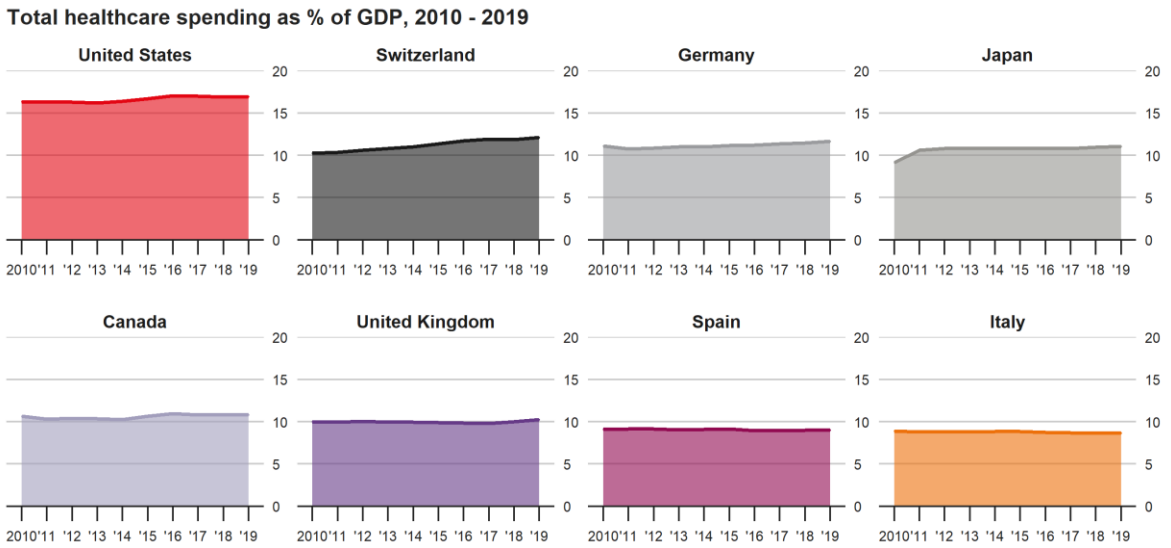
### 3.1.1 Comparing UK and US centres

The United States is home to the world's largest and most mature life sciences sector. This is due to several factors, including the country's large population, the depth of its capital markets, the quality of its top universities and its high spend on healthcare. Spending on healthcare in the US is equivalent to around 17% of the country's GDP– far more than any other country, and nearly twice the average across the OECD.[10]

[8] Bioscience and Health Technology sector statistics, Office for Life Sciences. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/910590/Bioscience_and_Health_Technology_Statistics_2019.pdf

[9] Life Sciences 2030 Skills Strategy, Science Industry Partnership. https://www.scienceindustrypartnership.com/media/2071/sip-life-sciences-2030-skills-strategy-print-version-final.pdf

[10] Organisation for Economic Co-operation and Development Health Statistics, available to download here: https://www.oecd.org/health/health-data.htm




JLL produces an annual scoring and ranking of the key life sciences centres in the United States. This analysis is based on calculating a weighted average of a number of metrics, including the size and concentration of life sciences employment; the number and concentration of firms; and the volume of private and public funding.[11] To provide an indication of how the key UK centres compare to those in the US, we have extended this analysis by integrating the three largest centres in the UK: London, Cambridgeshire and Oxfordshire. The results are shown in the table below.

The results loosely demonstrate the comparative scale and maturity of the life sciences ecosystem within each cluster. Boston and San Francisco, with both large and highly sophisticated life sciences infrastructure, are rated as the leading centres globally. While large metropolitan areas such as New York and London are home thousands of life sciences companies, they perform less well in the rankings due to lower concentration of life sciences firms, employment and investment in the context of their diversified local economies.

**Overall Life Sciences Cluster Rating (100 = max)**

| Rank | Cluster | Score |
|---|---|---|
| 1 | Greater Boston Area | 77 |
| 2 | San Francisco Bay Area | 67 |
| 3 | San Diego Metro Area | 62 |
| **4** | **Cambridgeshire** | **61** |
| 5 | Raleigh-Durham Metro Area | 60 |
| **6** | **Oxfordshire** | **48** |
| 7 | Suburban Maryland/Metro DC | 46 |
| 8 | Philadelphia Metro Area | 42 |
| 9 | Denver Metro Area | 42 |
| 10 | New Jersey | 41 |
| 11 | Los Angeles/Orange County | 40 |
| 12 | Seattle Metro Area | 40 |
| 13 | Minneapolis - St. Paul Metro Area | 37 |

[11] The data and weightings applied to this data can be found in Appendix 4 of this report.

| | | |
|---|---|---|
| 14 | Chicago Metro Area | 35 |
| 15 | Houston | 34 |
| **16** | **London** | **32** |
| 17 | New York City | 32 |
| 18 | Long Island | 21 |
| 19 | Westchester County | 18 |

The composite scores shown above are designed to identify locations that have a high concentration of both employment and established enterprises as a proportion of the total local economy, as well as those locations where these indicators have grown over the last five years. On this basis Cambridgeshire performs well, although the trends indicate the gap between it and Oxfordshire is narrowing, due to faster growth rates in the latter.

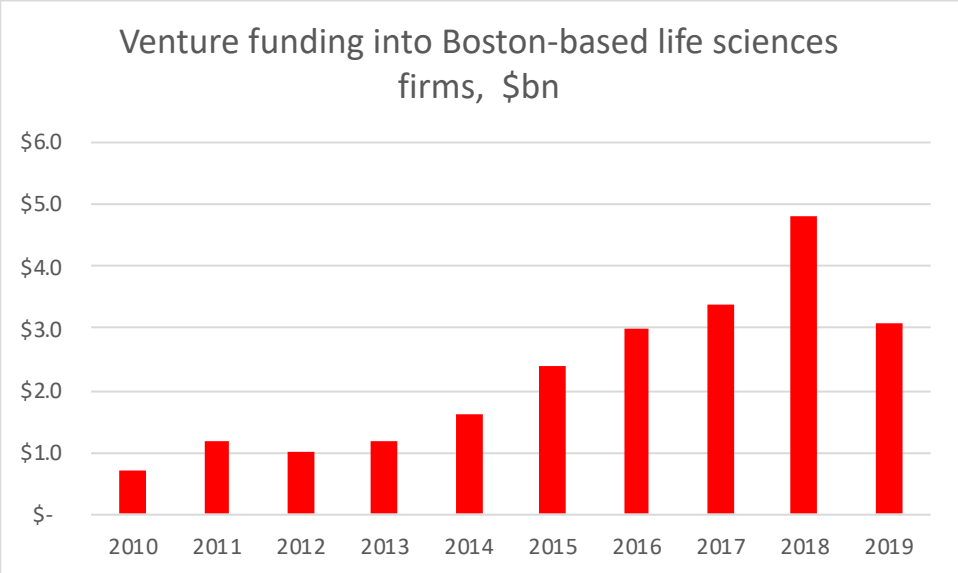
Cambridgeshire performs less favourably compared to the top US clusters in the measures of absolute size. Total venture and UK Research and Innovation funding into Cambridge, for instance, totalled $612 million combined in 2018. By comparison, total VC funding and National Institute of Health funding into Boston was $5.4 billion and $2.4 billion respectively – roughly 13 times more total funding than Cambridgeshire. However, although the Cambridgeshire figures are a fraction of those in Boston, Cambridgeshire still attracts almost a quarter of all UK life science VC funding and around 6% of UKRI funding. It is worth noting that Oxfordshire outperforms Cambridgeshire on both metrics and London receives nearly three times as much UKRI funding.

**Concentration of Venture and Public Funding into Life Sciences Centres**

| Cluster | % Total LS VC Funding in sector nationally | % Total NIH/UKRI Funding nationally |
|---|---|---|
| Chicago Metro Area | 1.8% | 2.8% |
| Denver Metro Area | 1.7% | 1.4% |
| Greater Boston Area | 27.7% | 8.7% |
| Los Angeles/Orange County | 0.9% | 4.6% |
| Minneapolis - St. Paul Metro Area | 1.2% | 1.1% |
| New Jersey | 2.5% | 0.8% |
| New York City | 3.3% | 7.0% |
| Philadelphia Metro Area | 1.8% | 3.6% |
| Raleigh-Durham Metro Area | 1.9% | 2.1% |
| San Diego Metro Area | 12.1% | 3.3% |
| San Francisco Bay Area | 28.5% | 3.7% |
| Seattle Metro Area | 1.2% | 3.3% |
| Suburban Maryland/Metro DC | 2.8% | 2.2% |
| **Cambridgeshire** | **23.1%** | **5.8%** |
| **Oxfordshire** | **24.7%** | **8.1%** |
| **London** | **23.7%** | **16.5%** |

It should be noted, however, that the American centres are many times more populous than both Cambridgeshire and Oxfordshire - Cambridgeshire has a population of around 650,000 people, while Greater Boston's population is around 4.9 million. Comparing life sciences venture investment per thousand people, for instance, Cambridgeshire attracts around half as much venture investment per capita as Greater Boston and San Francisco, and is comparable to San Diageo.

It should be further recognised, that the amount of venture capital investment in Massachusetts in 2010 was approximately $700 million[12] - much more comparable to current levels of investment in Cambridge, UK. While investment in life science companies in Cambridge, UK is unlikely to ever match the levels in Boston, the massive growth in the level of investment into life sciences companies in Boston today compared to 10 years ago demonstrates what can be achieved.




Source: CrunchBase, 2020.

It should be noted that over the period above, and substantially due to the shift in investment towards Boston, San Francisco has been overtaken as the leading US cluster. Based on recent trends, a similar threat is posed by Oxford in relation to the Cambridge cluster.

### 3.1.2 Comparing UK and other European Centres

With a population of more than 500 million and annual pharmaceutical expenditures of $145 billion, Europe is a highly mature life sciences market. The region's five largest economies – the UK, Germany, France, Italy and Spain – account for a combined share of around 20% of the global branded pharmaceutical market, second only to North America.[13]

[12] Industry Snapshot, MassBio. https://www.massbio.org/industry-snapshot/
[13] Site Selection for Life Sciences Companies in Europe, KPMG. https://home.kpmg/be/en/home/insights/2019/05/site-selection-for-life-sciences-companies.html

Due to different standards of data availability and quality across Europe, the method used to compare clusters within Europe is different from that used for the above American comparison. For this exercise we have collected data on the number and total volume of venture capital investments into life sciences firms since 2015; the number of international patent registrations; the number of universities within the top 500 globally, both overall and for life sciences in particular; and the number of high-quality research publications published by universities within each cluster across 35 European cities.

Consistent with the comparison of Cambridgeshire and Oxfordshire and their American peers, these areas are defined to catch all activities within their county areas, while all other clusters are defined (due to data availability) at the Nomenclature of Territorial Units for Statistics (NUTS) 2 area they fall within, excluding London which includes all of Greater London. A full appendix on the methodology and data sources is provided at the end of this report.

On the basis of this analysis, the relative maturity of the UK clusters is immediately apparent. London, Oxfordshire and Cambridgeshire ranked first, fourth and fifth respectively in terms of venture investment between 2015 and 2020. Cambridgeshire alone saw $950 million of venture funding into life sciences firms across this period – more than Dublin, Berlin and Barcelona combined. This is even more impressive when Cambridgeshire's relatively small population is considered – adjusting for population, Cambridgeshire has attracted more than ten times the amount of investment per 1,000 people than Paris.

The impact of the research publications of top 500 universities within London, Oxfordshire and Cambridge, as well as the other UK centres, is similarly notable. CWTS Leiden Ranking provides data on the number of university research publications that are among the top 10% most cited in different disciplines. More than a fifth of Oxfordshire's and Cambridgeshire's research publications within biomedical and health sciences are within this top decile – more than any other cluster in our study. Moreover, all of the top five (and seven of the top 10) best performing clusters for this metric are in the UK.

**Key life sciences metrics for European centres**

| | Venture capital investment, 2015 - 2020 | | Top universities | | High quality publications, 2015-2018 | | International patent registrations, 2016 - 2019 |
|---|---|---|---|---|---|---|---|
| | Investment, $bn | # deals | # Top 500 | # Top 250 | # Papers | % Papers | # Patents |
| London | 1.94 | 272 | 13 | 6 | 3,800 | 18% | 4,200 |
| Paris | 1.37 | 144 | 9 | 6 | 1,320 | 14% | 14,500 |
| Geneva | 1.19 | 91 | 3 | 3 | 870 | 14% | 2,500 |
| Oxford | 0.99 | 73 | 1 | 1 | 1,310 | 21% | 1,400 |
| Cambridge | 0.95 | 92 | 2 | 1 | 990 | 21% | 1,600 |
| Basel | 0.68 | 43 | 1 | 1 | 460 | 15% | 4,000 |
| Dublin | 0.47 | 50 | 4 | 3 | 430 | 13% | 1,400 |
| Zurich | 0.36 | 77 | 2 | 2 | 930 | 14% | 1,400 |
| Stockholm | 0.33 | 42 | 3 | 3 | 1,090 | 13% | 5,600 |
| Lyon | 0.30 | 27 | 3 | 1 | 60 | 12% | 2,100 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Copenhagen | 0.27 | 43 | 3 | 3 | 1,000 | 12% | 2,300 |
| Munich | 0.25 | 39 | 2 | 2 | 880 | 13% | 11,100 |
| Utrecht | 0.23 | 9 | 1 | 1 | 810 | 15% | 300 |
| Berlin | 0.23 | 61 | 4 | 4 | 580 | 11% | 1,300 |
| Barcelona | 0.21 | 56 | 3 | 3 | 580 | 12% | 1,100 |
| Heidelberg | 0.17 | 15 | 3 | 3 | 630 | 11% | 1,700 |
| Rotterdam | 0.16 | 21 | 3 | 3 | 1,400 | 14% | 2,700 |
| Brussels | 0.12 | 9 | 2 | 2 | 310 | 13% | 700 |
| Manchester | 0.08 | 24 | 1 | 1 | 640 | 16% | 400 |
| Stuttgart | 0.08 | 3 | 2 | 1 | 40 | 9% | 8,300 |
| Madrid | 0.07 | 13 | 1 | 0 | 240 | 10% | 800 |
| Milan | 0.07 | 16 | 5 | 1 | 700 | 10% | 2,800 |
| Edinburgh | 0.07 | 18 | 5 | 3 | 820 | 16% | 600 |
| Strasbourg | 0.07 | 11 | 1 | 0 | 190 | 11% | 300 |
| Amsterdam | 0.06 | 29 | 2 | 2 | 1,440 | 15% | 1,100 |
| Cologne | 0.06 | 12 | 3 | 3 | 660 | 11% | 2,200 |
| Malmo | 0.06 | 29 | 1 | 1 | 440 | 11% | 1,100 |
| Birmingham | 0.04 | 10 | 2 | 2 | 570 | 15% | 800 |
| Leeds | 0.04 | 6 | 1 | 1 | 270 | 14% | 300 |
| Gothenburg | 0.04 | 14 | 2 | 1 | 430 | 12% | 1,400 |
| Antwerp | 0.04 | 4 | 1 | 1 | 170 | 12% | 700 |
| Hamburg | 0.03 | 15 | 1 | 1 | 340 | 11% | 800 |
| Bristol | 0.02 | 14 | 2 | 1 | 430 | 15% | 900 |
| Dusseldorf | 0.02 | 6 | 1 | 1 | 170 | 11% | 4,000 |
| Frankfurt | 0.01 | 8 | 2 | 0 | 260 | 10% | 2,900 |

Where the UK's centres perform less favourably is in international patent applications, with the UK's best performing city, London, ranking 6th – behind Paris, Munich, Stuttgart and Stockholm. Oxfordshire and Cambridgeshire achieve only middling status, while many of the UK regional cities are positioned towards the bottom of the table.

### 3.1.3 Life Sciences in Asia

The Asia Pacific (APAC) region is also home to a flourishing life sciences sector, most notably in China, Japan, Sound Korea and Singapore. The region accounts for around 30% of global pharmaceutical spending.[14] Healthcare expenditure in APAC is also forecast to reach to $2.4 trillion by 2022 – and is growing at a faster rate than in the US or Europe.[15]

The lack of available data at a city or regional level across the APAC region means we have not undertaken a comparison between clusters in the UK and those within the Asia Pacific. However, it should be noted that many high-quality centres in China are emerging, bolstered by strong support from the government. China, which is already by some estimates the world's second

[14] Expanding into Asia-Pacific: Life Science Opportunities and Strategies for Success, LEK. https://www.lek.com/sites/default/files/insights/pdf-attachments/Expanding-into-Asia-Pacific-v2.pdf
[15] Expanding into Asia-Pacific: Life Science Opportunities and Strategies for Success, LEK. https://www.lek.com/sites/default/files/insights/pdf-attachments/Expanding-into-Asia-Pacific-v2.pdf

largest pharmaceutical market, has identified life sciences as an industry key the country's future growth. The Chinese government has also recently committed to investing huge sums to support cutting edge areas of medicine – including a $9 billion investment commitment to precision medicines over the next decade.[16]

Similarly, the Japanese life sciences sector has received special support and investment from the government. Recent initiatives have included targets to grow stem cell treatments into a ¥26 trillion ($249bn) sector by the end of 2020 by creating one of the world's fastest approval processes. Japan also created six National Strategic Special Zones – regions that offer eased regulations and tax benefits – encourage the creation of new drugs and medical devices.[17]

## 3.2 The Geography of UK Life Sciences

As is evident from the above comparisons, the preeminent centre for life sciences in the UK are the areas in and around London, Cambridge and Oxford – often referred to as the 'Golden Triangle'. These areas collectively represent one of the world's foremost knowledge-intensive clusters, encompassing world-leading universities and research institutes, a highly skilled workforce and a broad base of companies across both the life sciences and high-tech sectors. Five of the world's top ranked universities for life sciences are located within the golden triangle: The University of Cambridge, the University of Oxford, UCL, Imperial and Kings College.[18] The cluster supports more than 1,500 life sciences firms, which collectively generate a Gross Value Added worth more than £8.4 billion per annum to the UK economy.[19] Some of the world's largest research institutes also lie within the golden triangle – including the Sanger Centre, the Francis Crick Institute and the Harwell Campus.

