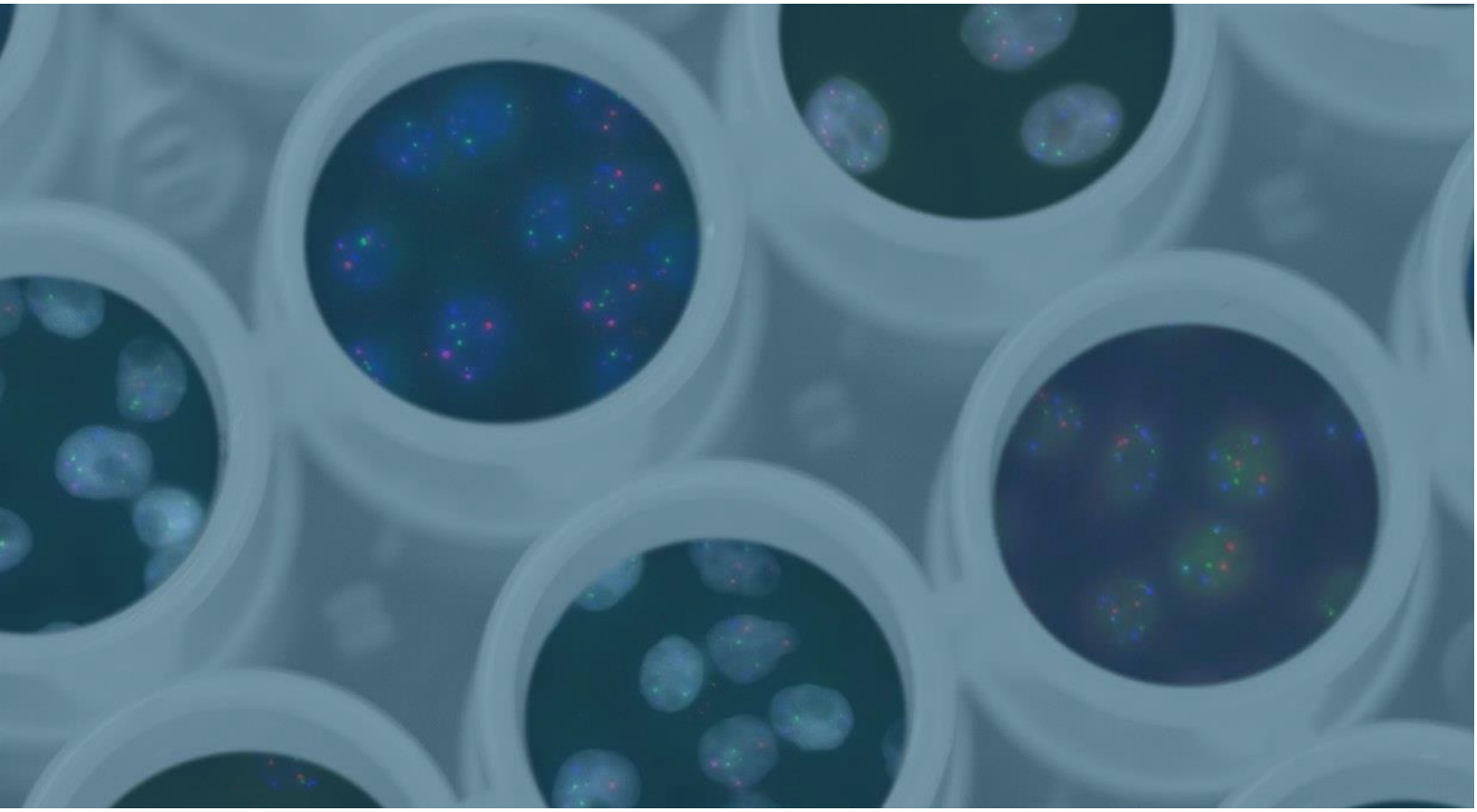


Health Innovation in Greater Manchester: Supercharging our Collective Strengths

A report by Metro Dynamics commissioned by Health Innovation Manchester

September 2023

Contents

Executive Summary

Context

The response to the COVID-19 pandemic was perhaps the most extraordinary example in history of the power of health innovation in responding to a public health catastrophe. Although the pandemic was unprecedented in terms of the support put in place to radically enable the health innovation response, it led to considerable learning and furtherment of the common understanding of the 'art of the possible' in improving human health. Alongside escalating the process of scientific discovery to develop and deploy tests, therapeutics and vaccines in record time, it crystallised the critical role of focussed collaboration between academics, businesses, regulators and healthcare system partners in powering the health innovation cycle from discovery through to mass adoption at pace and scale. This increased understanding and profile of the opportunities in the sector has contributed to a favourable policy landscape, which should create positive forecasts for this industry sector.

There are a series of national visions, strategies, plans and legislation which are relevant here, including the NHS Long Term Plan; levelling up White Paper, Health and Social Care Integration White Paper; UK Life Sciences Vision; Medical Technology Strategy; Genome UK and The Future of UK Clinical Research Delivery. These will ultimately be judged in terms of the impacts they achieve in improving population health, reducing health inequalities, and boosting the economic prosperity of the nation and citizens alike through raising productivity, diminishing the fiscal impacts of ill-health and securing inward investment.

Whilst these policies are driven nationally, they will need to come to fruition at a place level, in functional ecosystems where academic, industry and healthcare system partners will bring benefits of health innovation to populations at large. Yet these are still agendas explored in silos, most of which are driven from the centre without necessarily considering the importance of place.

Health Innovation Manchester has been developed by the leaders of the GM city region to respond to this challenge. It is now in its 7th year and it continues to work at the centre of these policy areas through partnerships and delivery of specific activities to discover, develop and deploy innovation aligned to the needs of GM citizens, and support economic development across the city region. This integrated approach remains unusual in the national landscape, contrasting against the more traditional approach based on separate and siloed commissions, delegations and responsibilities of academic, innovation and economic functions at place level.