Building on this thriving ecosystem's strengths in science, technology and innovation is a major component of the UK government's Industrial Strategy, both to support growth across the wider nation and to sustain the UK's international competitiveness. This has led to increasing focus on the Oxford-Cambridge Arc – the corridor of land that covers the counties of Oxfordshire, Buckinghamshire, Northamptonshire, Bedfordshire and Cambridgeshire. The Arc is home to almost four million people and has been estimated to contribute £111 billion annually to the UK economy. By 2050, the area has the potential to contribute around £191.5 billion annually, primarily due its strengths in science, technology and high-value manufacturing.[20]

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[16] Expanding into Asia-Pacific: Life Science Opportunities and Strategies for Success, LEK. https://www.lek.com/sites/default/files/insights/pdf-attachments/Expanding-into-Asia-Pacific-v2.pdf

[17] How Japan is Creating New Opportunities for Life Sciences Companies, Harvard Business Review. https://hbr.org/sponsored/2018/02/how-japan-is-creating-new-opportunities-for-life-sciences-companies

[18] World University Rankings, Times Higher Education. https://www.timeshighereducation.com/world-university-rankings/2020/subject-ranking/life-sciences#!/page/0/length/25/sort_by/rank/sort_order/asc/cols/stats

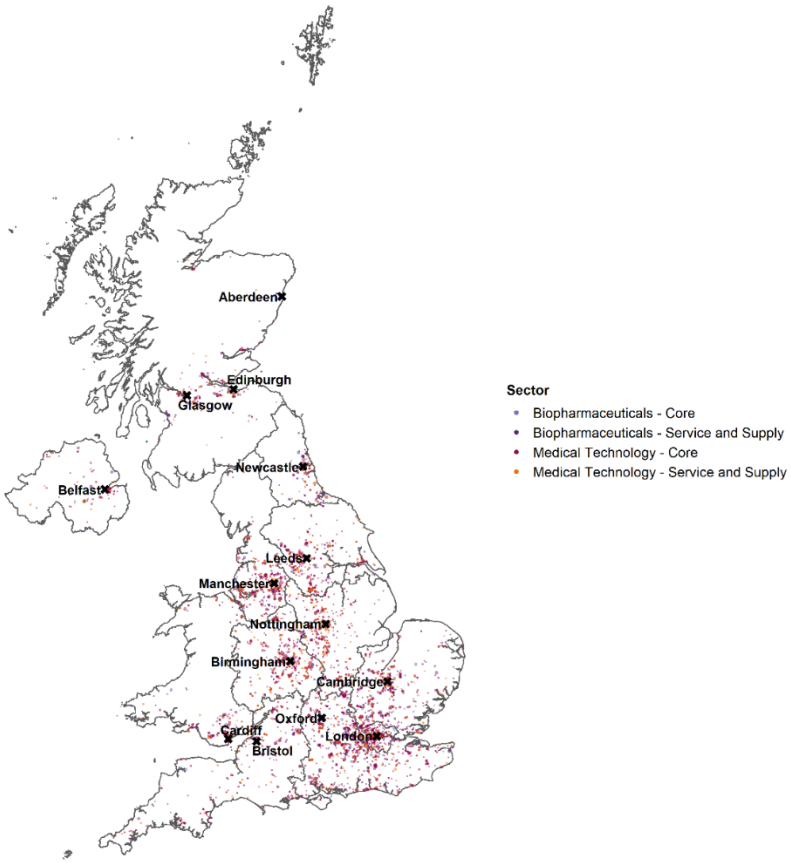
[19] Cambridge: Driving Growth in Life Sciences, AstraZeneca. https://www.astrazeneca.com/content/dam/az/media-centre-docs/article_files/articles-2018/Astrazeneca-Clusters-Report-Exec-Summary%20FINAL%202.pdf

[20] Cambridgeshire and Peterborough Local Industrial Strategy, Cambridgeshire and Peterborough Combined Authority. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/818886/Cambridge_SINGLE_PAGE.pdf

Beyond the Oxford-Cambridge Arc, there is also another major corridor of life sciences activity running from Cambridge to King's Cross, incorporating Stevenage in the middle. Stevenage is home to an excellent infrastructure for life sciences research and commercialisation, based around the Bioscience Catalyst, which was developed by GSK, the Wellcome Foundation and the UK government. The site, which is adjacent to a GSK R&D facility, comprises dedicated space for early stage ventures and scale-ups, and is home to the government-backed Cell and Gene Therapy Manufacturing Catapult. Firms based on the Bioscience Catalyst have raised more than £1.6 billion since the centre opened its doors in 2012.[21] The spreading south of the sector from Cambridge, the emergence of King's Cross as a global life science hub and the success of the Stevenage development, has the potential to create a cluster of global scale in the 46 miles between the two nodes. Indeed, the UK Innovation Corridor (linking King's Cross to Cambridge) has the potential to be more significant than the Ox-Cam arc, given the existing good transport infrastructure and the "in-fill" of activity along the length of the Corridor. It should be noted that the distance between San Francisco and San Jose (the two ends of "Silicon Valley") is 40 miles.

**Location of life sciences firms in the UK**

Source: Office for Life Sciences, 2020.




While in London the life sciences sector is comparatively less mature than in Cambridge and Oxford, it has grown rapidly over the last few years. Indeed, in the decade up to 2018, life sciences

[21] Stevenage Bioscience Catalyst, https://www.stevenagecatalyst.com/

employment in the capital has risen by about a quarter.[22] King's Cross, due to its excellent transport connections and the presence of the Crick Institute, the London Bioscience Innovation Centre and UCL, has emerged as the epicentre of the capital's life sciences sector. Global firms including GSK have recently set up operations in the cluster. In August 2020, Merck announced plans to build a £1bn HQ opposite King's Cross station. The 270,000 sq. ft. site will be the company's first set of labs outside the US that carry out early-stage research to discover new medicines, and is expected to house 800 people when it opens in 2025.[23] New commercial office, research facilities and laboratory space aimed at life sciences firms are also being developed in the area, including the proposed British Library extension. The scheme will deliver 600,000 sq ft of commercial space adjacent to the Francis Crick Institute, as well as housing the Alan Turing Institute (the national centre for data science research).[24]

Other centres are also emerging across other parts of the capital. White City, where Imperial University is developing a 23-acre campus focused on scientific research and entrepreneurship, has recently seen Autolus, Synthace and Novartis relocate to the burgeoning West London cluster. Developments on London's Southbank, including Royal Street, the London Institute of Healthcare Engineering and the King's Health Partners masterplan, have the potential to create a new cluster stretching from Waterloo to London Bridge.

Beyond the Golden Triangle, activity in the life sciences sector is spread broadly across the UK, often aligned with the main life science university locations. The sector is strong in the North West of England, with companies such as AstraZeneca still having a major presence as well as Unilever. The North is also home to a combination of both large med-tech companies such as Smith and Nephew and FUJIFILM, as well as a host of small companies in innovative digital and med-tech sectors. Leeds supports 200 med-tech companies and, with Sheffield, has a strong presence in orthopaedic med-tech. Reckitt Benckiser and Smith and Nephew have major production facility for over-the-counter products in Hull and are both major UK exporters. Small and mid-sized med-tech companies form a cluster in the Midlands, while the Edinburgh-Glasgow corridor is home to several global firms such as Thermo-Fisher. South Wales has a burgeoning med-tech cluster and is home to multiple CROs, while Northern Ireland excels in diagnostics.[25] Growing these regional centres is likely to emerge as a key part of the government's 'levelling up' agenda, given that life sciences is a growing sector of international significance. The challenge for both government and the leading life science centres will be to ensure that "levelling up" is not done so at the expense of further building on the country's existing strengths. Those existing centres of excellence will need to be prepared to "fight their corner" over the coming years to ensure they do not suffer relative to other global centres.

[22] Knowledge Networks: London and the Ox-Cam Arc, NLA. https://nla.london/insights/knowledge-networks-london-and-the-ox-cam-arc

[23] Merck Plans to Build £1bn UK research hub in Central London, Financial Times. https://www.ft.com/content/c96e79e1-ec9b-49db-9c32-a1fc789f1c3a

[24] British Library Plans a £500m extension, Financial Times. https://www.ft.com/content/83e7b358-1eae-11e7-b7d3-163f5a7f229c

[25] Life Science Industrial Strategy, Office for Life Sciences. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/650447/LifeSciencesIndustrialStrategy_acc2.pdf

## 3.3 UK Life Sciences Industrial Strategy

The strength of the life sciences sector in the UK is in part the result of many successive industrial strategies, including the foundation of Celltech in 1980 by Prime Minister Margaret Thatcher, the creation of R&D tax credits by the Labour Government in 2000, and the current Government's commitment to 'make the UK the leading global hub for life sciences.'[26]

In August 2017, Sir John Bell, of the University of Oxford, submitted to the government the Life Sciences Industrial Strategy. The document outlined an extensive programme of ambitious recommendations to government to support the UK's life sciences sector, including the creation of the Health Advance Research Programme (HARP), to undertake large infrastructure projects and so-called 'moonshot' programmes; the creation four UK companies with a market capitalisation of more than £20 billion in the next decade; attracting ten investments in manufacturing facilities of up to £250 million each; increasing by half the number of clinical trials in the UK; and attracting 2,000 new discovery scientists into the UK; and making the UK one of the world's fastest adopters of new medicines.[27] The Life Sciences Industrial Strategy was followed by the Sector Deal, which was backed by 25 global companies, and provides a multi-billion pounds funding pot for research, health data and other innovation.[28] It will be important over the next few years that Cambridge is able to fight hard to secure some of the significant initiatives that will be forthcoming as a result of the increased funding and focus on the sector.

### 3.3.1 Life Science Industrial Strategy Update

Substantial progress has been made on the recommendations of the UK industrial strategy since its publication. The NHS has committed to supporting the best value new treatments and technologies through the Accelerated Access Collaborative (AAC) and new Long-Term Plan. The AAC, an umbrella organisation for health innovation, is supporting a host of proven innovations that have a potential benefit to up to 500,000 patients. The AAC has also agreed coordination plans to support the adoption of cutting-edge techniques in advanced therapy medicinal products, tumour-agnostic therapies, and the use of AI in diagnostics and screening.

To better support efforts by UK companies to scale, investment programmes have been created to improve access to capital. In October 2019, the government announced a dedicated £600m life sciences scale-up investment fund was to be established through the British Business Bank although there is no evidence this has yet formally launched and the amount, while welcomed by the industry, is insufficient to make a significant difference if distributed across the UK. Alongside the scale-up fund announcement, the government has also expanded its investments in promising life sciences firms via British Patient Capital – a £2.5 billion government fund to increase the amount of long-term funding available to British firms. In July 2020, the body invested $65 million

[26] Life Sciences: Catalysing Investment and Growth, UK Bioindustry Association. https://www.bioindustry.org/uploads/assets/uploaded/cf63473a-0e6e-491f-827250457cc39aed.pdf
[27] Life Science Industrial Strategy, Office for Life Sciences. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/650447/LifeSciencesIndustrialStrategy_acc2.pdf
[28] Future of UK Life Sciences, Economist Intelligence Unit. http://www.eiu.com/graphics/marketing/pdf/Future-of-UK-Life-Sciences-EIU.pdf

to a fund managed by SV Health Investors, which will invest in companies working in precision medicines.[29]

The UK has also launched a renewed Life Sciences Opportunity Zone (LSOZ) offer, through which the government will support science parks in attracting investment, with Cambridge BioMedical Campus named as one of the LSOZ.[30] Policies to incentivise investment into the sector have also been sharpened, including tax relief support for schemes such as Enterprise Investment Schemes and Venture Capital Trusts. The Financial Conduct Authority is working with large pension funds to enable investment into high-growth companies, including those in the life sciences sector.

Improving access to healthcare data was identified as a key component of the life sciences industrial strategy. Considerable efforts have subsequently been undertaken to improve the UK's stock of medical data. The UK Health Data Research Alliance has been founded to facilitate common processes for accessing data between NHS digital, NHS England, Public Health England, Genomics England, UK Biobank and a number of hospital trusts. NHS Digital, NHSX and partners are also establishing a new approach for the utilisation of GP Data for planning and research, and enabling secure linkage of this to other key datasets such as hospital data.

Better management and linking of data will enable applications of AI, an area in which considerable progress has been made. A national Artificial Intelligence Lab was established in 2019 to support the development and deployment of AI solutions. The lab is part of NHSX and bring together the sector's leading academics, specialist and technology firms to work on applications of AI in healthcare, including earlier cancer detection, new dementia treatments and more personalised care. Supporting these efforts are programmes to ensure the UK has the necessary technical and statistical skills to effectively utilise AI: A national programme launched last year will provide £200 million to fund 1,000 PhDs in AI.[31] Health Education England has also created a Digital Fellowships in Healthcare to support NHS organisations in upskilling clinical staff in specialist digital skills.[32]

Investments have also been made to enhance the UK's capabilities in genomic healthcare. In September 2019, a consortium of life sciences companies, The Welcome Trust and the government collectively invested £200 million to deliver whole genome sequencing of the half a million participants of the UK's Biobank. The resulting data will enhance efforts to understand how genetics combine with lifestyle and environment to cause diseases.[33] The UK's largest ever health research programme, The Accelerated Detection of Disease programme, was also launched in

[29] British Patient Capital commits $65m to SV Health Investors, to invest in life-changing biotechnology companies, British Patient Capital. https://www.britishpatientcapital.co.uk/british-patient-capital-commits-65m-to-sv-health-investors-to-invest-in-life-changing-biotechnology-companies/
[30] UK Life Science Opportunity Zones announced, Pharma News https://pharmafield.co.uk/pharma_news/uk-life-science-opportunity-zones-announced/
[31] Government backs next generation of scientists to transform healthcare and tackle climate change, Gov UK. https://www.gov.uk/government/news/government-backs-next-generation-of-scientists-to-transform-healthcare-and-tackle-climate-change
[32] Topol, https://topol.hee.nhs.uk/digital-fellowships/
[33] UK Biobank leads the way in genetics research, UK Biobank. https://www.ukbiobank.ac.uk/2019/09/uk-biobank-leads-the-way-in-genetics-research-to-tackle-chronic-diseases/

2019. The programme will collect genomic and phenotypic data from 5 million volunteers, and make it available for researchers.

Considerable investments have also been made to build capabilities in the manufacture of advanced medicines. £146 million was committed to medicines manufacturing as part of the Life Sciences Sector Deal. New state of the art facilities are being created in the Medicines Manufacturing Innovation Centre in Glasgow and the Vaccines Manufacturing Innovation Centre in Harwell, near Oxford. Existing programmes in place through the Cell and Gene Therapy Catapult (CGTC) have also been bolstered by additional funding and enhanced capabilities. Manufacturing capacity at the CGTC manufacturing centre in Stevenage, a facility that enables companies to develop their manufacturing processes at scale, was doubled in September 2019 with the completion of extension works. In July 2020, the CGTC was granted a further £100 million by the government to establish a new manufacturing innovation centre in Braintree.[34]

## 3.4 The Impact of Brexit

At the time of writing, however, the UK-EU transitional agreement is poised to lapse at the end of 2020 with no post-Brexit trade deal currently agreed. While most pharmaceuticals are exempt from new tariff barriers, regulatory barriers could prove a substantial additional cost. The UK life sciences sector is highly dependent on exports to the European Union: In 2018, the EU accounted for almost half of UK pharmaceutical exports, according to the Office for National Statistics. There were already signs that Brexit uncertainty was impacting sales - total pharmaceutical exports to the EU fell by 19% in 2018 year-on-year.[35]

To mitigate further declines and help companies prepare for the changes ahead, the government has issued Brexit guidance for companies. For the typical pharmaceutical company, however, this amounts to around 80 separate documents. To mitigate the effects of a potential no deal Brexit, most companies have transferred marketing authorisations, rerouted logistics and built up stockpiles. In many cases this will have meant setting up new operations in mainland Europe.

If managed carefully, the UK Life Science Industrial Strategy explains that an EU exit may be used as a catalyst to take steps to speed the growth of the life sciences sector in the UK. Healthcare is a global business and Brexit may present an opportunity for the UK to expand and develop its global markets, as well as being a destination for inward investment that wishes to take advantage of world class science and infrastructure.[36]

However, to capitalise on this opportunity the UK will need to forge new trade links outside the EU. There are about 40 countries that have EU free-trade agreements (FTAs), economic partnership agreements (EPAs) or mutual recognition agreements (MRAs) in place. The UK will

[34] Positioning statement: CGT Catapult Manufacturing Innovation Centre, Catapult. https://ct.catapult.org.uk/news-media/general-news/positioning-statement-cgt-catapult-manufacturing-innovation-centre

[35] Future of UK Life Sciences, Economist Intelligence Unit. http://www.eiu.com/graphics/marketing/pdf/Future-of-UK-Life-Sciences-EIU.pdf

[36] Life Science Industrial Strategy, Office for Life Sciences. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/650447/LifeSciencesIndustrialStrategy_acc2.pdf

have to convince many of these countries to rollover existing agreements to post-Brexit Britain or sign new agreements. Additionally, the UK must strike entirely new deals from scratch with the US, China and India.

AstraZeneca has also warned that failure to secure domestic R&D funding to replace funding that had been expected from EU programmes could cost nearly 700 gross jobs and GVA worth £139 million p.a. in net terms by 2023. Additionally, failure by the UK to continue to attract and have access to the current share of the world's best R&D talent could result in the UK losing around 3,000 gross jobs and GVA worth £445 million per annum in net terms by 2023. It is important to recognise that these are some of the headwinds that the Cambridge life science sector faces.

# 4 Analysis of the Cambridgeshire and Peterborough Life Sciences Market

The Cambridgeshire and Peterborough Combined Authority is home to the UK's most mature life sciences market. According to the data from the Office for Life Sciences, there are around 470 firms based in the area. These firms employ around 20,000 scientists and other personnel.[37] The epicentre of this market is Cambridge and its immediate surrounding area – life sciences firms in and around Cambridge alone are estimated to contribute around £2.9 billion annually to the UK economy. By 2032, according to analysis from AstraZeneca and Development Economics, the cluster could generate an additional £1 billion per annum and create an additional 6,000 jobs.[38]

## 4.1 Life Sciences Corporate Landscape

Commercial life sciences operations are heavily concentrated across the South Cambridgeshire with the second largest cluster being in the city of Cambridge: Of the approximately 470 life sciences companies based in the Cambridgeshire and Peterborough Combined Authority area, Cambridge and South Cambridgeshire are home to around 390 of them. A further 70 firms are based across East Cambridgeshire and Huntingdonshire, while Peterborough is home to only around 10 firms.[39]

**Number of Life Sciences Firms by Local Authority Area**

| Local authority Area | Number of companies |
|---|---|
| South Cambridgeshire | 240 |
| Cambridge | 150 |
| Huntingdonshire | 40 |
| East Cambridgeshire | 30 |
| Peterborough | 10 |
| Fenland | 0 |

Source: Office for Life Sciences, figures are rounded to nearest 10 companies.