Since Health Innovation Manchester's creation there has been significant evolution, bringing together the Academic Health Science Network (AHSN) and Academic Health Science Centre (AHSC) functions, adding in translational research capabilities through the NIHR Applied Research Collaboration GM (ARC-GM) and supplementing this with a major focus on digital, including hosting the GM ICS digital transformation office. More recently there has been a more significant focus on developing industry partnerships, specifically with the global pharma sector. Health Innovation Manchester harnesses these capabilities

through an innovation pipeline and delivery method aiming to accelerate innovation at scale, with projects prioritised directly towards GM's transformation priorities. Health Innovation Manchester plays a major role in coordinating partners across the city region including in securing investment, over £200m from 2020/21 – 2022/23. Full documentation of HInM business plan and recent impact report are available via corporateoffice@healthinnovationmanchester.com.

This report was commissioned by Health Innovation Manchester to make an independent assessment of the life sciences and MedTech industry sector in the Greater Manchester city region. For the purposes of the report we have considered activity in Cheshire East within the functional economic geography of the city region where possible from existing data and relevant to the analysis. The analysis is framed within a light touch description of the health status of the GM population and its consequences, the academic landscape in the city region and its readiness to support future growth of the sector, and the current GM approach to health and care delivery. The detailed analysis explores the scale and composition of the industry sector and its geographical focus within the UK and more granularly within GM, alongside national trends and data. We have explored the competitive strength of the sector in GM within its national context. The findings are drawn from secondary data and information currently available within the public domain. The report ultimately seeks to identify the areas where we can strengthen our place-based capacity and capabilities in pursuit of this aim.

To successfully deliver healthcare innovations for the benefit of patients, citizens, industry partners and the local economy, knowledge must lead into products, services, clinical pathway transformation and methods, which must be applied in our healthcare settings and communities. To make a meaningful difference these things must be delivered at scale. As expanded on in Chapter Four, we have made a baseline assessment of some of the critical elements of a successful health innovation ecosystem.