[37] Based on data from Office for National Statistics NOMIS. https://www.nomisweb.co.uk/
[38] Cambridge: Driving Growth in Life Sciences, AstraZeneca. https://www.astrazeneca.com/content/dam/az/media-centre-docs/article_files/articles-2018/Astrazeneca-Clusters-Report-Exec-Summary%20FINAL%202.pdf
[39] Based on data from the Office for Life Sciences. https://www.gov.uk/government/statistics/bioscience-and-health-technology-sector-statistics-2019

Many of global behemoths of the life science sector have a presence in the Cambridgeshire, including AstraZeneca, Amgen, Pfizer and GSK. The depth of the area's ecosystem, its world-leading research institutions, has drawn multinationals to set up or expand their operations in the cluster over recent years. AstraZeneca, which opted to relocate its global headquarters to Cambridge in 2013, is the most significant of these. AstraZeneca arrived in Cambridge through its acquisition of Cambridge Antibody Technology in 2006, which was subsequently merged with MedImmune, a later acquisition. The company's new headquarters on the Cambridge Biomedical Campus are set to open in 2021 and are expected to house 2,000 staff, many of whose roles were relocated from London and Alderley Park in Cheshire.[40]

Cambridgeshire has proven to be a generally supportive environment for the establishment and growth of new firms. Indeed, around two-thirds of all life sciences firms across Cambridgeshire were founded in the two decades to 2018.[41] As one key investor in the industry we interviewed for this report said, **'The reason I took up the role in Cambridge is that the quality of its early stage company base offers the opportunity for explosive growth.'** Local champion Abcam, founded in 1998, last year opened its £46 million headquarters on the Cambridge Biomedical Campus. The 100,000 sq. ft. laboratory and office facility houses over 450 Abcam staff, but has room to grow to accommodate more than 600.[42]

**% of life sciences in the Combined Authority by number of employees**

| Number of employees | % of firms |
|---|---|
| 0-4 | 46% |
| 5 – 9 | 16% |
| 10 - 19 | 10% |
| 20-49 | 14% |
| 50-99 | 6% |
| 100-249 | 6% |
| 250+ | 2% |
| Source: Office for Life Sciences | |

As discussed above, some of the most innovate and cutting-edge treatments and techniques within life sciences are being pioneered by the sector's start-up and scale-up firms. Each year, around 15 – 25 new life sciences firms are formed in Cambridgeshire, compared with 15 – 20 in Oxfordshire and 30 – 40 in London.[43]

[40] AstraZeneca's HQ budget balloons to 3 times original forecast, Fierce Biotech. https://www.fiercebiotech.com/biotech/astrazeneca-s-hq-budget-balloons-to-3-times-original-forecast

[41] Based on data from the Office for Life Sciences https://www.gov.uk/government/statistics/bioscience-and-health-technology-sector-statistics-2019

[42] Inside Abcam's new £46million headquarters on Cambridge Biomedical Campus, Cambridge Independent. https://www.cambridgeindependent.co.uk/business/inside-abcams-new-46million-headquarters-on-cambridge-biomedical-campus-9064030/

[43] Cambridge Life Sciences Market Update, JLL. https://www.jll.co.uk/content/dam/jll-com/documents/pdf/other/cambridge-life-sciences-market-overview.pdf

Providing a more conductive infrastructure to allow these firms to scale, as Abcam has, was one of the key themes to emerge during our interviews with experts from the local life sciences sector. Indeed, while Cambridge is home to many of the world's largest life sciences firms, these companies represent a relatively small share of the total number of firms across the Combined Authority. Almost three quarters of the firms across Cambridgeshire and Peterborough employ fewer than 20 people, and only around 8% employ more than 100 people.[44] The presence of larger firms plays a vital role in a successful life sciences cluster, as such firms are able to pull talent and their supply chain partners to relocate locally, as well as making private investment into critical commercial infrastructure, such as laboratories, more viable.

It should be noted that the issue of affordable housing and transport was often raised by interviewees. These conversations were not pursued as they are outside the remit of this report and indeed, the impact extends to all growing industries in the Cambridge area, not simply life sciences.

### 4.1.1 The Life Sciences – Technology Nexus

Life sciences firms in Cambridge also benefit from the cluster's world-leading capabilities in computer science, software engineering and artificial intelligence. **'Cambridge is uniquely positioned to take advantage of the merging of AI and life sciences- the question is how we make the most of that'**, said one leading industry figure during interview. Many of the breakout successes of Cambridge's life sciences ecosystem within the last few of years, including Healx and Congenica, have been working at the confluence of life sciences and these fields.

Firms working on applications of emerging technology in life sciences benefit from the presence of Cambridge University, which provides some of the sharpest minds and most impactful research in the industry; as well as the large community of global firms from across the broad spectrum of technology. Arm Holdings, the world's leading designer of processors for mobile devices, was founded in Cambridge in 1990. The company, along with its new parent Nvidia, announced in September 2020 it would be creating a new AI research centre in Cambridge to focus on applications of the technology in life sciences, autonomous vehicles and other fields.[45] Elsewhere, the likes of Apple, Microsoft, Amazon and Samsung have all recently made investments to expand their operations in the city.

While Peterborough is home to only a handful of life sciences firms, it does have a strong high-tech manufacturing base. Around one fifth of turnover from businesses in Peterborough, according to figures from the CBR, comes from high-tech manufacturing, with a further 6% coming from other manufacturing.[46] Large engineering firms, including Caterpillar, have engineering bases in the city. Prototype fabrications for the first MRI machines were built just outside Peterborough at Chatteris,

[44] Based on data from the Office for Life Sciences https://www.gov.uk/government/statistics/bioscience-and-health-technology-sector-statistics-2019
[45] NVIDIA and Arm to Create World-Class AI Research Center in Cambridge, NVIDIA. https://blogs.nvidia.com/blog/2020/09/13/arm-ai-research-center-cambridge-uk/
[46] Cambridge and Peterborough Independent Economic Review, CPIER, https://www.cpier.org.uk/final-report/

and Stainless Metalcraft continues to produce high-end scientific products such as cryostats - chambers that can maintain very low temperatures – on the Chatteris industrial estate.[47]

**4.1 Life Sciences Corporate Landscape – key points**

- Most life sciences activity is concentrated in Cambridge centre and to the south of the city.
- The distribution of firms in the Combined Authority skews small. There are relatively few firms that employ more than 100 people.
- The strengths in technology and life sciences are a real competitive advantage for the Combined Authority's life sciences ecosystem.

## 4.2 Funding

Access to capital is a critical component of any successful commercial cluster. This is especially the case in life sciences, given the large quantities of capital required to develop new medicines. Start-up and scale-up firms across Cambridgeshire have been supported by the large volumes of venture investments that have flowed into the area in recent years. Data from CrunchBase shows that more than $950 million of venture funding was invested into life sciences firms in Cambridge between 2015 and 2020. Compared with its peers in the golden triangle, moreover, venture investments into Cambridge-based firms tend to be larger – with a median round size of $6 million, compared with $3.9 million in Oxford and $1.3 million in London.[48] This is potentially due to the relative maturity of businesses in Cambridge. However, the $950 million of venture capital invested in Cambridge life sciences companies over the past five years pails into insignificance compared to around $17 billion raised by biopharma companies in Massachusetts over the same period.

A growing number of Cambridge-based funds have been established in the last few years to support local businesses. In June 2019, Cambridge-based Ahren announced it had raised £200 million ($254 million) to invest in science and technology firms. Ahren is backed by some of Cambridge's best-known scientists and engineers, and has received money from the likes of Unilever, Aviva and Sky.[49] The fund has so far invested in Cambridge-based life sciences firms Adrestia Therapeutics and Bicycle Therapeutics.[50] Elsewhere, the University of Cambridge's Cambridge Innovation Capital (CIC) raised an additional £150 million in March 2019 to invest in high-tech firms. CIC has backed many local life sciences companies, including Inivata, a spinout of Cancer Research UK's Cambridge laboratory; and CMR Surgical, a medical robotics company.[51]

[47] Cambridge and Peterborough Independent Economic Review, CPIER, https://www.cpier.org.uk/final-report/
[48] Based on data from CrunchBase. https://www.crunchbase.com/
[49] Scientists' $250m fund aims to keep start-ups in the UK, Financial Times. https://www.ft.com/content/d66a8d84-9748-11e9-8cfb-30c211dcd229
[50] Ahren, https://www.ahreninnovationcapital.com/companies
[51] Cambridge fund raises £150m in year's largest UK tech round, Financial Times. https://www.ft.com/content/27baa410-5245-11e9-b401-8d9ef1626294

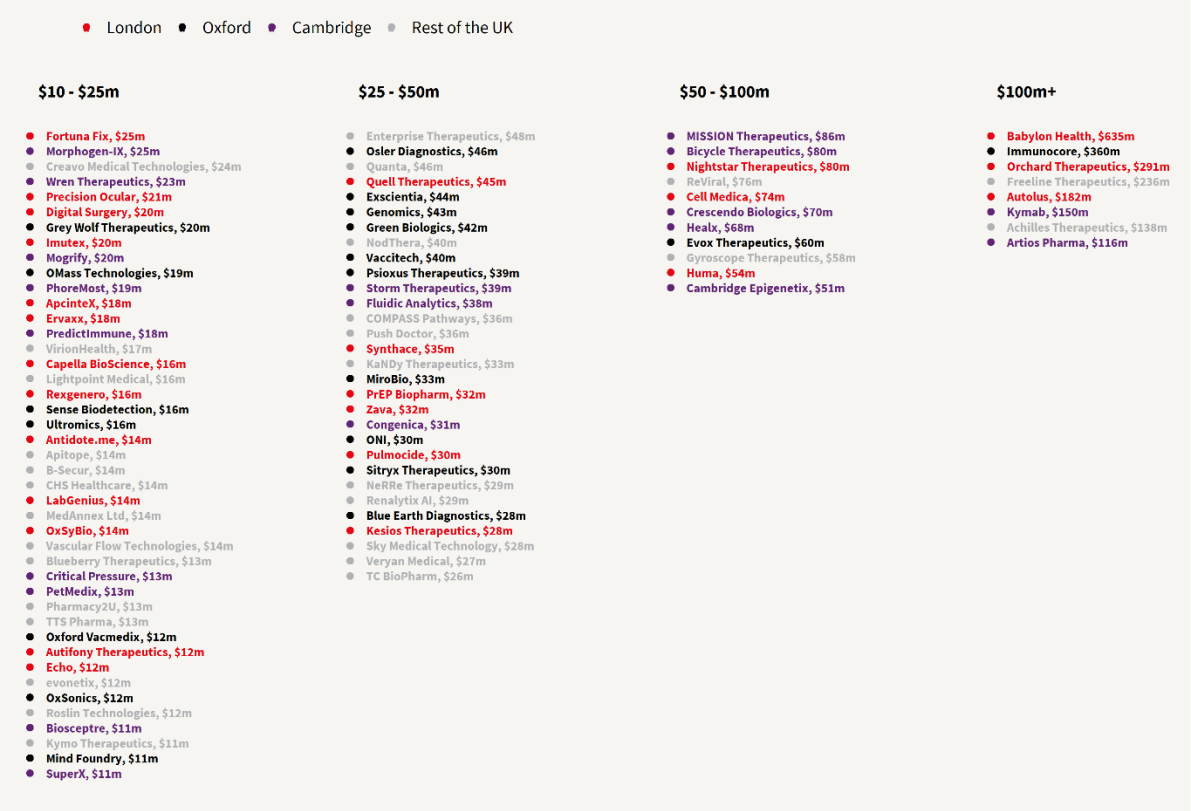
Aside from CIC, Cambridge Angels has supported start-ups and growing life science companies for many years.

The Combined Authority is also active in supporting early stage life sciences firms. It is one of several backers of Start Codon, a programme established in 2019 to provide life sciences firms with seed funding, mentoring and access to office and laboratory space. Start Codon recently raised £15 million to invest in life sciences start-ups, and is also backed by Genetech, Novartis and Cancer Research.[52]

Elsewhere, several Cambridge-based life sciences firms have established their own programmes to provide funding and growth opportunities to young enterprises. Illumina Accelerator, run out of the biotech company's labs in Granta Park, provides start-ups with seed investment and access to Illumina's sequencing systems and reagent.[53]

The general picture, confirmed repeatedly through interviews and surveys, is that early stage financing for life science companies in Cambridge is not in short supply.

**Total venture funding into life sciences firms in London, Oxford and Cambridge, 2015 - 2020**




But while the large volumes of venture investment into Cambridge have supported the area's vibrant ecosystem of private firms, Cambridge is home to relatively few publicly traded firms. We

[52] Start Cordon closes new £15 million venture fund to translate life science innovation into successful companies, Start Cordon. https://startcodon.co/ASSETS/UPLOADS/StartCodon_Press-Release_Fund-close-and-Novartis_161120.pdf

[53] Illumina Accelerator, https://www.illumina.com/science/accelerator.html

have identified just ten public life sciences firms headquartered in Cambridge, with a median market capitalisation of £186 million. Of these, only three went through an Initial Public Offering (IPO) in the last five years: Nuformix in December 2015; Acacia Pharma in March 2018; and Bicycle Therapeutics in May 2019. By comparison, Boston and its surrounding areas are home to more than 160 publicly-traded life sciences firms, around half of which have been through an IPO since 2015.[54]

The lack of public companies in Cambridge is in part because many of the breakout successes of the life sciences sector have been acquired before they were able to grow into large, independent global firms. Cambridge Antibody Technology, for instance, was sold to AstraZeneca even though it had developed a host of potential products that could have allowed it to become a major life sciences firm had it been able to navigate the capital-intensive tasks of late-stage development, manufacturing and commercialising these products.[55] Similarly, KuDOS Pharmaceuticals had developed a breakthrough treatment for breast and ovarian tumours that was undergoing clinical trials when the firm was acquired.[56] Most recently, Horizon Discovery announced its acquisition by PerkinElmer for £296 million, reducing further the number of independent publicly listed life science companies in the area.

In the 2017 UK Life Sciences Industrial Strategy, the authors stated an ambition that the UK should aim to create four life sciences firms with a market capitalisation of more than £20 billion this decade. The UK is currently home to only two such companies, AstraZeneca and GSK. Given that Cambridge is perhaps the UK's most advanced centre for life sciences, we could reasonably expect that the city and its surrounding area should be home to perhaps two of these four firms. However, leaving aside AstraZeneca, Cambridge's next two most valuable firms – Abcam and GW Pharmaceuticals – are collectively worth less than £5 billion.[57]

**Cambridgeshire-HQ'd publicly listed life sciences firms**

| Company name | Market cap (£m) |
|---|---:|
| AstraZeneca | 108,509 |
| Abcam | 2,636 |
| GW Pharmaceuticals | 2,346 |
| Bicycle Therapeutics | 281 |
| Acacia Pharma Group | 177 |
| Horizon Discovery Group | 146 |
| SDI Group | 61 |
| Sareum Holdings | 26 |
| Nuformix | 15 |
| Feedback | 12 |

[54] The data used here are from Refinitiv Eikon and refer to public companies in the healthcare sector.
[55] Life Science Industrial Strategy, Office for Life Sciences. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/650447/LifeSciencesIndustrialStrategy_acc2.pdf
[56] While this transaction occurred in 2005, it's noteworthy that the prohibitive costs of conducting the clinical trials were cited by the then CEO as a reason for selling the firm to AstraZeneca. https://www.theguardian.com/business/2005/dec/24/3
[57] Data from Refinitiv Eikon

Notes:
- Market cap at 07 October 2020.

Source: Refinitiv Eikon

Supporting firms in accessing public markets is key to the long-term growth of companies in the life sciences sector. This is not only because the public markets provide much deeper pools of capital than is usually seen with venture and other forms of private funding, but, more importantly, venture funds typically seek to exit their investments within 5-10 years – providing little patience for the long-term investments that building a business of significant global scale requires. Without strong local public markets, the scale of venture capital investment seen in Boston will not be achievable as investment model that enables large scale venture investments at good valuations struggles to work. Moreover, the public markets provide a key societal good in democratising access to firms and a route to sharing in their successes by allowing individuals (or their pension funds) to purchase shares.

**4.2 Funding – key points**

- While investment in Cambridge life science companies looks strong compared to other European clusters, it is just a fraction of that in Boston and arguably insufficient to reliably build globally significant businesses.
- The poorly developed public equity markets and paucity of IPOs is holding back development of the sector in the UK, and Cambridge in particular.

## 4.3 Employment and Skills

The UK Office for National Statistics publishes annual estimates of employment within different Standard Industrial Classicisation (SIC) categories. We have combined several of these categories into a definition of life sciences. On this basis, we estimate the total life sciences employment in Cambridgeshire and Peterborough amounts to around 20,000 people. The vast majority of this employment is concentrated in Cambridge and South Cambridgeshire, and comprises roles focused on research and development into biotechnology and natural sciences.

Furthermore, comparing the same figures for other life sciences centres in the UK, the Combined Authority performs extremely favourably: We estimate that life sciences employment in Cambridgeshire and Peterborough is around 60% larger than in Oxfordshire, and around four times larger than in either Greater Manchester or Edinburgh.