Findings

Globally the Life Sciences sector is growing by approximately 7.6% pa and the UK is positioning itself to increase its share of the market. Although there continues to be fierce competition for investment internationally, the Life Sciences (LS) and MedTech sector comprises a significant and growing part of the UK economy which is forecast to play an increasingly important economic role in the years to come. There has been significant growth in the sector national (16% over the last 10 years), driven by increased demand linked to changing population needs, and supply developments in the form of emerging scientific advances in diagnostics and therapeutics as well as digital technologies. Significant further sector growth is anticipated (12% to 2028[1]). 10% of UK LS and MedTech business that are in the Northwest of England and of those (37.8% (288) of Northwest sites are in GM. The Northwest businesses grew at more than twice the national rate in the last five reported years, and GM is now one of a limited number of density-based Life Sciences clusters in the UK. Although many of these businesses are still small in terms of

[1] Based on annual rate of increase forecast in the biotechnology sector between 2022/23 and 2027/28

employment and turnover, sector trends suggest there is growth potential. Analysis of the size and shape of industry shows that the city-region has emerging specialisms in key policy areas, such as genomics, and the areas where Life Sciences and Technology converge, but this focus is not yet a dominant finding.

GM is outstanding at higher education and producing knowledge; the four universities give us among the largest student populations in Europe, educating nearly 40,000 people per year. There are more than 20 universities within a one hour drive of our city region. The largest medical school in the UK is in Manchester, and between the Universities proportionately more people are educated in Life Sciences and complementary STEM subjects than comparable city regions. This is fundamental in producing the world-leading researchers, clinicians, and HealthTech entrepreneurs of tomorrow, as well as providing the human capital for an expanding health innovation business base. There is evidence of some success in elements of commercialisation of this knowledge, with strong links between where industry focus and academic excellence, with strong recent spin-out performance within the city of Manchester. However the track record in scaling these startup bases is not as significant. Comparative lack of Innovate UK funding within GM is a related factor.

Our ecosystem preparedness assessment, which is summarised below and included in full with justifications at Chapter Four, considers the readiness of the ecosystem to be responsive in seizing and fully capitalising upon the opportunities which will come. Overall, the sector shows success, but there is further development needed to enable GM to stand out as an obvious choice for investment.

GM Health Innovation Ecosystem Preparedness Assessment - Summary		
Category	**Ecosystem Requirement**	**GM RAG Assessment**
Knowledge Engine	Research Quality	
	Research environment and interdisciplinary infrastructure	
	Research impact and reputation	
	Commercialisation through spinouts	
	Knowledge Transfer	
	Commercialisation through contract research and consultancy	
	Talent Pipeline	
	Specialism within industry (breadth)	
	Specialism within industry (depth)	
	Specialism within complementary industry	
	Supply Chain	
	Supply chains, commercialisation and moving to diffusion	
Physical Space	A pipeline of investment in creating physical innovation assets	
	Availability of office and industrial space	
	Business Incubators and Science Parks	

	Proportion of premises with Gigabit broadband coverage	
Finance and IP	IP	
	Funding to Clinical Trials	
	Patents	
	Seed Funding	
	Health Innovation Manchester leveraged funding	
	Venture Capital	
	Innovate UK Funding	
	Gross Domestic Expenditure on R&D	
Capability Development Programmes	Sector Support	
	General support	
	IP commercialisation support	
	Accelerators	
	Complementary Support	
Networks and Linkages	Business Networks	
	Soft Power	
	System Partners	

Conclusions

Our review suggests that GM has a core of strength across the assets required for a thriving health innovation ecosystem, but that there are further collective actions that should be taken to develop conditions for the sector to flourish, to optimise working between elements of the ecosystem, and for GM to confidently position its significance and offer. We suggest that by taking these actions, there is a significant opportunity for GM, as one of the key economic and research centres in the North, to create the conditions to support Life Sciences and Health Tech entrepreneurship. Linking emerging businesses into supportive networks and creating the conditions for businesses to flourish, grow and continue to innovate will be key to ensuring that GM plays is maximal contribution for UK economic productivity. The report concludes with recommendations in six areas:

- **The Knowledge Engine:** maximising the efficacy of health innovation commercialisation and knowledge transfer.
- **Confident prioritisation:** building emerging activities into embedded, recognised health innovation strengths for GM.
- **Creating Vibrant Start and Scale ups:** maintaining a strong pipeline of startups to deepen the HealthTech blend and further encouraging and supporting business to scale.
- **Crowd in National and International Companies and Finance:** understanding where the balance lies between the available level of investment and loan finance; the corporate and technical expertise needed to ensure it is structured into fundable deals

and access to the subject matter expertise to make projects fundable; as well as the role of networking in catalysing this process.