**Breakdown of life sciences employment in the combined authority**

| SIC code | Description | South Cam. | Cambridge | Peterborough | Huntingdonshire | East Cam. | Fenland | Total |
|---|---|---|---|---|---|---|---|---|
| 72110 | Research and experimental development on biotechnology | 1,000 | 350 | 0 | 45 | 10 | 0 | 1405 |
| 72190 | Other research and experimental | 11,000 | 4,500 | 125 | 225 | 200 | 10 | 16,060 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | development on natural sciences and engineering | | | | | | | |
| 21100 | Manufacture of basic pharmaceutical products | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 21200 | Manufacture of pharmaceutical preparations | 800 | 5 | 0 | 0 | 10 | 0 | 815 |
| 26600 | Manufacture of irradiation, electromedical and electrotherapeutic equipment | 100 | 30 | 0 | 0 | 0 | 0 | 130 |
| 32500 | Manufacture of medical and dental instruments and supplies | 150 | 75 | 45 | 100 | 10 | 0 | 380 |
| 46460 | Wholesale of pharmaceutical goods | 175 | 250 | 500 | 250 | 35 | 0 | 1210 |
| **All life sciences employment** | | **13,225** | **5,210** | **670** | **620** | **265** | **10** | **20,000** |
| Source: ONS Nomis, 2018 | | | | | | | | |

**Estimated life sciences employment by city**

| Location | Estimated life sciences employment |
|---|---|
| London | 30,000 |
| Cambridgeshire and Peterborough | 20,000 |
| Oxfordshire | 12,500 |
| Leeds | 6,100 |
| Greater Manchester | 5,400 |
| Edinburgh | 5,300 |
| Glasgow | 3,600 |
| Birmingham | 3,500 |
| Nottingham | 3,200 |
| Bristol | 1,700 |
| Cardiff | 1,400 |
| Newcastle | 800 |
| Aberdeen | 700 |
| Source: ONS Nomis, 2018 | |

### 4.3.1 The Skills and Talent Challenge

The positive growth prospects for the life sciences sector are set to create thousands of new jobs across the UK over the next decade. According to the Life Sciences 2030 Skills Strategy, the sector is likely to need 133,000 new roles across the UK to meet forecasted growth in demand and to

replace retirees by 2030. Around 90,000 of these jobs will be in the medical technology sector, with the remaining 43,000 in biopharmaceuticals.[58]

Filling these vacancies will not only be a challenge due to the numbers involved, but also because the skills requirements of the sector are evolving. A 2019 report by ABPI identified shortages of technical skills in immunology and genomics, areas of critical importance to the development of new medicines; as well as a shortage of technical skills, such as data science. There is likely to be a considerable shortfall in areas of interdisciplinary overlap between medical fields and data analytics, such as computational chemistry, chemometrics and chemoinformatics.[59]

While the Combined Authority is home to a large employment base and some of the world's most talented scientists, interviewees consistently mentioned skills shortages as an area of concern. In particular, retaining those working in bioinformatics and related fields is a challenge. As one interviewee working in this field said **'One of the issues we face is that data scientists and bioinformaticians are lured away to London by much bigger salaries. We can't compete on salary, but we simply aren't producing enough people with these skills to compensate'.**

It was also made clear to us in our interviews that skills shortages in the sector are not only related to scientific and technology fields, but also to more generalist skills in business management and entrepreneurship. As one industry leader commented, **'We need people with the commercial management skills to take companies to the next level, but these are few and far between. Buying them in is not the answer as they are just as rare, if not more so, in the rest of the UK'**. The shortage of commercial management skills was one of the most frequently commented-upon points.

### 4.3.2 The Combined Authority's Future Talent Pipeline

Much of the sector's future talent will still be enrolled in education programmes. Cambridge University, as the world's top-rated university in life sciences, is central to helping address the talent demands of the sector and shaping some of the sharpest minds, while Anglia Ruskin University is also a key player in addressing skills shortages.

The Higher Education Statistics Agency (HESA) provides data on undergraduates, postgraduates and other students enrolled in full time and part time programmes at UK higher education institutions. According to this data, there are currently 8,375 students enrolled in life science related programmes at the University of Cambridge in 2018 - 2019, compared with 8,065 in 2014 – 2015.[60] There are also an additional 10,965 students enrolled in these programmes at Anglia Ruskin University.

[58] Life Sciences 2030 Skills Strategy, Science Industry Partnership. https://www.scienceindustrypartnership.com/media/2071/sip-life-sciences-2030-skills-strategy-print-version-final.pdf

[59] Bridging the Skills Gap in the Biopharmaceutical Industry, ABPI. https://www.abpi.org.uk/media/6657/190124-final-abpi-bridging-the-gap-in-the-biopharmaceutical-industry_v3.pdf

[60] Programmes related to Life Sciences are subjects aligned to medicine, biological sciences, physical sciences, mathematics, computer science and engineering and technology.

It is important to recognise that many students enrolled in subjects suitable for life sciences employment will not enter the industry after graduating. Many who do enter the combined authority's life sciences sector will migrate from other parts of the UK (and beyond). However, ensuring that a large proportion of Cambridge's newly graduated talent opt to remain in Cambridge after completing their studies will be an important component of meeting the labour needs of the life sciences sector going forward.

According to several people we spoke to during our interviews, some of the most talented individuals leaving university are increasingly opting to relocate to London over remaining in Cambridge. Indeed, data from the UK Office for National Statistics shows that the combined authority experienced a net negative migration of those aged between 25 and 30 over the last three years, with around 1,450 more young people moving out of the area than moving in.

London boroughs, including Lambeth, Wandsworth, Tower Hamlets and Southwark, are among the top destinations for this outward migration.[61] Indeed, looking at net migration to London boroughs alone over the last three years – not taking into account the other parts of the UK where Cambridge experiences a net positive flow of young people – the combined authority experienced a net loss of around 1,750 people aged between 25 and 30.

**Migration into and out of the Combined Authority from other parts of the United Kingdom, 2017 – 2019 inclusive**

| Age | Moves to Combined Authority | Moves from Combined Authority | Net Internal Migration |
|---|---|---|---|
| 0-5 | 4,156 | 4,162 | -6 |
| 5–10 | 2,586 | 2,689 | -103 |
| 10–15 | 1,691 | 1,951 | -260 |
| 15-20 | 8,630 | 10,608 | -1,978 |
| 20-25 | 27,447 | 28,720 | -1,273 |
| 25-30 | 16,194 | 17,665 | -1,471 |
| 30-35 | 10,632 | 10,490 | 142 |
| 35-40 | 6,917 | 6,800 | 117 |
| 40-45 | 4,163 | 4,040 | 123 |
| 45-50 | 3,063 | 3,212 | -149 |
| 50-55 | 2,718 | 2,960 | -242 |
| 55-60 | 1,964 | 2,446 | -482 |

[61] Calculated from the Office for National Statistics Internal Migration Data: https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/migrationwithintheuk/datasets/internalmigrationbyoriginanddestinationlocalauthoritiessexandsingleyearofagedetailedestimatesdataset

| | | | |
|---|---|---|---|
| 60-65 | 1,415 | 1,785 | -370 |
| 65-70 | 1,033 | 1,342 | -309 |
| 70-75 | 754 | 874 | -120 |
| 75-80 | 406 | 388 | 18 |
| 80-85 | 287 | 303 | -16 |
| 85-90 | 166 | 163 | 3 |
| 90-95 | 90 | 111 | -21 |
| 95-100 | 25 | 25 | 0 |
| Source: Office for National Statistics | | | |

**Top 10 destinations for outward net domestic migration from the combined authority of 25 – 30-year olds, 2017 – 2019 inclusive**

| Local Authority area | Moves in | Moves out | Net migration |
|---|---|---|---|
| Lambeth | 235 | 509 | -274 |
| Wandsworth | 180 | 408 | -228 |
| Tower Hamlets | 215 | 440 | -225 |
| Southwark | 167 | 387 | -220 |
| Islington | 196 | 378 | -182 |
| Hackney | 94 | 259 | -165 |
| West Suffolk | 535 | 684 | -149 |
| South Kesteven | 353 | 461 | -108 |
| Camden | 231 | 332 | -101 |
| Westminster | 133 | 229 | -96 |
| Source: Office for National Statistics | | | |

**Top 10 destinations for inward net domestic migration from the combined authority of 25 – 30-year olds, 2017 – 2019 inclusive**

| Local Authority area | Moves in | Moves out | Net migration |
|---|---|---|---|
| Central Bedfordshire | 344 | 236 | 108 |
| Nottingham | 218 | 137 | 81 |
| North Hertfordshire | 399 | 320 | 79 |
| East Hertfordshire | 172 | 97 | 75 |
| Sheffield | 246 | 177 | 69 |
| Southampton | 123 | 56 | 67 |
| Stevenage | 127 | 65 | 62 |
| King's Lynn and West Norfolk | 568 | 509 | 59 |
| Welwyn Hatfield | 110 | 53 | 57 |

| | | | |
|---|---|---|---|
| Boston | 111 | 59 | 52 |
| Source: Office for National Statistics | | | |

**4.3 Employment and Skills – Key Points**

- There is a shortage of people with the technical skills to support the life science industry in the Cambridge area, especially in the convergence of AI and life sciences, seen as a key differentiator for the industry in the area
- There is a shortage of people with the commercial management skills required to grow a life science company

## 4.4 Universities

While the combined authority is home to several highly regarded universities and other higher education institutions, The University of Cambridge is a global leader. The University supports over 1,800 researchers and 18,000 students, and is rated by the 2020 Times Higher Education World University Ranking as the world's third best university.[62]

Cambridge University plays a vital role in supporting the strength of the life sciences sector across the combined authority (and beyond). A leader in the pharmaceutical industry noted **'We have multiple relationships with Cambridge University and have found the experience to be positive'.** This isn't limited to large companies- none of the people interviewed raised working with the universities as a particular challenge.

In addition to being the world's top-rated institution in the field of life sciences, many breakthrough discoveries that formed the foundation of the life science industry were made by the university's researchers – including the structure of DNA (alongside Maurice Wilkins of King's College, London); monoclonal antibodies; DNA sequencing; and phage display antibody production.

[62] World University Rankings 2020 by subject: life sciences, Times Higher Education.

Research publications produced by Cambridge University's academics across life sciences-related disciplines are some of the most impactful in the world. According to data from the CWTS Leiden Ranking, academics at the University of Cambridge produced more than 4,700 biomedical and health publications between 2015 and 2018. Just over a fifth of these papers were among the top 10% most cited in the field – the same proportion as the University of Oxford, the University of California and Harvard University.[63]

**Top 20 universities worldwide for quality of biomedical and health sciences research publications**

| University | Country | # Papers | # Papers in top decile most cited | Top decile most cited as % of all papers |
|---|---|---|---|---|
| Massachusetts Institute of Technology | United States | 2196 | 668 | 30% |
| University of California, Berkeley | United States | 2240 | 488 | 22% |
| University of Oxford | United Kingdom | 6151 | 1314 | 21% |
| **University of Cambridge** | **United Kingdom** | **4715** | **992** | **21%** |
| Harvard University | United States | 24791 | 5133 | 21% |
| Stanford University | United States | 8139 | 1621 | 20% |
| University of Colorado, Boulder | United States | 1027 | 199 | 19% |
| University of California, San Francisco | United States | 8892 | 1709 | 19% |
| Imperial College London | United Kingdom | 4947 | 937 | 19% |
| University College London | United Kingdom | 8073 | 1520 | 19% |
| University of California, San Diego | United States | 6564 | 1165 | 18% |
| Cornell University | United States | 6364 | 1118 | 18% |
| Columbia University | United States | 6965 | 1224 | 18% |
| Yale University | United States | 7231 | 1259 | 17% |
| University of Dundee | United Kingdom | 1114 | 194 | 17% |
| Queen Mary University of London | United Kingdom | 1733 | 302 | 17% |
| University of Glasgow | United Kingdom | 2118 | 368 | 17% |
| University of Texas Southwestern Medical Center at Dallas | United States | 4124 | 707 | 17% |
| Washington University in St. Louis | United States | 6366 | 1085 | 17% |
| London School of Hygiene & Tropical Medicine | United Kingdom | 1667 | 284 | 17% |

[63] CWTS Liden Ranking 2020, https://www.leidenranking.com/downloads

Source: CWTS Leiden. Based on % of publications in the top decile for number of citations between 2015 and 2018. Excludes institutions who published less than 1,000 papers.

The university's strengths at the cutting-edge of life sciences research are also bolstered by its credentials in adjacent fields of artificial intelligence and machine learning. Cambridge University is home to the Cambridge Centre of AI Medicine, which brings together some of most influential scientists across the both AI and medicine to research applications of emerging technology in precision medicine, biomedical discovery and the design of clinical trials.[64]

The university's academic strengths in teaching and research produces a stream of intellectual property and spin-out companies. Around 25 new spinout life sciences firms from the University of Cambridge were formed in between 2014 and 2018 – more than those spun from universities in Manchester, Leeds and Edinburgh combined. These companies have to date received around £334 million of venture investment.[65]

The University of Cambridge is also closely involved with the provision of laboratory and research space that enables spinouts and other life sciences firms to grow. Indeed, Cambridge Science Park, the UK's first science park, was founded by Cambridge's Trinity College in 1970 and modelled on similar initiatives undertaken by American universities to spur greater links between higher education and industry. The park has since grown to accommodate 130 firms, including life sciences firms Bayer, Novogene and Amgen.[66] Similarly, St John's college founded the St John's Innovation Centre in 1987 to provide space for fast-growing firms in the high-tech sector. The success of the original centre spurred the subsequent development of several adjacent buildings, and the park is now home to several life sciences firms, including ProductLife Group, Endomag and Coalesce. The college announced plans in July 2020 to develop two new buildings on the site, totalling an additional 170,000 sq ft of office and R&D space.[67]

While Anglia Ruskin University lacks the prestige and capabilities of the University of Cambridge, it still ranks within the top 350 universities globally and, as stated above, there are 10,965 students currently enrolled in life science-related programmes at the university. In addition, the establishment of the University of Peterborough, which is set to welcome its first cohort of students in September 2022, potentially offer a platform for the creation of new technical and scientific degrees more closely aligned to the needs of the Combined Authority's life sciences firms.

**4.4 Universities – Key Points**

- The universities in Cambridge underpin the strength of the life science sector
- There is no strong sense among people from the corporate world that working with the universities is a challenge that needs to be addressed

[64] Cambridge Centre for AI in Medicine. https://ccaim.cam.ac.uk/
[65] Based on data from Beauhurst. https://www.beauhurst.com/
[66] Cambridge Science Park. https://www.cambridgesciencepark.co.uk/about-park/
[67] Two major new buildings proposed for St John's Innovation Park, Cambridge Independent. https://www.cambridgeindependent.co.uk/business/two-major-new-buildings-proposed-for-st-john-s-innovation-park-9117625/

## 4.5 Commercial Real Estate

For the most part, the Combined Authority's life sciences firms are found across the network of large and expanding science parks located around Cambridge and South Cambridgeshire. The growth of life sciences within these areas has kept the commercial property market buoyant and spurred further development. Since 2015, JLL has tracked more than 680,000 sq. ft. of publicly disclosed lettings of offices and laboratory space from life sciences firms within and around Cambridge – though as many of the smaller lettings in the sector are not disclosed, even this figure is likely to underestimate overall demand. Prime office rents in Cambridge have risen to £48.50 per sq. ft. per year at the end of Q2 2020, up almost 8% on a year earlier. Cambridge is now the UK's most expensive market for business accommodation outside of London. South Cambridgeshire however, offers more accessible rental rates.

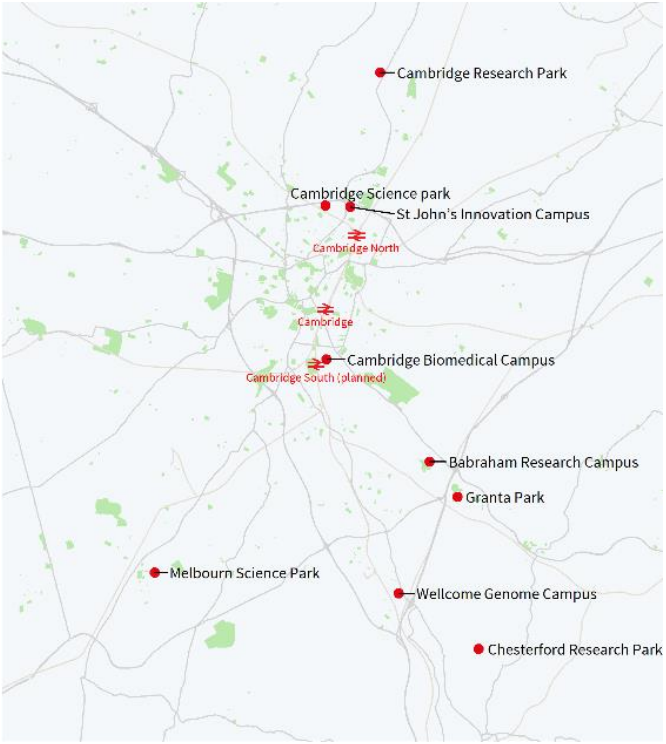
While higher office and laboratory rents may initially be expected to have a negative impact on the growth of the industry, this is not always the case. Increases in rents make the economics of developing new commercial life sciences facilities more viable - enabling the public sector to step away from a previously essential role in delivering facilities for life science companies and freeing up funds for other uses. For well-funded therapeutics and diagnostics companies, property costs are a small component of total expenditure compared with the costs of salaries or developing new products - so within limits, rising rents have a relatively limited overall impact. Conversely, consistently low rents can constrain business cases for developing new facilities and lead to a shortage of space to accommodate growth.

### 4.5.1 Cambridge's Life Science Parks

As discussed above, Trinity College-backed Cambridge Science Park and St John's Innovation Park are two of the oldest and most important commercial centres for life sciences firms within the combined authority. Cambridge Science Park recently expanded its offering to life sciences firms with the opening of the 40,000 sq. ft. Bio-Innovation Centre in 2019, delivered in part through an investment partnership between Trinity College and TUSPark, the development body of China's Tsinghua University. Construction is also underway on another plot which will deliver three office and R&D buildings, while consent has been given on a further building that could provide an additional 50,000 sq. ft. of Grade A office and specialist laboratory space.[68] However, Cambridge city represents only a fraction of the physical growth capacity of the Cambridgeshire cluster. By comparison all the parks in South Cambridgeshire are seeking to expand at much greater rates, with Granta Park alone seeking to bring to the market a further 1,000,000 sq. ft.

[68] Cambridge Science Park. https://www.cambridgesciencepark.co.uk/about-park/future/new-buildings/

**Location of Key Life Sciences Business Parks in Cambridgeshire and Peterborough**




North of the Cambridge Science Park and St John's Innovation Park lies the Cambridge Research Park, which provides a mix of office, laboratory and industrial space. Life sciences firms based on the park include Horizon Discovery Group, BioChrom and Stemcell Technologies.

On the southern fringes of Cambridge itself lies the Cambridge Biomedical Campus (CBC), the largest cluster of medical and life sciences research in Europe. The campus has been transformed since 2009, when planning permission was granted to develop 1.8 million sq. ft. of medical, laboratory and office space. Three hospitals are located on the campus, as well as several research institutes, charitable organisations and a growing number of life sciences firms – including AstraZeneca, GSK and Abcam. In February 2020, the government announced that Cambridge Biomedical Campus had been designated one of six new Life Science Opportunity Zones. The only one its kind in Cambridgeshire, the designation means that the campus will receive government support in attracting investment.[69] Many interviewees mentioned the opportunity presented by CBC and felt that its potential had yet to be realised. A common comment was summed up by one local business leader, **'Cambridge Biomedical Campus currently lacks vibrancy or a heart. It needs somewhere for people to gather and bump into each other'.** This is partly a reflection of the fact that the campus is still in its formative stages, but also presents an opportunity.