- **Building Innovation Assets:** it should be noted that one of the strengths in the revival of GM over the last two decades has been the renewal of the physical infrastructure of the city region. This will be an ongoing part of the development of the science and technology ecosystem in general and will subsequently be an important contributor to the health innovation economy.
- **The Power of Focussed Collaboration:** facilitating deeper, quicker and more dynamic connections to respond quickly particularly as opportunities arise.

Our research to date is primarily based on published data and reports. At the next stage, a fuller picture of the ecosystem will need to be developed informed by discussions with key stakeholders to agree priorities for focussed, collective partnership action, and to continue to build relationships with national policymakers to ensure GM has the support to achieve its growth ambitions.

1 Introduction

Health Innovation Manchester

Health Innovation Manchester is an academic health science and innovation system, working at the heart of the research, health and care system and Life Science and Health Tech sectors in the GM city-region. The core of their mission is to create the conditions for new and improved solutions to be discovered, developed and deployed, to address the major health challenges and inequalities of our time, transforming the health and wellbeing of GM citizens and stimulating innovation-based growth across the city-region.

Their current strategy, Leading with Delivery, was developed as the UK emerged from the COVID-19 pandemic, at a time when the unequal health outcomes across the GM population had been exacerbated, and the healthcare system came under acute and sustained pressure. Despite enduring demands on system bandwidth, partners in GM have achieved significant steps in health innovation, including as a key national partner in the pandemic response, in which 8000+ GM residents took part in 73 COVID-19 studies, and through strategy, design and innovation projects which have been delivering results to support system recovery and development. Now, in the final year of delivery against this strategy, the HInM 2023-24 Business Plan set out five clear priorities designed to strengthen the relationships and capabilities of the combined GM Health Innovation Ecosystem, deploy tested solutions to directly affect patient health across the Integrated Care System (ICS), and deliver novel diagnostics for some of the most prevalent health conditions in the city-region. These priorities are:

1. Enhanced diagnostics accelerator, a programme funded by Innovate UK under levelling-up monies
2. GM Care Record optimisation to increase benefits realisation from existing investment through enhanced direct care clinical decision making
3. Deployment of proven innovation as agreed with the GM ICB (NHS GM Integrated Care)
4. Strategic industry partnerships
5. Academic partnerships

Study Objectives: Understanding the Life Sciences and Health Tech Sector

As Health Innovation Manchester shapes the ambitions for the next phase of their evolution, there is a window of opportunity to take stock of the Health Innovation, Lifesciences and MedTech sector within GM and nationally, and frame this within a high-level review of the local assets and ecosystem preparedness.

GM is well placed to maximise the possibilities for health innovation locally. The new, deeper devolution deal will enable more local leadership over factors which affect the wider determinants of health, and GM has been recognised as an emerging globally competitive cluster of research and innovation activity across multiple industry sectors

through being awarded £33m to fund projects through the GM Innovation Accelerator. . There is a national policy push towards the betterment of population health with the Health and Social Care Integration White Paper aiming to adapt healthcare models to enable prevention and population health management at scale, The he UK Life Sciences Vision[2] and MedTech Strategy[3] and the future of clinical research document (ref) aim to create the conditions for national health research and innovation activity to become increasingly globally competitive and improve UK population health,. The more recent Sinker review has been commissioned to make recommendations on the national innovation ecosystem and its relationship with the NHS.