Transformation of CBC could be on the horizon with a new phase of development on the campus which has the potential to deliver an additional 800,000 sq. ft. of commercial and clinical floorspace, anchored around Abcam's global HQ. The Campus is also the proposed location of the Cambridge South train station which, subject to plans being approved, is set to open in 2025.

[69] £10 million boost to improve patient care with new technologies, Gov.uk. https://www.gov.uk/government/news/10-million-boost-to-improve-patient-care-with-new-technologies

Six miles south of Cambridge lies the Babraham Research Campus, which co-locates the Babraham Institute with early-stage life sciences firms across 300,000 sq. ft. of research, services and commercial floor space. The campus, which is backed by UKRI, is home to one of the oldest bioincubators in the UK and was created to provide space for young firms with an ambition to scale to an IPO – it specialises in proving pre-fitted space on a flexible basis. More than 60 life science firms are based on the site.[70] Near to the Babraham Research Campus is Granta Park, a 120-acre commercial park that houses the operations of Pfizer, Illumina, Medimmune and Gilead.

Further south lie both the Wellcome Genome Campus and the Chesterford Research Park. While the Wellcome Campus currently provides only a small amount of space for businesses, it does house the Sanger Institute, one of the world's foremost centres for genomics research; and the BioData Innovation Centre, a specialist facility that provides flexible space for genomics and biodata companies. Illumina, Congenica and Genomics England all have a presence on the Wellcome Campus.[71] The Chesterford Research Park, located three miles south of the Wellcome campus, provides a mix of office and labs space targeted at life sciences firms. Global firms including AstraZeneca and Charles River, as well as a host of local and smaller life sciences companies, have operations on the park.

Nine miles south-west of Cambridge is the Melbourne Science Park, which although currently majority occupied by its owner technology firm TTP, accommodates AstraZeneca and a number of smaller life sciences firms. This park is being marketed for sale in the last quarter of 2020 and will likely increasingly focus on life sciences.

### 4.5.2 The Shortage of Grow-on Space

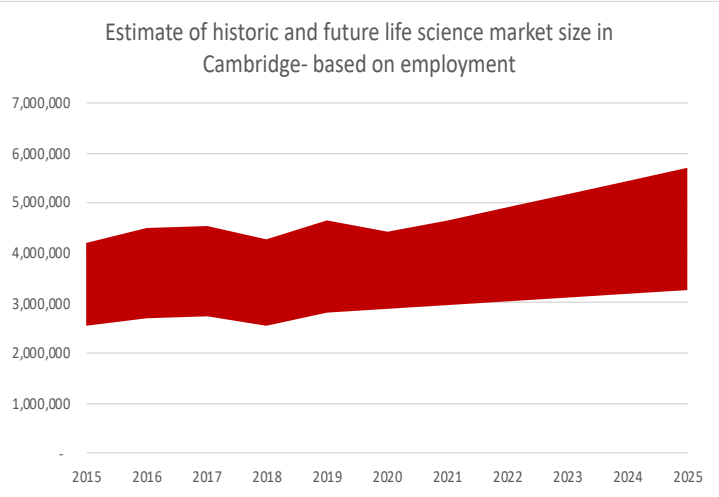
Between these nine science parks, the Combined Authority is home to the most mature property infrastructure for life sciences firms in Europe. However, vacancy rates are running at just a few percent and we heard repeatedly during our interviews that there is an acute shortage of space for start-up and scale-up firms. While facilities such as Babraham are intended to address the requirements of early-stage firms, the existing stock of specialist laboratory and flexible workspaces for these businesses across the combined authority has proven insufficient to meet the current level of demand. One of the key challenges at Babraham is that start-up companies on the site have grown to the point that there is no space to accommodate the next generation of businesses, in part because the growing companies themselves have nowhere to move on to. Derek Jones, CEO of Babraham Bioscience Technologies commented **'Because there is nowhere for the companies at Babraham to grow on to, it means the campus struggles to accommodate the start-up businesses it was intended for'**. However, supporting and encouraging requested expansions at adjacent sites like Granta Park could alleviate this problem.

### 4.5.3 The long-term position

There is a total of approximately 3.2 million square feet of space on the science parks in the Cambridge area that are dedicated wholly or predominantly to life sciences. Using employment

[70] The Economic Impact of the Babraham Research Campus, Babraham Reseach Campus. https://www.babraham.com/media/2077/brc-impact-report-210520-na-web.pdf
[71] BioData Innovation Centre. https://www.wellcomegenomecampus.org/aboutus/bic/

data over recent years and by estimating a range of space used per employee, we have estimated the amount of additional grow-on space needed by life science companies in Cambridge by 2025 to be up to 1.3M sq ft. This does not allow for inward investors which, with the right positioning of the Cambridgeshire cluster, could amount to as much again in realisable demand.




[Historic CAGR 2.6%, future CAGR 2.6-5.2%. Space/e'ee ranging from 150 to 250 sq ft]

Whilst we are aware of a substantial amount of life science space potentially in the development pipeline, much of this is meeting with resistance from planners and at best this would address the needs at the top end of the range, with no allowance for future growth. This suggests that the availability of space for life science companies will remain tight.

Both the UK government, via the Industrial Strategy for Life Sciences and Sector Deal, and the Combined Authority share an ambition to grow the life sciences sector in Cambridge. Much of this growth, however, will come from start-up and scale-up firms for whom high-quality and affordable laboratory and workspace is just as vital as sourcing capital and talented staff.

**4.5 Commercial Real Estate – Key Points**

- There is currently a shortage of start-up and grow on space for current firms and virtually no major opportunities to accommodate major inward investors in the Combined Authority area
- The current life science parks have the capacity to grow to absorb a 40% increase in employment in the sector, but resistance from planners will keep availability of space tight and the current infrastructure could struggle to accommodate growth beyond that

## 4.6 Hospitals and the NHS

Hospitals and healthcare infrastructure, along with universities, research institutes and private firms, are often another critical component of a successful life sciences cluster. Healthcare providers, including local NHS trusts, are likely to play an increasingly important role in supporting innovation in life sciences over the next decade, given the stated ambition of Life Sciences Industrial Strategy to make the UK one of the fastest adopters of innovative new forms of treatments.

The Cambridgeshire and Peterborough combined authority area is in the relatively unique position of facilitating close collaboration between internationally recognised research institutes, world-class universities and excellent hospitals. This is exemplified by partnerships such as the Cambridge University Health Partners (CUHP), which brings together the University of Cambridge, the Cambridge and Peterborough NHS Foundation Trust, Cambridge University Hospitals NHS Foundation Trist and Royal Papworth Hospital NHS Foundation Trust to collaborate on research and other initiatives to improve patient healthcare.

The expansion of the Cambridge Biomedical Campus has provided a potential hotbed for collaboration between hospitals, research institutes and universities because of the co-location of these entities on one site. For instance, researchers from Addenbrookes Hospital, one of the three hospitals located on the Campus, working alongside researchers from the Cambridge University announced in July 2020 that they had developed a new, 'game-changing' method to diagnose oesophageal cancer. The method relies on a Cytosponge test - a small pill on a string that the patient swallows, which then expands into a sponge when it reaches the stomach. A medical practitioner can then retrieve the sponge by pulling the string, which collects cells from the oesophagus as it's removed. The technique proved ten times more effective at diagnosing Barrett's oesophagus, a condition that can lead to oesophageal cancer, than conversional techniques. The research was funded by Cancer Research UK who, along with Addenbrookes Hospital and the University of Cambridge's Medical Research Council Cancer Unit, are also based on the Cambridge Biomedical Campus.[72]

Ensuring that these sorts of collaborative practises can be maintained and supported between the Combined Authority's life sciences firms, research institutes, universities and the five different NHS trusts that cover the Combined Authority will be imperative to extending the area's competitive advantage in the life sciences sector, as well as improving the healthcare outcomes of the local population. Supporting initiatives to foster partnerships on research, centralise and share data or trial innovative new medical interventions will be essential to building on the Combined Authority's strengths. Moreover, the design and master-planning of future developments should give due consideration to how schemes can better integrate healthcare providers, research institutes and life sciences firms.

**4.6 Hospitals and the NHS – Key Points**

- The Combined Authority area is in the unique position of facilitating close collaboration between internationally recognised research institutes, world-class universities and excellent hospitals.
- Supporting initiatives to foster partnerships on research, centralise and share data or trial innovative new medical interventions will be essential to building on the Combined Authority's strengths

[72] 'Sponge on a string' test to transform oesophageal cancer diagnosis, MRC Cancer Unit. https://www.mrc-cu.cam.ac.uk/news/sponge-on-a-string

## 4.7 Knowledge Networks & Organisational Structures

In addition to the area's hard infrastructure for life sciences, the Combined Authority is also supported by a soft infrastructure of formal and informal networks that connect scientists, researchers, academics, investors and other professionals. These networks play a vital role in the dissemination of knowledge, development of new initiatives and the provision of early-stage funding.

Key networks operating within the Combined Authority area include One Nucleus, which provides networking opportunities, events and training to those working in the life science sector across Cambridge, London and the East of England; and the Cambridge Network, a similar organisation focused on the broader high-tech sectors within Cambridge. Elsewhere, investor networks play a vital role in supporting early stage ventures with seed and angel funding - Cambridge Business Angels, for instance, has invested into Cambridge-based life sciences firms including Healx, Stemnovate and Arecor.

A major component of the informal networks is a core of very experienced and successful life science entrepreneurs in Cambridge, many of whom achieved their first success one or more decades ago. These individuals give their time and advice to support up and coming businesses and the development of the sector, which is an extremely valuable contribution to the industry locally. However, we heard during our interviews that because this network of mentors and experienced professionals is informal it relies on "knowing someone who knows someone". This model works very well in a relatively small industry, with many interviewees referring to Cambridge as being "like a village", but the life science sector in Cambridge has grown to the point where such an informal approach rarely functions to its best effect. Furthermore, a common comment from the interviews was that there is little visibility of the next generation of leadership for the sector that could pick up the reins when the current generation retires.

Similarly, while there are many networks and agencies that act as advocates for Cambridgeshire's strengths in life sciences, for outsiders looking to invest or grow in the area there is no single point of entry. According to insiders we spoke to during our interviews, this results in the knowledge networks for life sciences in the combined authority feeling fragmented and disorganised. "The Cambridge networks work very well when you are on the inside, but getting in can be a real challenge". Particularly concerning were comments made that **'for those looking to invest in life sciences in Cambridge, there is no obvious person or organisation to contact'**. Similarly, a couple of senior individuals interviewed referred to a comment from a visit by the CEO of one of the world's largest life sciences firms, who said he'd been given eight different sets of information about the sector in Cambridge, paraphrasing his comments as "you guys need to get your act together".

**4.7 Knowledge Networks & Organisational Structures – Key Points**

- Cambridge benefits from a wealth of experienced life science entrepreneurs who make a valuable contribution to supporting the industry.
- There is some concern that the next generation of leaders of the sector are not obvious.
- The informal nature of the networks in Cambridge has traditionally been a strength, but there are signs that the industry is growing to a scale where the informality does not work as well.
- Cambridge potentially misses out on opportunities by not having a coordinated front to present to the outside world.

# 5 Recommendations

Cambridge is home to arguably the most successful life science cluster outside of the United States. It could, therefore, be asked that if it has come this far without a coordinated strategy, why does it need one now?

As is evident from the previous chapter, while Cambridge is certainly home to a world-class life sciences sector, there are evidently improvements that can be made. Previous sections of this report have shown that other UK centres are advancing rapidly, especially London. Recent decisions by MSD and GSK to expand into King's Cross show that Cambridge is no longer the de facto location of choice for global life science firms – even for those, such as MSD, which is setting up specialist research and development-focused facilities. Furthermore, we would also contend that the Cambridge life sciences cluster is now reaching a scale and sophistication at which the existing ad-hoc and informal approach to supporting the sector will be less impactful. Throughout our interviews with those working in the sector, many interviewees commented that the Cambridge ecosystem was 'like a village'. While this was not intended as a critical comment, it's hardly a desirable description of a centre aiming to maintain and enhance its competitiveness vis-à-vis the likes of London, Boston and Beijing.

This section provides 11 recommendations to enhance Cambridge's life sciences sector structured around three themes of building companies of scale, optimising the network and enhancing talent and skills. While there are many more initiatives that could be included, we believe that focusing on a small number of impactful areas is more likely to be achievable and to galvanise the industry behind them, than a raft of smaller measures. Similarly, we have not attempted to provide a solution to the oft-repeated challenge of gaining access to the NHS or improving the flow of intellectual property out of the NHS. These goals may be impacted by of some of the initiatives listed below, but the challenges are so embedded and long-standing they require their own strategy. We understand the CUHP is doing just that so have avoided duplicating effort.

## 5.1 Building the Financial and Management Capacity for Growth

Cambridge is home to a world-leading community of firms that are not only at the cutting-edge of advances in medicine, but also in overlapping areas of technology including artificial intelligence and machine learning. As was discussed in previous sections of this report, applications of artificial intelligence within life sciences will transform all stages of healthcare and create enormous opportunities for value creation. Space is being created for new global behemoths to be forged at the apex of life sciences and technology, and Cambridge is extremely well-placed to take advantage of this. To realise the benefits of this shift, however, the Combined Authority must prioritise policies that support efforts by firms to scale, rather than simply be acquired early in their life cycle and subsumed into a parent company.

The UK Life Sciences Strategy sets the goal of the UK producing four companies with a market capitalisation in excess of £20 billion within the decade. The Combined Authority should aim for at least two of these firms to be based in Cambridge.

The presence of large-scale companies in the community has many benefits and, by targeting the creation of two, £20 billion companies, there will be many side effects, not least the creation of

companies that don't achieve the £20 billion target but are substantial, global businesses in their own right. The outcomes will be, among other things, the creation of a further waive of world-beating firms, job creation, skills development and a planned delivery of infrastructure.

The advantage of the two £20 billion firms aim is that it is simple, easy to rally around, fits with the UK Life Science strategy and, if even only partially achieved, will propel Cambridge even further up the global life science league tables.

Achieving this will require a concerted effort on multiple fronts. We recommend the following initiatives.

### 5.1.1 Establish a New £1 billion Life Sciences Innovation Fund

In June 2008, the state government of the Commonwealth of Massachusetts launched the Massachusetts Life Sciences Fund. The $1 billion ten-year fund aimed to transform the life sciences industry in the American state by investing in companies, infrastructure and programmes for training and skills development.

Over the next decade, the life sciences sector in Massachusetts experienced a Cambrian moment. Venture capital funding to life sciences firms ballooned from $700 million in 2010 to around $5.6 billion in 2018.[73] Over the same years, the number of life sciences firms jumped by 50%, and large pharmaceutical firms began to relocate to the area. Massachusetts is now home to 18 of the world's top 20 pharmaceutical companies.

Although the Massachusetts Life Science Fund was concerned with more than venture investment it is evident that the availability of capital is an important factor in the growth of the life sciences sector. Availability of capital plays a critical role in shaping business strategy. When a company develops its plans, it is rational for managers to consider the perceived availability of capital: low levels of funding encourage steady, organic growth, a particular type of company and business model and, sometimes, lower ambitions. Higher levels of funding do the opposite.

The availability of capital also spurs higher rates of business incorporation. For example, the Oxford Sciences Innovation Fund was established by the University of Oxford and several commercial partners to back science-based businesses. The £600 million fund has invested in almost 20 life sciences firms since 2015. In parallel, the number of spin outs from Oxford University has jumped: 28 firms were spun out from Oxford between 2014 and 2018, up from 13 during 2010 – 2014. The same pattern applies to Cambridge, before and after the advent of Cambridge Innovation Capital. Compare that with four universities (Nottingham, Birmingham, Warwick & Leicester), which together recorded the same biological science research power as Cambridge (i.e. the same strength of research base), but where there has been no significant investment fund available locally. In this case, there has been no growth in the number of life science spin outs.

[73] Based on data from CrunchBase. https://www.crunchbase.com/

**Number of life sciences spinouts from universities in Cambridge, Oxford and the Midlands**

| | Biol Sci Resch Power-REF 2014 | Pre OSI & CIC LS Spin outs 2010-2014 | Post OSI & CIC LS Spin outs 2014-2018 | % increase in spin outs |
|---|---|---|---|---|
| Oxford | 761 | 13 | 28 | 115% |
| Cambridge | 640 | 8 | 25 | 213% |
| Nottingham, Leicester, Birmingham, Warwick | 652 | 9 | 9 | 0% |

If the impact of the availability of capital on the growth of the life science sector is accepted, then increasing local funds should further stimulate sector growth beyond that which has been achieved since the advent of the CIC fund. Moreover, greater availability of capital should lead to greater company scale.

This report therefore proposes the development of a plan for a £1 billion fund. A £1 billion life science fund of this size for Cambridge is of sufficient scale to both encourage the development of companies with ambition to achieve scale and to further encourage start-up and spin-out formation. It would also attract companies to the Cambridge region, possibly from outside the UK.

### 5.1.2 Lead on the drive to improve UK public equity markets for life sciences.

American companies are able to scale in large part because they have access to deep pools of capital in the public equity markets. The public equity markets in the UK for life science companies lack the scale and sophistication of the American markets and consequently many high potential companies are either acquired rather than list or choose a US stock market listing, which may end in a relocation to that country. This situation is unlikely to change unless the volume and scale of activity increases.

Consequently, Cambridge should take a leadership role in considering what initiatives might stimulate an increase in the number and scale of life science companies listed on the London Stock Exchange and then look to drive the implementation of those initiatives.

This is clearly a far less tangible initiative, requiring organisation and leadership rather than a specific investment. However, to ignore this is to ignore one of the main reasons why the sector is being held back.

### 5.1.4 Create a "Future Leaders Programme" to Build Commercial Management Skills of the Sector

If scale-up companies are to be developed, they will need people with the commercial skills to lead them. The shortage of such skills was a repeated comment among interviewees. Consequently, initiatives should be considered to address this shortfall.

We recommend creating a world class initiative that develops the next generation of leadership talent. There are a number of programmes that could be reviewed as exemplars:

- *Saltire Fellows.* This is a Scottish initiative whereby future leaders in the life science industry are put forward for a 12-month programme that includes mentoring, on-the-job experience and lectures, including a period at Babson College in the United States. Each year a cohort of 10-15 is selected and that group remains in contact after the programme and creates a support infrastructure as they progress through to senior positions. https://www.scotland.org/study/saltire-scholarships
- *Kaufman Fellows*. This is a prestigious two-year programme established by the venture capital industry. Those enrolled in the programme work at venture capital firms, and are provided with a two-year structured curriculum as well as access to coaching, networking events and international summits. https://www.kauffmanfellows.org/

Cambridge is already fortunate in having a world leading business school which could provide the core of a programme and confer the relevant prestige to the programme. It is also well blessed with a large number of potential mentors to provide additional support.