GM has a strong health innovation heritage to build on. The city-region has been responsible for ground-breaking developments in fields such as cancer treatment, mental health and regenerative medicine. GM innovators have played key roles in developing life-savings medical technologies such as CT scanners and portable defibrillators. The city-region has strong ambitions to bring the transformative power of innovation to bear on our greatest challenges. GM aspires to be at the forefront of global progress as nations interpret the opportunities and challenges that will come through mass adoption of new technologies in the fourth industrial revolution and the increasing volatilities in an uncertain and changing world. Whilst it is not as overt in the above policy documents as we might like, place based approaches to innovation ecosystem development are essential in delivery of the above policy areas.

Understanding GM's place-based assets and areas of competitive advantage within a sector which is fast paced and experiencing high growth is critical to delivering these innovation ambitions. All too often, health, economic and innovation policy are considered in silos, but in GM conditions are being created to do things differently by working more effectively across the sectors. Innovation GM has an ambitious plan to create a new place-based partnership, led through a triple-helix Board representing industry, academia and the public sector building on GM's existing R&D assets and public sector delivery capacity to drive innovation-led growth in towns, city centres, and out-of-town science and technology parks in every district in GM. The GM Innovation Accelerator, a Government-backed pilot to boost innovation and attract new R&D investment into the city-region, supported by funding from Levelling up, is a key proof point of the current approach to deliver value through innovation.

Within this context, this current report has the following aims:

- To describe the GM Life Sciences and MedTech sector and its current position within the broader UK Life Sciences sector, drawing on public and private datasets.
- To frame this within a high-level review of the broader GM Health Innovation Ecosystem, to understand our underlying population health and its consequences as well as our place-based assets and how these can be targeted to support industry growth.

[2] UK Life Sciences Vision
[3] UK Medical Technology (MedTech) Strategy

- To identify opportunities for us to grow the Life Sciences and MedTech sector in GM, bringing investment into the city-region and strengthening our enterprise and industrial core.

The report provides an opportunity for the Health Innovation Manchester team, Board and system partners to:

- Reflect on the current state of the GM health innovation ecosystem.
- Reflect on where Health Innovation Manchester and the associated partners are currently adding value, regionally and nationally.
- Calibrate where future potential impact lies.
- Guide the work that needs to be done to create conditions for success in future.

Scope of the Research

This report was commissioned to make an assessment of the Life Science and MedTech sector in Greater Manchester, with a specific emphasis on the existing industry base. It explores the scale and composition of the sector and its geographical focus nationally, with a spotlight on understanding the competitive strength of the sector in GM. The industry analysis has been framed by a high-level review of GM's health innovation ecosystem and its preparedness to support future growth of the GM LS and MedTech sector. The report has been produced through desk-based research and is designed to providing an overview and starting point for those with an interest in the sector.

Definitions

Health innovation is defined by The World Health Organisation (WHO) as:

"a new or improved solution with the transformative ability to accelerate positive health impact[4]."

This definition encompasses a multi-partner collaborative approach, focussed on health demands, the supply of innovations, and incubation to implementation and sustainment.

The **Health Innovation Ecosystem** is defined in this report as the research, industry and healthcare partners conducting health innovation activities in GM, and the structures and incentives which provide the enabling conditions for collective success.

The **Life Sciences** sector is defined by the UK government as being made up of four sub-sectors[5]:

- biopharmaceutical core
- biopharmaceutical service and supply
- medical technology core
- medical technology service and supply

[4] Health Innovation for Impact; The World Health Organization
[5] Bioscience and health technology sector statistics 2021

'Core' sub-sectors are made up of businesses which research, develop and market new products while 'Service and Supply' businesses are part of the supply chains and specialist ecosystem.

To assess the LS and MedTech sector we have analysed the following sub-sectors of businesses[6] to define the businesses which operate at the interface of digital and health:

- Artificial Intelligence: Life Sciences
- Immersive Technologies: Healthcare
- Internet of Things: e-Health
- Sensors: Medical
- Software as a Service: Healthcare
- Wearables and Quantified Self: Medical

The MedTech sector refers to businesses creating equipment, medical devices, machines, diagnostics, software and tools used within clinical setting, and developing treatments and improvements relating to clinical processes and pathways.