### 5.1.5 Develop a culture that aspires to scale

As important as the availability of funding to grow life science companies of scale is the establishment of a culture where aspiring to build a multi-billion-dollar company becomes the norm. This might be achieved through a raft of initiatives, but one would be to actively celebrate those companies that are on track to achieve scale.

Each year an independent, highly regarded panel would select the 5-10 "Ones to watch" – companies with the potential to become one of the £20 billion companies. Such designated companies should receive a raft of tangible benefits such as: a significant cash award; fast tracked grant approvals; reduced cost facilities; an assigned mentor or team of mentors. Few, if any, of these companies would achieve a £20 billion but aspiring to do so would be a game changer for the sector.

## 5.2 Building Network Capacity for Growth

Common phrases that emerged during our interviews on the strengths of the Cambridge's ecosystem included, 'it's like a village' and it's 'very effective when you know where to go'. This small scale, intimate approach has served the community well, but the Cambridge is now at a scale where ad hoc and informal networks don't provide a complete enough infrastructure to effectively disseminate knowledge and promote the area to outsiders. Greater structure and coordination are needed. We recommend the following.

### 5.2.1 Develop a Coordinating Body for the strategic initiatives

If the strategy is to be successful a leadership team will need to be created with a salaried director role to lead implementation. Key aspects of the "Cambridge Life Science Strategy Director" role will be to:

- Drive forward the establishment of the £1B fund

- Instigate the “one’s to watch” initiative
- Ensure life science space planning is undertaken and monitored
- Develop and implement the Future Leaders programme
- Lead on securing research funding and national infrastructure projects
- Act as the main life sciences contact for the newly established agency to promote Cambridge Life Sciences (below)

This report therefore recommends the CPCA makes available funding for a Cambridge Life Sciences Strategy Leadership role and supports the creation of a strategy board. This is probably the single most important recommendation in this report and, if an appointment is well made, it would pay back the cost many times over.

**We note that Cambridge University Health Partners (CUHP) has also recently created a vision paper for the local life sciences sector, along with some recommended steps to deliver that vision. The findings and proposals of the CUHP paper (included in Appendix 2) are consistent with this strategy and we recommend a combined approach to delivering a strategy for the sector.**

### 5.2.2 Establish a Single Agency to Promote Cambridge around the UK and Internationally

A common comment was the need for Cambridge Life Sciences to have a “better front door”- an obvious entry point into the local ecosystem. We understand a new body, Cambridge &, is being established which could potentially take this role, supported by the Life Sciences Strategy Director. There is clearly no point in replicating an existing effort, so this report simply recommends supporting and assessing the effectiveness of the proposed Cambridge & initiative.

### 5.2.3 Leverage the Ox-Cam Arc, the UK Innovation Corridor and the Golden Triangle

While Cambridge is home to the UK’s most developed centre for life sciences, when grouped into the Golden Triangle it is part of one of the world’s foremost knowledge centres and preeminent clusters for life sciences. The Combined Authority has leveraged Cambridge’s position in this geographic grouping through partnerships with other local authorities in the Oxford-Cambridge Arc, an area that has world-leading capabilities not only in life sciences, but also in technology, advanced manufacturing, aviation and space tech. This has resulted in a clear set of economic priorities that stakeholders within the area are working towards and petitioning the UK government to support.

Similarly, the UK Innovation Corridor (linking King’s Cross to Cambridge)has even greater potential to be a world leading cluster because of its scale and existing connectivity. This report recommends the Combined Authority actively supports the Innovation Corridor initiative.

Efforts between the authorities should be coordinated to lobby central government for funding, promote the area for national and international investment, and partner on programmes to support the life sciences sector within the Golden Triangle.

## 5.3 Building Talent & Skills Capacity for Growth

A good supply of scientists and other highly skilled professionals will be fundamental to the growth of the life sciences sector. Analysis by AstraZeneca has suggested that growth in Cambridge's life sciences sector could create an additional 6,000 roles by 2032[74] and it could well be much greater than that if the growth initiatives in this report are successfully implemented.

Filling these roles will not only require that a sufficient supply of talent is provided, but also that those entering the sector are equipped with the right skills. Participants in the interviews conducted for this report consistently mentioned that Cambridge potentially faces an acute shortage of technical skills, especially in bioinformatics, data analytics and those working at a general technician level. We recommend the following.

### 5.3.1 Create New Technical Education Programmes to Support Skills Required by Life Sciences Firms

The combined authority, in partnership with the area's higher education institutions, should identify where education programmes could be created or better adapted to meet the needs of the life sciences sector. The establishment of the new University of Peterborough presents a once in a generation opportunity to create a suite of new scientific and technical degrees closely aligned with the needs of the combined authority's life sciences businesses. As the University ramps up its offering, it should be mindful of how emerging areas of skills shortages within the sector – including immunology, genomics, bioinformatics and data analytics – could form the basis of degree programmes or specific modules. Moreover, Anglia Ruskin University is already well placed to deliver graduates with the appropriate technical skills and should be supported to do so.

A programme of continuous engagement should also be put in place with combined authority's businesses to identify and track how their skills requirements evolve, and how this can be incorporated into the offerings of higher education institutions.

One challenge that may be made to our recommendations is that efforts to further enhance life sciences education within the combined authority will have little practical effect on the strengths of the local ecosystem, as many graduates will relocate to other centres in the UK and abroad after they complete their studies. We would respond by suggesting that the if the combined authority's graduates relocate to other parts of the UK, this will likely boost the strength of the sector overall, with long term benefits to Cambridge. Furthermore, the more Cambridge is seen to be the leading centre in the supply of new talent, the more likely it is that firms will opt to grow their headcount in the area over other parts of the UK. This will help create a virtuous circle, in which more jobs are created, and graduates increasingly opt to remain in the combined authority to take up these jobs.

### 5.3.2 Support for alternative routes into life sciences employment

Alongside efforts to expand and enhance life sciences programmes at higher education institutions, alternative routes into employment in the sector, such as apprenticeships, should

[74] Cambridge: Driving Growth in Life Sciences, AstraZeneca. https://www.astrazeneca.com/content/dam/az/media-centre-docs/article_files/articles-2018/Astrazeneca-Clusters-Report-Exec-Summary%20FINAL%202.pdf

also be encouraged. We understand that Anglia Ruskin University has already begun working with players in the life sciences sector to provide higher level National Vocational Qualifications, apprenticeships and other technical courses. The Combined Authority should look work with ARU and other providers to expand such offerings.

Currently, apprenticeships tend to be underutilised by smaller and medium enterprises, due to the requirement to provide training and additional administration cost that are often involved bringing in apprentices. Given that almost three quarters of life science firms across the combined authority employ fewer than 20 people, however, encouraging greater utilisation of apprentices within SMEs could have a significant impact on overall employment. Funding via the Apprenticeship Levy has already made it more economically viable for smaller firms to utilise apprentices, and we would recommend a concerted effort by the combined authority area to promote apprenticeships within the sector.

In addition, the combined authority's Skills Brokerage Service could play an important role in raising the profile of STEM subjects in schools, which will pay dividends to the life sciences sector over the medium to long term. Efforts should be made to ensure that local life sciences firms are appropriately engaged and represented in the programme.

### 5.3.3 Create new programmes to upskill in the tech- life science convergence

There is a considerable shortage of skills in the overlap between life sciences and emerging technologies, particularly artificial intelligence. This shortage will become more acute over the next decade, as applications of AI become more prevalent across all areas of healthcare. We recommend that the combined authority, in partnership with the area's higher education institutions, establishes programmes to upskill or retrain its workforce in the convergence between life sciences and technology.

National efforts are already underway to establish new educational programmes in AI. The UK Office for Students, for instance, last year launched a competition for universities to develop their own AI postgraduate conversion courses.[75] Such programmes will offer students from a diverse range of disciplines a path towards a career in AI. The combined authority should encourage the area's universities to provide such programmes, as well as promoting their uptake by students who've studied life sciences-related degrees.

Programmes should also be identified to support those already in the workforce to upskill in AI. The cutting edge of medicine and technological innovation will evolve and develop over the next decade – maintaining Cambridge's competitive advantage in these areas will require a commitment to lifelong learning and support for those looking to upgrade their skills.

### 5.3.4 Improve the Diversity and Inclusion of the Sector

As with other industries, promoting better representation of different ethnic, gender, demographic, socio-economic and other identity groups within life sciences firms must be a key

[75] Government backs next generation of scientists to transform healthcare and tackle climate change, Gov.uk. https://www.gov.uk/government/news/government-backs-next-generation-of-scientists-to-transform-healthcare-and-tackle-climate-change

priority for the sector. According to a 2020 study by executive search firm Liftstream, just 14.8% of board directors across 132 public and private life sciences firms in the UK are female. The same study also estimated that just 7.3% of board directors at these companies belonged to a racial or ethnic minority group.[76] Beyond the moral imperative of working to address such shortcomings, it should also be recognised that improving the representation of the sector will be a key mechanism to ensure the supply of talent: the more people from across different societal groups who see life sciences as an inclusive and lucrative sector to work in, the larger the supply of talent will be.

The combined authority should seek to improve representation in the life sciences sector by encouraging firms to publicly disclose as much data on the diversity of their workforces, at all levels, as possible. The combined authority should also consider prioritising funding to firms that can demonstrate a broad representation among their leadership, and have implemented rigorous diversity and inclusion strategies covering areas such as recruitment, retention and advancement policies.

## 5.4 Building Physical Capacity for Growth

### 5.4.1 Ensure future provision is made of facilities for scale-ups and start-ups

There is currently a shortage of grow-on space within the Cambridge area with the result that expanding companies are occupying facilities meant for start-ups, such as at Babraham. While there is currently land available to build further life science infrastructure, and indeed new space is being planned, it will be important to ensure that the availability of development land with the appropriate planning use is sufficient to meet the needs of at least a 40% increase in employment in the sector. A very conservative estimate of the new space required to accommodate such growth suggests that more than one million sq. ft. of additional life sciences space is required.

This report therefore recommends a detailed space planning exercise is undertaken, taking into consideration the amount of potential life sciences space that could be supplied at the existing and planned sites. This should then be matched against forecast demand along multiple growth trajectories and progress monitored. Planning and zoning decisions can then be made in the context of future demand so as to ensure the availability of land for life science developmet doesn't fall short of that needed.

Further to this, there is an immediate need for space to accommodate start-up companies. These are well catered for at Babraham campus, but there is currently no more space to accommodate them on site. The building of incubator facilities for start-up companies is less commercially viable than for more established businesses. Without space to accommodate start-ups it is likely that their creation could be slowed, they could end up in sub-optimal locations or be forced to move out of the area completely.

Consequently, consideration should be given to supporting the development of further start-up facilities.

[76] UK Life Sciences 2020 Board and Leadership Diversity, LiftStream, https://www.liftstream.com/life-sciences-diversity.html

**Summary of Recommendations**

| Theme | Description | Recommendations to address |
|---|---|---|
| **Building the Financial and Management Capacity for Growth** | Cambridge and South Cambs are home to a world-leading community of start-up and scale-up firms, but very few home-grown global companies. To better support the life sciences ecosystem, the Combined Authority must prioritise policies that help firms to scale, rather than simply be acquired early in their life cycle and subsumed into a parent company. | Establish a new £1 billion Life Sciences Innovation Fund. |
| | | Lead on the drive to improve UK public equity markets for life sciences companies |
| | | |
| | | Create a "Future Leaders Programme" to build commercial management skills of the sector |
| | | Support the development of a culture that aspires to scale |
| **Building Network Capacity for Growth** | While the Combined Authority is home to a fantastic network of firms, entrepreneurs, scientists and advocacy groups, local efforts by these networks to promote and enhance the sector are often uncoordinated and overlapping – making them less effective. Policies should be adopted that help coordinate these efforts. | Develop a coordinating body for the strategic initiatives and appoint a "Life Sciences Strategy Director" to drive the implementation of these initiatives. |
| | | Support the establishment of a single agency to promote Cambridge around the UK and internationally |
| | | Leverage the Ox-Cam Arc, the UK Innovation Corridor (linking King's Cross to Cambridge) and the Golden Triangle |
| **Building Talent & Skills Capacity for Growth** | Realising the anticipated growth of the life sciences sector is dependent on addressing the dual challenges of both supplying enough scientists and other professionals to the sector, and also ensuring that these individuals are equipped with the right mix of skills. Policies should be adopted to address both challenges – encouraging greater uptake of life-science related subjects at all levels of education, creating new routes into life sciences employment, and upskilling workers in emerging tech-enabled roles. | Create new technical education programmes to support skills required by life sciences firms |
| | | Support for alternative routes into life sciences employment |
| | | Create new programmes to upskill in the tech- life science convergence |
| | | Improve the diversity and inclusion of the sector |
| **Building Physical Capacity for Growth** | Ensuring future provision is made for facilities for scale-ups, start-ups and inward investing companies is dependent on a transformation in | *Implementing* life science employment growth within site areas currently consented for new buildings but stalled |

| | | |
|---|---|---|
| | planners' appetite and openness to growth in the sector. Given the established dominance of South Cambs (240 vs 150 firms), the more accessible property and rental prices, and the longer term and more difficult to resolve constraints to the expansion sites in Cambridge city around transport and space availability, much greater, and more coordinated, effort between the Combined Authority and South Cambs District Council should be undertaken to expand out the existing South Cambs sites. However, this should be in a manner that minimises environmental and spatial impacts, by maximising the use of each site's assets as laid out in the recommendations and in descending priority. | *Densifying* life science employment within site areas currently consented for new building but with the potential to be utilised more effectively |
| | | *Intensifying* life science employment within current buildings, by encouraging and incentivising firms from other sectors to relocate to alternative parks, freeing up space for life science firms and creating dedicated, and networked, life science villages |
| | | *Expanding* life science employment through new planning applications within current sites' established employment areas |
| | | *Expanding* life science employment through new planning applications adjacent to current sites' established employment areas |

# 6 Next Steps

Following the receipt of this report, we would anticipate the establishment of a steering group to coordinate adoption of the recommendations and to develop detailed implementation plans. We would also propose the creation of a salaried director role to lead the further development and implementation of the strategy.

# 7 Thanks and Acknowledgments

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# 9 About JLL

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# Appendix 1: The Global Life Sciences Sector

Understanding the key trends and challenges in the global life sciences sector is important to understanding Cambridgeshire and Peterborough's place within it, and the opportunities and threats that are emerging. We have here provided a summary of the main trends shaping the sector, as well as key areas of investment.

The coronavirus pandemic has underscored the importance of a vibrant life sciences sector to public health, and focused the world's attention on critical efforts by governments, universities and life sciences firms to develop a vaccine. As the pandemic spread in the first half of 2020, precipitating historically unprecedented falls in output, life sciences firms demonstrated their resilience: across the major American, European and Asian equity indices, Life sciences firms have added around a quarter of a trillion dollars in market capitalisation since the start of the 2020.[77]

Even prior to the pandemic, moreover, the life sciences sector was experiencing a period of robust growth. Long term macro-economic and demographic trends, such as the ageing of the world's population, the growth of the consumer class in many emerging markets and the growing burden of chronic diseases that will accompany significant changes in demography, are creating new opportunities for the sector. Globally, the sector is expected to reach over $2 trillion in gross value by 2023, according to estimates from Accenture.[78]

Of these long term macro-economic forces, the implications of an ageing population are particularly pronounced. The share of the over-65s as a proportion of the world's population has doubled in the last fifty years. By the middle of the century, one quarter of the population of Europe and North America will be over the age of 65. Managing the more complex healthcare needs of an ageing population will be expensive, requiring a shift towards more proactive long-term health management and better utilisation of emerging treatment techniques and technologies.[79]

**Key Global Firms in the Life Science Industry**

| Company Name | Country of Headquarters | Market Cap $bn | Number of Employees '000s |
|---|---|---|---|
| Johnson & Johnson | USA | 390 | 132 |
| UnitedHealth Group Inc | USA | 314 | 325 |
| Roche Holding AG | Switzerland | 294 | 98 |
| Novartis AG | Switzerland | 213 | 109 |
| Pfizer Inc | USA | 211 | 88 |
| Merck & Co Inc | USA | 202 | 71 |
| Abbott Laboratories | USA | 194 | 107 |

[77] JLL analysis of Eikon data.
[78] New Science: BioPharma's New Growth Machine, Accenture. https://www.accenture.com/_acnmedia/Accenture/Conversion-Assets/Secure/pdf-no-index-2/Accenture-Life-Sciences-New-Science.pdf
[79] Transforming healthcare with AI: The impact on the workforce and organizations, McKinsey. https://www.mckinsey.com/industries/healthcare-systems-and-services/our-insights/transforming-healthcare-with-ai

| | | | |
|---|---|---|---|
| Thermo Fisher Scientific Inc | USA | 185 | 75 |
| Danaher Corp | USA | 161 | 60 |
| Abbvie Inc | USA | 152 | 30 |
| Medtronic PLC | Ireland | 148 | 90 |
| Eli Lilly and Co | USA | 140 | 34 |
| AstraZeneca PLC | United Kingdom | 139 | 71 |
| Amgen Inc | USA | 138 | 23 |
| Bristol-Myers Squibb Co | USA | 138 | 30 |
| Novo Nordisk A/S | Denmark | 129 | 43 |
| Sanofi SA | France | 127 | 100 |
| CSL Ltd | Australia | 96 | 25 |
| GlaxoSmithKline PLC | United Kingdom | 91 | 99 |
| | | | Source: Eikon, October 2020 |

## 1.1 Global Trends in Life Sciences

While the long-term outlook for life sciences is positive, firms in the sector are currently navigating a period of profound transition. The advance of new technologies, such as artificial intelligence, and cell & gene therapies are reshaping work in the sector. Declining returns on research and development activities are forcing the global pharmaceutical firms to reassess how and where research is undertaken. The competitive landscape is also becoming more nuanced as firms across the sector find new ways to combine, collaborate and compete with each other.

### 1.1.1 Technology and the Emergence of 'New Sciences'

Life sciences and technology are converging, leading to the emergence of 'New Sciences', which leverages technologies such as advanced analytics, artificial intelligence and new devices to generate new revenue streams, expedite research and development, and deliver better healthcare outcomes.[80]

*Data, analytics and artificial intelligence*

Applications of data and advanced analytics in the life sciences sector are upending traditional approaches to diagnostics, drug development and care delivery. According to research from Markets & Markets, the global life science analytics market is projected to be worth $42 billion by 2025, up from $22.1 billion in 2020.[81]

[8080] New Science: BioPharma's New Growth Machine, Accenture. https://www.accenture.com/_acnmedia/Accenture/Conversion-Assets/Secure/pdf-no-index-2/Accenture-Life-Sciences-New-Science.pdf

[81] Markets and Markets. https://www.marketsandmarkets.com/Market-Reports/pharmaceutical-life-science-analytic-market-174990653.html#:~:text=%5B301%20Pages%20Report%5D%20The%20global,13.7%25%20during%20the%20forecast%20period

Analytical techniques including statistical modelling, machine and deep learning, commonly referred as artificial intelligence (AI), are increasingly being applied in the sector to aid diagnosis, optimise clinical trials and accelerate the development of new medicines. Because AI software can process massive amounts of genomic, molecular, cellular and biology data, it can quickly identify new compounds, treatments, biological targets, pathways and clinical trial participants, as well as potentially predicting a new medicine's efficacy and safety.[82]

Firms pioneering these techniques include Healx, a Cambridge-based company that specialises in using artificial intelligence to repurpose existing medicines to treat other illnesses. Healx has created its own network of medical information, known as Healet, that unearths connections between discoveries using machine learning. This information is then used to identify where existing medicines, or combinations of them, could be repurposed to treat other illnesses. In December 2019, Healx announced a partnership with Boehringer to focus on rare neurological diseases, and has recently turned its attention to identifying potential treatments for covid-19.[83]

Elsewhere, Novartis has established Data42, an initiative aimed at using artificial intelligence to analyse the firm's massive clinical trials dataset to identify leads for new drugs.[84] Using insights gleaned from data, Novartis hopes that it will become possible to develop new drugs 'in silico' – using software, rather than from advances in labs. Similarly, GSK have recently established a £10 million AI lab at King's Cross, where its scientists and data specialists are collaborating on applications of AI with scientists from the Francis Crick and Alan Turing Institutes, as well tech giant Nvidia.[85]

### *Devices and the Medical Internet of Things*

The Internet of Things (IoT) describes the network of sensors, actuators, wearables and other devices that can connect and exchange information over the Internet. The promise of the IoT is that by connecting more devices to the network, insights and operational efficiencies can be created in managing supply chains, generating energy and running public infrastructure.

Within life sciences, the growth of IoT offers particular opportunities for medical technology firms, as one key application of the IoT is embedding smart sensors into medical devices - enabling the remote capturing and monitoring of patient data. Bayer's Betaconnect autoinjector, for instance, pairs with users' phones to enable their data to be shared with medical professionals.[86]

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[82]Life Science Tech, Vision 2019, Accenture. https://www.accenture.com/_acnmedia/109/Accenture-Life-Sciences-Tech-Vision-2019.pdf

[83] Biotechs harness AI in battle against Covid-19, Financial Times. https://www.ft.com/content/877b8752-6847-11ea-a6ac-9122541af204?desktop=true&segmentId=7c8f09b9-9b61-4fbb-9430-9208a9e233c8

[84] The data42 program shows Novartis' intent to go big on data and digital, Novartis. https://www.novartis.com/stories/discovery/data42-program-shows-novartis-intent-go-big-data-and-digital

[85] Medicines giant GlaxoSmithKline launches £10 million Kings Cross artificial intelligence hub to find new cures, Evening Standard. https://www.standard.co.uk/business/glaxo-gsk-ai-machine-learning-kings-cross-a4538461.html

[86] Bayer wins FDA approval for MS electronic autoinjector and app, PM Live. http://www.pmlive.com/pharma_news/bayer_wins_fda_approval_for_ms_electronic_autoinjector_and_app_1195765

Applications of the medical IoT has the potential to create new revenue streams and transform med tech firms into service providers. Data collected by IoT devices could be used to monitor patients in real time, shape more personalised treatment programmes and enable predictive modelling of medical outcomes. However, it has also allowed non-traditional players to enter the sector. Many consumer wearables are now equipped with medical-grade sensors: Apple, for instance, was granted Grade 2 FDA approval in 2018 for its Apple Watch product, which can notify users and healthcare professionals if it detects an irregular heartbeat.[87]

### 1.1.2 Research and Development Challenges

While the fundamentals of the life sciences sector are extremely strong, the financial viability of investing in the development of new medicines is considerably challenging. Research and development activities in the sector are notoriously difficult, time-consuming and costly.

Over the last decade, pharmaceutical firms poured around $1.5 trillion into research and development.[88] Since 2010, however, Deloitte calculates that the average cost of developing a new drug has almost doubled to $2.2 billion, while the value of average forecast peak sales for a new treatment has more than halved. Consequently, expected return on investment from drug development has declined precipitously – falling from 10.1% in 2010, to just 1.8% in 2019.[89] Moreover, one third of the costs of developing a new drug are spent during the initial drug discovery phase, during which tens of thousands are molecules are screened, with only a small number ever making it to clinical trials.

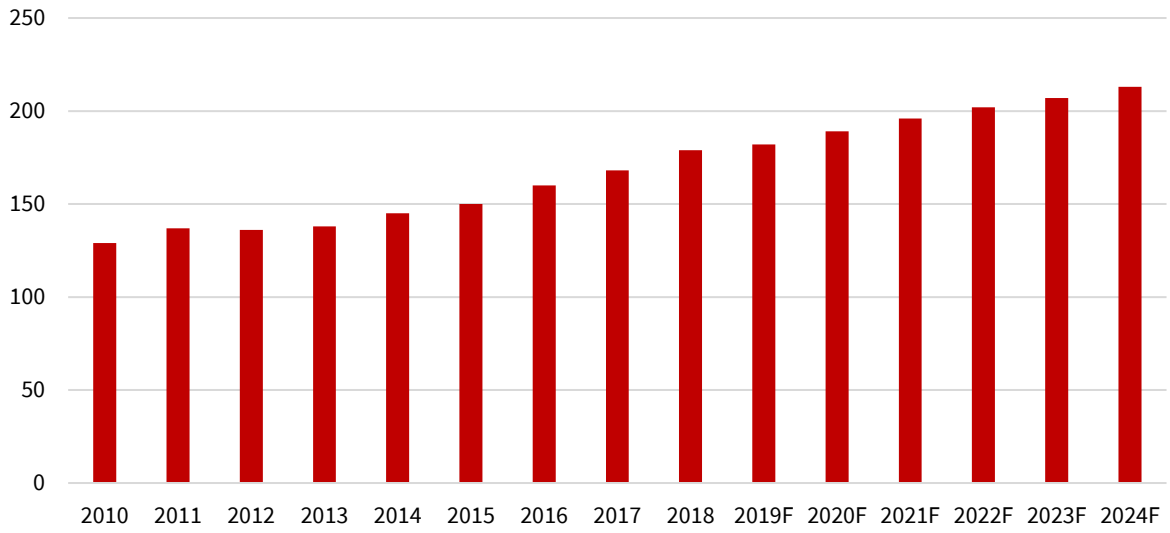
The challenges with research and development are in part why firms are enthusiastically exploring applications of artificial intelligence in drug development, as well as bolstering their pipelines by acquiring other players. Moreover, it is causing pharmaceutical companies to rethink how they are structured and where they are located. The drive to become embedded in thriving life science ecosystems of academia and entrepreneurial companies is causing large pharmaceutical companies in particular, to question the wisdom of out-of-town campuses and instead set up shop in the leading life science hubs.

[87] ECG app and irregular heart rhythm notification available today on Apple Watch, Apple. https://www.apple.com/newsroom/2018/12/ecg-app-and-irregular-heart-rhythm-notification-available-today-on-apple-watch/

[88] Wold Preview 2019 to 2020, Evaluate Pharma. https://info.evaluate.com/rs/607-YGS-364/images/EvaluatePharma_World_Preview_2019.pdf

[89] Ten Years On: Measuring the Return from Pharmaceutical Innovation 2019. https://www2.deloitte.com/content/dam/Deloitte/uk/Documents/life-sciences-health-care/deloitte-uk-ten-years-on-measuring-return-on-pharma-innovation-report-2019.pdf

**Worldwide Total Pharmaceutical R&D Spend in 2010-2024, $bn**




Source: Evaluate Pharma

### 1.1.3 Acquisitions, Partnerships and a Shifting Competitive Landscape

Technological advances and lower returns on research and development activities has spurred greater volumes of mergers and acquisitions in the life sciences sector. Around $1.6 trillion of mergers and acquisitions have taken place over the last decade, according to analysis by PharmaIntelligence.[90]

The momentum behind acquisitions will likely continue as larger groups look to make bets on emerging areas in cell and gene therapies, oncology and rare illnesses (see below). This was part of the rationale for the $74 billion merger of Bristol-Myers Squibb and Celgene in 2019 - Celgene had previously acquired Juno for $9 billion, a leader in cell therapies. Similarly, Roche acquired Spark Therapeutics, a specialist in gene therapy, at the end of 2019 for $4.4 billion.[91] UK-based Nightstar Therapeutics, a clinical-stage gene therapy company focused on treatments for inherited retinal disorders, was also acquired by Biogen for $877m in June 2019.[92]

Life sciences firms are not only looking to M&A as a route to expanding their pipelines or bolstering their competitive position, but also to augment their capabilities in emerging areas of technology. In 2019 alone, life sciences companies announced plans to acquire 37 technology companies. These deals included Thermo Fisher acquiring HighChem, a Slovakia-based developer of mass spectrometry software that analyses complex data and identifies small molecules and their

[90] A Decade of Biopharma M&A and Outlook for 2020, Pharma Intelligence. https://pharmaintelligence.informa.com/~/media/informa-shop-window/pharma/2020/files/whitepapers/ma-whitepaper.pdf
[91] A Decade of Biopharama M&A and Outlook for 2020, Pharma Intelligence. https://pharmaintelligence.informa.com/~/media/informa-shop-window/pharma/2020/files/whitepapers/ma-whitepaper.pdf
[92] Biogen closes $800m Nightstar Therapeutics acquisition, Pharmaceutical Technology. https://www.pharmaceutical-technology.com/news/biogen-nightstar-therapeutics-acquisition/

fragments. Elsewhere, Roche acquired Flatiron Health for $1.9 billion in 2018.[93] Flatiron Health specialises in using natural language processing, a form of artificial intelligence, to enable faster research into cancer treatments.[94]

Even if they're not acquiring other firms, many life sciences companies are establishing partnerships with technology specialists to enhance their capabilities. AstraZeneca and Novartis, for instance, both announced in 2019 that they were entering major partnerships BenevolentAI, a specialist technology firm that uses AI to help scientist identify new ways to treat diseases and personalise medicines.[95]

*The convergence of fields*

The increasing convergence of technology and life sciences is reshaping the sector. Not only are life sciences firms augmenting their technical capabilities, technology companies are expanding into life sciences. Verily Life Sciences, a subsidiary of Google's parent company, raised $1 billion in venture funding in 2019 – the largest ever single venture investment into a life sciences firm.[96] Google itself announced in 2019 that it was partnering with Sanofi to create a new innovation lab focused on personalised treatments.[97] Elsewhere, Microsoft and Novartis signed a multi-year collaboration agreement last year focused on applications of AI in healthcare.[98]

The growth of new sciences is also forcing life sciences firms to expand their stock of technical and digital talent. Novartis, for instance, now employs around 800 data scientists and bio-statisticians.[99] The competition for highly skilled talent, particularly in fields including statistical analysis, data science and software engineering, will also become more intense as life sciences firms and those from other sectors draw more intensely from the same technical talent pool.

Alongside this, the growth of new technology-led business models within life sciences have made the sector more attractive to venture and private equity investors. Consequently, flows of venture capital into start-up and scale-up firms have grown markedly in the last five years. In the UK alone, we estimate that more than $5.2 billion of venture funding was invested into life sciences firms between 2015 and 2020 – more than double the same figure for the five years prior.[100] Over time,

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[93] 2020 Global Life Sciences Outlook, Deloitte. https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Life-Sciences-Health-Care/gx-lshc-di-2020-global-life-sciences-outlook.pdf

[94] Roche to acquire Flatiron Health to accelerate industry-wide development and delivery of breakthrough medicines for patients with cancer, Roche. https://www.roche.com/media/releases/med-cor-2018-02-15.htm

[95] Intelligent Drug Discovery Powered by AI, Deloitte. https://www2.deloitte.com/content/dam/insights/us/articles/32961_intelligent-drug-discovery/DI_Intelligent-Drug-Discovery.pdf

[96] Alphabet's Life Sciences Tech Unit Verily Raises $1 billion from investors, Reuters. https://www.reuters.com/article/us-alphabet-verily-idUSKCN1OX1UJ

[97] Sanofi and Google to develop new healthcare Innovation Lab, Sanofi. https://www.sanofi.com/en/media-room/press-releases/2019/2019-06-18-07-00-00

[98] Novartis and Microsoft join forces to develop drugs using AI, Financial Times. https://www.ft.com/content/93e532ee-e3a5-11e9-b112-9624ec9edc59

[99] Novartis and Microsoft join forces to develop drugs using AI, Financial Times. https://www.ft.com/content/93e532ee-e3a5-11e9-b112-9624ec9edc59

[100] JLL analysis of data from CrunchBase. https://www.crunchbase.com/

increasing flows of investment into smaller firms may make it easier to develop and commercialise products independently of larger players – making it more difficult for larger firms to simply acquire innovation.

The upshot of all this is that the competitive environment for life sciences firms is becoming more complex and nuanced. The boundaries between technology and life sciences will continue to converge, redefining work processes and forcing life sciences businesses to augment their skills requirements. At the same time, growing levels of investment will support a more vibrant ecosystem of start-ups, scale-ups and smaller firms. Locations that are strong in both technology and life sciences and, moreover, can jointly harness those strengths, should be well positioned.

**Partnerships between life sciences and technology firms**

| Life Sciences Company | Technology company | Partnership |
|---|---|---|
| AstraZeneca | ProtenQure | Multiyear collaboration to use quantum computing for drug discovery |
| BMS | Concerto HealthAI | Analysis of real-world oncology data to generate insights and real-world evidence |
| Gilead | Insitro | Use Insitro's platform for developing disease models for non-alcoholic steatohepatitis |
| Janssen | Iktos | Use Iktos's virtual design technology for discovery of small molecules |
| Merck | Iktos | Use Iktos's virtual design technology for discovery of small molecules |
| Novartis | Microsoft | Develop at AI innovation lab for personalised medicines |
| Pfizer | CytoReason | Standardisation and organisation of Pfizer's data for integration with the company's immune system model |
| Sanofi | Google | Develop an virtual innovation lab for analysis of real-world data |

Source: Deloitte

## 1.2 Key areas of innovation

Three major areas of innovation and investment within life sciences currently are gene therapy, Immuno-oncology and oncology.

### 1.2.1 Gene Therapy

Large pharma companies will likely need to keep acquiring and making bets on cell and gene therapy companies.[101] According to Allied Market Research, the global gene therapy market valued at $584 million in 2016 and is estimated to reach $4.4 billion by 2023. Manufacturers are also preparing for growth in this market. In a flurry of M&A activity, manufacturers are expanding their gene therapy capability to drive the next major leg of industry growth.[102]

### 1.2.2 Immuno-oncology

Immuno-oncology line extensions are predicted to significantly contribute to growth. GlobalData estimates that the total immuno-oncology market will grow to $35 billion by 2024, up from $14 billion in 2019. Checkpoint inhibitors will drive the growth, growing from $10 billion in 2019 to $25 billion by 2024. The pipeline of immunotherapies is particularly active and includes almost 300 assets with 60 separate mechanisms being evaluated in Phase I or Phase II clinical trials, which is a significant jump from the four mechanisms in Phase III trials or under regulatory review. These immunotherapy trials are being conducted across 34 different tumour types, indication the broad-based application of this new approach to cancer treatment.[103]

### 1.2.3 Oncology

Despite its rapid growth, immuno-oncology is a fraction of the broader market for cancer drugs, which is expected to be worth $200 billion by 2022. According to the IQVIA Institute for Human Data Science, the U.S. market alone will reach $100 billion in 2020. By some estimates, 30 percent of the revenue growth in the pharma industry will come from oncology, and nine of the top 20 products will be oncology products[104]. Oncology is expected to remain the dominant therapy segment.

[101] 2020 Global Life Sciences Outlook, Deloitte. https://www2.deloitte.com/global/en/pages/life-sciences-and-healthcare/articles/global-life-sciences-sector-outlook.html
[102] 2019 Life Sciences Outlook, JLL. https://www.jll.co.uk/en/trends-and-insights/research/2019-life-sciences-outlook-innovation-is-alive-and-well
[103] 2019 Life Sciences Outlook, JLL. https://www.jll.co.uk/en/trends-and-insights/research/2019-life-sciences-outlook-innovation-is-alive-and-well
[104] 2019 Life Sciences Outlook, JLL. https://www.jll.co.uk/en/trends-and-insights/research/2019-life-sciences-outlook-innovation-is-alive-and-well

## Appendix 2: Benchmarking UK life sciences in a global context

The competitive position of life sciences in the UK is supported by a world-leading research landscape and science base. The UK government invests more in health research and development than any market in Europe[105] – a competitive strength that will be bolstered by the recent government commitment to boost overall R&D spending to 2.4% of GDP by 2027. Four of the world's top 20 universities for life sciences are located in the UK (Cambridge, Oxford, UCL and Imperial), while UK research accounts for almost a fifth of the top 1% of global life sciences academic citations.[106] Around 14% of UK university graduates study programmes in natural sciences, mathematics and statistics – approximately double the proportion in the United States, France and Italy.[107]

To assess the maturity of the UK's life sciences sector in a global context, we have provided a summary of the UK's competitive position across several metrics, including research and development spending; the value of pharmaceutical and medical technology exports; participation in global research studies; foreign direct investment into life sciences; and capital raised from life sciences Initial Public Offerings (IPOs).[108] This is important because it provides the framework within which the Cambridge life sciences sector sits.

### 2.1 Government spend on health research and development

The UK government spend on health R&D was $3.0bn in 2017, making the country second only to the US in health R&D spend among comparator countries. As shown in the table below, the UK spend was approximately double that of Germany and Japan.

**Government spend on health research and development, 2017**

| | Spend ($m) |
|---|---|
| USA | 33,710 |
| **UK** | **3,034** |
| Germany | 1,670 |
| Japan | 1,275 |
| France | 1,099 |
| Spain | 1,048 |
| Italy | 914 |

[105] Life Science Competitiveness Indicators, Office for Life Sciences. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/811347/life-sciences-competitiveness-data-2019.pdf

[106] Life science Industrial Strategy Update, Office for Life Sciences. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/857348/Life_sciences_industrial_strategy_update.pdf

[107] Life Science Competitiveness Indicators, Office for Life Sciences. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/811347/life-sciences-competitiveness-data-2019.pdf

[108] Unless otherwise stated, the data presented here is drawn from the Office for Life Sciences' 2019 Life Science Competitiveness Indicators report. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/811347/life-sciences-competitiveness-data-2019.pdf

| | |
|---|---|
| Netherlands | 250 |
| Sweden | 79 |
| Belgium | 67 |
| Ireland | 53 |

## 2.2 Global exports

UK exports of pharmaceutical products had a value of $33.3bn in 2017. While this places the UK fifth amount comparator countries, it should be noted that the value of UK exports was less than half that of Germany in the same year. The value of UK pharmaceutical exports was also considerably lower than that of Switzerland, the United States and Belgium.

The UK also performs poorly in international comparisons of medical technology exports, with the total value of medical exports reaching just $4.0bn in 2017, around one tenth of the value of exports from the United States, and around a fifth of that of Germany.

While the UK is very strong in discovering new products, it is evidently much less so in developing and manufacturing them.

**Global exports of pharmaceutical products by exporting country, 2017**

| | Exports ($m) |
|---|---|
| Germany | 84,192 |
| Switzerland | 71,706 |
| USA | 46,936 |
| Belgium | 45,604 |
| **UK** | **33,299** |
| Netherlands | 38,806 |
| Ireland | 39,246 |
| France | 32,151 |
| Italy | 26,981 |
| India | 14,276 |
| China | 14,986 |
| Singapore | 10,123 |
| Canada | 6,337 |
| Japan | 4,955 |
| Republic of Korea | 3,210 |
| Mexico | 1,490 |
| Brazil | 1,326 |
| Russia | 738 |

**Global exports of medical technology products by exporting country, 2017**

| | Exports ($m) |
|---|---|
| USA | 33,352 |
| Germany | 20,864 |
| Netherlands | 12,422 |
| China | 11,094 |
| Mexico | 8,118 |
| Belgium | 7,696 |
| Japan | 6,830 |
| Ireland | 5,714 |
| France | 4,747 |
| Singapore | 4,486 |
| Switzerland | 4,229 |
| **UK** | **4,029** |
| Italy | 2,854 |
| Republic of Korea | 2,385 |
| Canada | 1,583 |
| India | 911 |
| Brazil | 187 |
| Russia | 147 |

## 2.3 Share of patients recruited to global studies

The UK share of patient recruited to global studies across all trial phases in 2017 was just under 3%, placing it behind only the United States, Germany and Spain among comparator countries. The United States, however, is far and away the global leader – accounting for one third of patients recruited to global studies.

**Share of patients recruited to global studies (all trial phases), 2017**

| | % |
|---|---|
| USA | 32.6 |
| Germany | 3.3 |
| Spain | 2.9 |
| **UK** | **2.7** |
| Canada | 2.6 |
| France | 1.9 |
| Italy | 1.5 |
| Netherlands | 1.4 |
| Australia | 1.1 |
| Switzerland | 0.2 |

## 2.4 Life sciences foreign direct investment

The value of life sciences foreign direct investment into the UK reached £1.1 billion in 2018 – behind only the US, China and Ireland and up by more than a third on the previous year. Total life sciences foreign direct investment in the UK in 2018 was also three times the level recorded in 2014.

**Life sciences foreign direct investment - capital expenditure**

| | Expenditure ($m) |
|---|---|
| USA | 3,254 |
| China | 2,852 |
| Ireland | 1,764 |
| **UK** | **1,107** |
| India | 521 |
| Germany | 540 |
| Switzerland | 188 |
| France | 939 |
| Canada | 664 |
| Republic of Korea | 305 |
| Australia | 94 |
| Japan | 277 |
| Italy | 120 |
| Russia | 116 |
| Sweden | 6 |

## 4.1.5 Global life science Initial Public Offerings (IPOs)

The UK had two life sciences IPOs in 2018, equating to a 1% of the global life sciences IPOs. This is a comparable share to Germany, Japan and Switzerland. The United States had the largest share of life sciences IPOs in 2018, with 40%, followed by China, with around 19%. The relatively poor position of the UK and other European countries in this table should be a matter of concern for the industry as it is access to the deep pools of funding provided by the public equity markets that facilities a company to achieve scale.

**Share of global life science Initial Public Offerings (IPOs) in 2018**

| | Global share of number of life sciences IPOs |
|---|---|
| USA | 40% |
| China | 19% |
| Republic of Korea | 9% |
| Canada | 6% |
| Sweden | 4% |
| Australia | 4% |
| India | 4% |
| Nordic countries | 3% |
| France | 2% |
| Singapore | 2% |
| Germany | 1% |

| | |
|---|---|
| Japan | 1% |
| Switzerland | 1% |
| **UK** | **1%** |

## Appendix 3: Cambridge University Health Partners Life Sciences Vision

While the CPCA Life Sciences strategy work was being undertaken, Cambridge University Health Partners (CUHP) has also developed a vision for the future success of the life sciences sector in Cambridge. Although viewing the subject through a different lens, the approach to developing the sector and delivering the vision is consistent with the strategy set out in this document. The CUHP paper is included here for reference.

# Life Sciences Cambridge

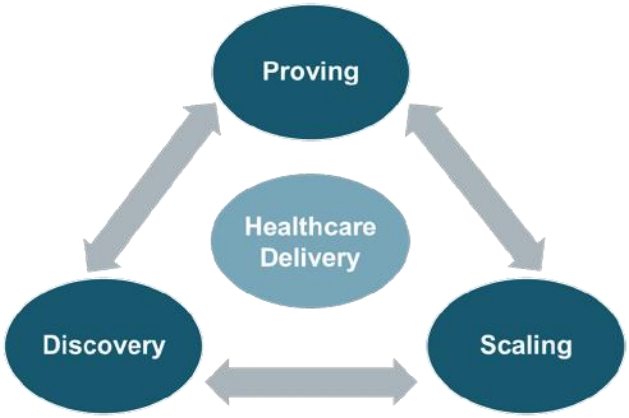
**THE WORLD BEYOND 2030**

- The **burden of global disease** has been shifted by forces of climate change, urbanisation and globalisation, increasing the value placed on science and innovation
- Healthcare is **personalized** and delivered through hybrid digital and physical **community based provider networks** with a focus on **prevention and early diagnosis**
- **Socioeconomic inequality and ageing populations** lead to increased pressures on public services and funding
- **Technology, digitalisation, data and artificial intelligence** have increased productivity across every sector
- **Digital and physical connectivity** facilitate knowledge transfers between sectors and places, resulting in increasingly complex systems and economies
- **Flexible and remote working** have become the norm, with individuals choosing when to work and where to live based on attractiveness and assets

**OUR VISION**

***Accelerating the cycle of discovering, proving and scaling healthcare innovations to improve lives***

- **Improving lives** by reducing the global burden of disease and disability with our local population at the centre
- **Discovery** powered by the *Knowledge Engine*, delivering breakthrough insights into the underlying mechanisms of disease, novel treatments and improved systems for care delivery
- **Proving the value of discoveries from Cambridge and beyond** in real world populations and health systems using integrated health, social and economic data
- **Scaling** breakthrough life science discoveries through the parallel development of versatile commercial models to deliver impact at pace




**HOW WE WILL BE DISTINCTIVE**

***A concentration of exceptional expertise and experience with the culture, infrastructure and systems in place for collaboration and pace***

- **Critical mass of research talent** in the key disciplines of the future with flexible career paths that encourage movement between academia, industry and funders
- **Concentration of companies** across different sectors and stages bringing global perspective and commercial skills
- **Intellectual entrepreneurialism and freedom of thought** to take risks and pursue novel directions
- **Proximity and physical co-location** of expertise across delivery, discovery and commercialisation
- Access to and ability to use integrated **high quality health, genomic, biological, social and economic data** including on local stable research ready population
- National and **global links** stretching beyond the personal making Cambridge as the gateway to global talent, knowledge and scale of data
- Access to **funding and facilities** that are appropriate to and support discovering, proving and scale up in a flexible manner with sharing of core technology

**OUR PROPOSITION TO CORE STAKEHOLDERS**

***Ability to deliver globally differentiated and impactful outcomes in a place they want to be***

- Local population: **world class personalised healthcare**, **jobs** in life sciences of every kind, **great place to live and work** that celebrates diversity
- Researchers, clinicians and professionals: ability work at **leading edge of science and care** with opportunities for flexible career paths and competitive remuneration
- Entrepreneurs: access to funding, expertise, talent, shared resources and **ability to rapidly prove** value; integrating discovery expertise with commercial operations
- Health and care providers: **local integration; commercial partnerships; and a population dataset** that enables value based care delivery and innovative treatments
- Research funders and investors: discoveries that **deliver impact sooner** in the real world; a growth mindset rooted in improving lives and valuing commercial skillsets

- Technology / life science companies: access to **ideas that cross boundaries**, a place where employees want to be that provides opportunities to rapidly test new concepts
- Developers / commercial agents: development of facilities in **full partnership** with focus on maximising long term benefit for all
- Local and national government: enhanced **UK global reputation and competitiveness**, through research business opportunities facilitated throughout the UK

**HOW WE WILL JUDGE OUR SUCCESS**

***Translating our Vision to measurable outcomes that demonstrate our competitiveness not just in outcomes but in speed of obtaining them***

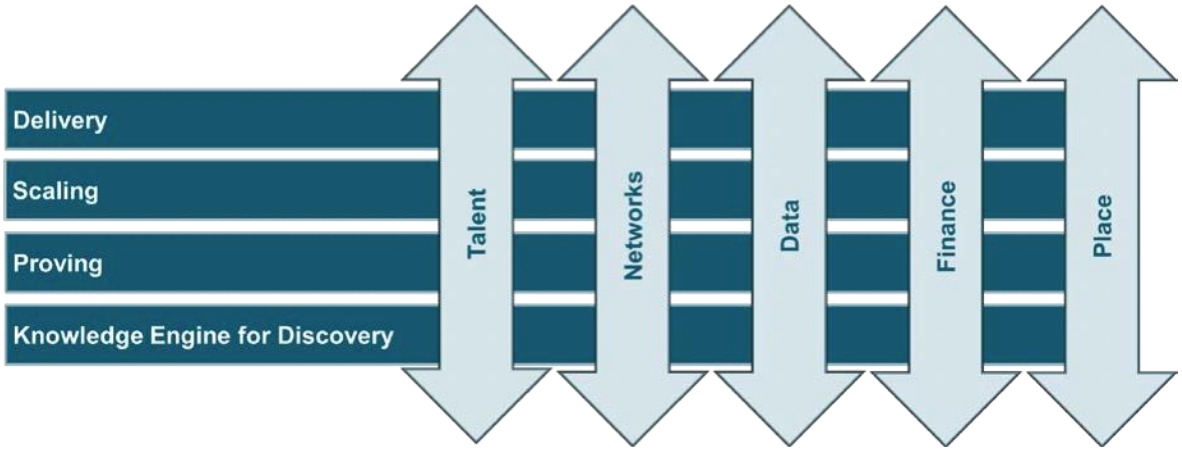
- **Improving lives**: Health status of our local population, number of treatments attracting national and global patients, number of patients treated with innovative / novel / pre-launch treatments
- **Discovering**: Patent files and high quality publications, number of breakthrough discoveries, conversion of patents to innovation or commercial success
- **Proving**: Enquiries run on key data assets, number of innovations being tested or trialled within healthcare providers, speed of proving impact
- **Scaling**: Time to market, funding available, size of IPOs **WHAT CAMBRIDGE WILL HAVE TO DO TO GET THERE**

  **Addressing the gaps and continuing to improve the underlying five pillars (talent, networks, data, finance and place) that underpin the knowledge engine and scaling up resultant discoveries**

  **To deliver on this value proposition, compared with where we are today, Cambridge needs to:**

• Continue to foster and develop the **culture** and **skills** required for discovery and beyond

- — Adapt to post-COVID-19 balance of remote versus co-located working
- — Commit to support specialisms beyond traditional life science knowledge engine – to include data, AI, machine learning, commercialisation
- — Create a culture that expects talent to move between and work across different institutions, take risk, value diversity and drive impact from discoveries
- — Have a competitive attitude towards remuneration



• Evolve our **mechanisms and supporting capabilities for partnerships** internally and externally to

- — Create the agile delivery model for formation of virtual and physical institutions around specific problems
- — Identify and develop core shared infrastructure and assets
- — Develop our Integrated Care System and Primary Care Networks in a way that optimizes care and facilitates discovery, proving and scaling of innovations
- — Create the standard legal and commercial arrangements that facilitate collaboration, the sharing of data and the co-development of IP
- — Connect talent within and across the cluster via networks and partnerships capitalising on the unique 'college' approach to interacting, working and living
- — Develop our common front door, concierge for researchers, industry or investors coming to Cambridge and work collectively on external promotion

• Put responsibly sourced, stewarded, robust and reliable **data** to work by

- — Using it explicitly to improve delivery of care, fuel discovery by connecting and data to drive health innovation and discovery
- — Identifying the highest value opportunities for further investment in creation, enrichment and combination of high quality data
- — Laying the groundwork for long term 'digital mimic' of the population; and the health system
- — Forming links and access arrangements to global data sources to expand power of insights

• Facilitate access to **finance** and funding mechanisms to empower public and private sector endeavours

- — Collaborate and invest in actively seek out and attract funding
- — Fill the gaps in current funding proposition e.g., cross over investors
- — Refine, report and promote the value proposition

• Develop our **place** via physical infrastructure to

- — Allow for the types of research and collaborations which are necessary providing flexible space to accommodate needs at different stages and fast tracking priority developments
- — Create fit-for-the-future healthcare facilities which support innovative models of care
- — Ensure local clusters are exemplars, with effective and sustainable long term transport solutions and infrastructure to support productive and liveable communities

## THE ROLE OF THE CAMBRIDGE BIOMEDICAL CAMPUS (CBC) WITHIN THIS VISION

### *A compelling place to deliver world class healthcare facilitating breakthrough discoveries and a rapid pathway to global impact*

Within the Cambridge cluster, the CBC will be the innovation district distinguished by the colocation of health and care delivery with research institutions and industry that benefit from this proximity

- Vibrant healthcare delivery is at the heart of any successful life science cluster. Access to patients, those that treat them and live with them and generate a deep understanding their needs is crucial for discovery, scale up and proof. In turn research and continuous service improvement benefits patient care.
- Given the current concentration of services Cambridge will continue to make CBC the healthcare campus for the region for public health, primary, mental health, private facilities and specialist care
- Physical proximity facilitates collaboration, exchange of ideas and a common sense of understanding and purpose. Therefore collocating the research and industry that benefits from collaboration with healthcare delivery and each other will be the priority including

- — Flexible facilities for disease themed teams or companies looking to conduct research, prove and scale up healthcare innovations
- — Dedicated collaboration space to enable the exchange of tacit knowledge and informal collaboration
- — University or foundations focusing on healthcare improvement research
- — Permanent disease / condition based research institutions
- — Additional commercial life science company headquarters both pre and post IPO

• Particularly in a modern age with options for virtual working, the CBC also has to attract talent by creating attractive work environments that are easy to access while also providing leisure and support facilities.

# Appendix 4 – One-page CPCA Life Sciences Sector strategy summary

## Cambridge and Peterborough Combined Authority Life Sciences Strategy

Summary of Recommendations

Cambridge has a long and proud history at the cutting edge of life sciences research and is the leading cluster outside London. Growth to date has arguably been through "constructive chaos", which has served the sector well. However, the cluster has reached a level of maturity where that approach may no longer be appropriate and Cambridge plays a crucial role within the UK Life Sciences sector, but has grown more slowly than other clusters in recent years. Hence it is important, recognising the role it plays, and value add it provides nationally, that there is continued support and investment from Government to ensure Cambridge continues to remain competitive'

| Theme | Strengths & Weaknesses | Observations | Recommended Actions |
|---|---|---|---|
| Building the Financial & Management Capacity for Growth | Strengths:<br>-start-up base and support system<br>-funding for early stage companies<br>Weaknesses<br>-Series C+ funding<br>-Few companies of scale<br>-Lack of commercial leadership talent | To better support the life sciences ecosystem, the Combined Authority must prioritise policies that help firms to scale, rather than simply be acquired early in their life cycle and subsumed into a parent company. | • Establish a new £1 billion Life Sciences Innovation Fund<br>• Lead on the drive to improve UK public equity markets for life sciences companies<br>• Create a "Future Leaders Programme" to build commercial management skills of the sector<br>• Support the development of a culture that aspires to scale |
| Building Network Capacity for Growth | Strengths:<br>-multiple established networks<br>-experienced entrepreneurs<br>Weaknesses:<br>-inefficient and confusing networks<br>-lack of single voice to speak to govt and inward investment | Policies should be adopted that help coordinate networks and interactions with external parties.. | • Develop a coordinating body for the strategic initiatives and appoint a "Life Sciences Strategy Director" to drive implementation<br>• Support the establishment of a single agency to promote Cambridge around the UK and internationally<br>• Leverage the OxCam Arc, the UK Innovation Corridor (linking King's Cross to Cambridge) and the Golden Triangle |
| Building Talent & Skills Capacity for Growth | Strengths:<br>-top graduate and post doctoral talent<br>-Existing high employment pool of 20,000+<br>Weaknesses:<br>-Shortage of people with technical skills, especially in the convergence of AI and life sciences, seen as a key differentiator for the Cambridge industry | Work with education providers in the area to further develop education and training programmes and align with industry needs. University of Peterborough presents opportunity to create new scientific and technical degrees aligned with needs of areas life sciences businesses. | • Create new technical education programmes to support skills required by life sciences firms<br>• Support for alternative routes into life sciences employment<br>• Create new programmes to upskill in the tech life science convergence<br>• Improve the diversity and inclusion of the sector |
| Building Physical Capacity for Growth | Strengths:<br>-Well established and substantial specialist provision of space for life science companies<br>Weaknesses:<br>-Need for additional capacity - esp. grow on<br>-Need to address transport & housing issues | Ensure planning policies make provision for facilities to enable growth of the sector. Coordination between the Combined Authority and Cambridge City Council/South Cambs District Council should be undertaken to expand out the existing Cambridge and South Cambs sites. | • Implement life science employment growth within site areas currently consented for new buildings but stalled<br>• Densify life science employment within currently consented sites<br>• Intensity life science employment within current buildings by encouraging firms from other sectors to relocate to alternative parks<br>• Expand life science employment through new planning applications within and adjacent to established areas |