Report Structure

To meet these aims, the report sets out:

Chapter	Overview
2. **The Case for Change**	Describes the interdependent local population health, social and economic drivers that health innovation must respond to, and key features of the national and city-regional policy landscape.
3. **The Life Sciences and Health Tech Industry**	Analysis of the national sector and the size, shape and growth of the sector in the North West and GM.
4. **Health Innovation Ecosystem Preparedness Assessment**	Baseline assessment of GM's quantifiable strengths within the critical components of a successful health innovation ecosystem.
5. **Where Next for GM Health Innovation?**	Conclusions and recommendations for Health Innovation Ecosystem partners to consider.

[6] We have opted not included the parts of the MedTech and Biopharmaceuticals sectors which overlap with digital sectors to avoid double counting.

2 The Case for Change

The Health Challenges of Our Time

The combined efforts of scientific, healthcare and social progress have a long history of driving significant improvement to life expectancy in England. From the 19th century to the early years of the 21st century scientific discovery, the dawn of universal healthcare and societal and lifestyle improvements in housing, hygiene, sanitation and nutrition led to an almost doubling of the longevity expected at birth. In 1841 males and females in England could expect to live to their early 40s; by 2011 males could expect to live for 79.09 years, and females for 82.96 years.

Given these extraordinary successes, the nature of the health challenges that we are responding to has evolved. More effective treatment of disease has led to increasing numbers of people living to older and 'very old[7]' ages. However, many people are living for longer with complex comorbidities, requiring increased levels of healthcare support, and we have persistent inequalities in health which were exacerbated by the COVID-19 pandemic. With the significant exception of the recent pandemic, infectious diseases have fallen well down the list of causes of mortality, to be replaced by a series of diseases which are significantly driven by lifestyle factors.

These social changes have created new economic opportunities and stimulated growth of the Life Science sector nationally and internationally (explored in chapter 3). Outlook for the sector is strong, fuelled by rising demand, investment in R&D and accelerated growth through the adoption of digital technologies.

The market remains competitive however with an evolving regulatory landscape and businesses continuing to face geopolitical and economic uncertainties. Capitalising on the sector's growth potential to unlock economic opportunity as well as tackle pressing social issues will require targeted intervention and partnership working which GM is well placed to deliver.

Population Health Drivers

Fundamentally, the NHS was designed to treat disease, and the shift to a more complex human health picture, alongside increases in mental ill-health, has led to sustained pressures on healthcare systems. Providers are recovering from the pandemic, dealing with patient backlogs and staffing pressures, and simultaneously reforming into Integrated Care Partnerships which will be better able to address population health in its broadest sense.

Consequently, the health innovation policy landscape aims to balance priorities between keeping people well as well as diagnosing, treating and curing disease:

[7] Defined by UK Government as 90 years and over

The Challenges for Health Innovation	
	
Keeping People Well	**Treating and Curing Illness**
The number of people living to older ages, driven by advances in the treatment of disease, has not been accompanied by people staying in good-health during mid- and later-life. This has led to an increase numerically in the number of our residents who live in ill-health for long periods of their lives. We know that this is holding back local economic productivity. To support people to live healthy, independent and full lives for longer, we need to increasingly apply health innovation to prevention and early diagnosis and capitalise on the possibilities of medical technology and digitisation.	The rising older population also means that despite scientific improvements leading to reduced death rates, there are still increasing numbers of people dying from some major diseases. Three in four of us will die from cancer, cardiovascular disease, or dementia[8]. Making further major scientific gains in treating and ultimately curing these diseases will require us to create the conditions for knowledge discovery and diffusion at a scale commensurate with the challenge.

The challenges that Health Innovation needs to respond to are evident in the data. On average men now live 16.4 years in poor health; for women this is 19.2 years – almost two decades of their lives. As evidenced in Table 1 (below), there is also a wide gap in healthy life expectancy between those in the least- and most-deprived deciles of society, largely due to wider and social determinants of health (Annex A).

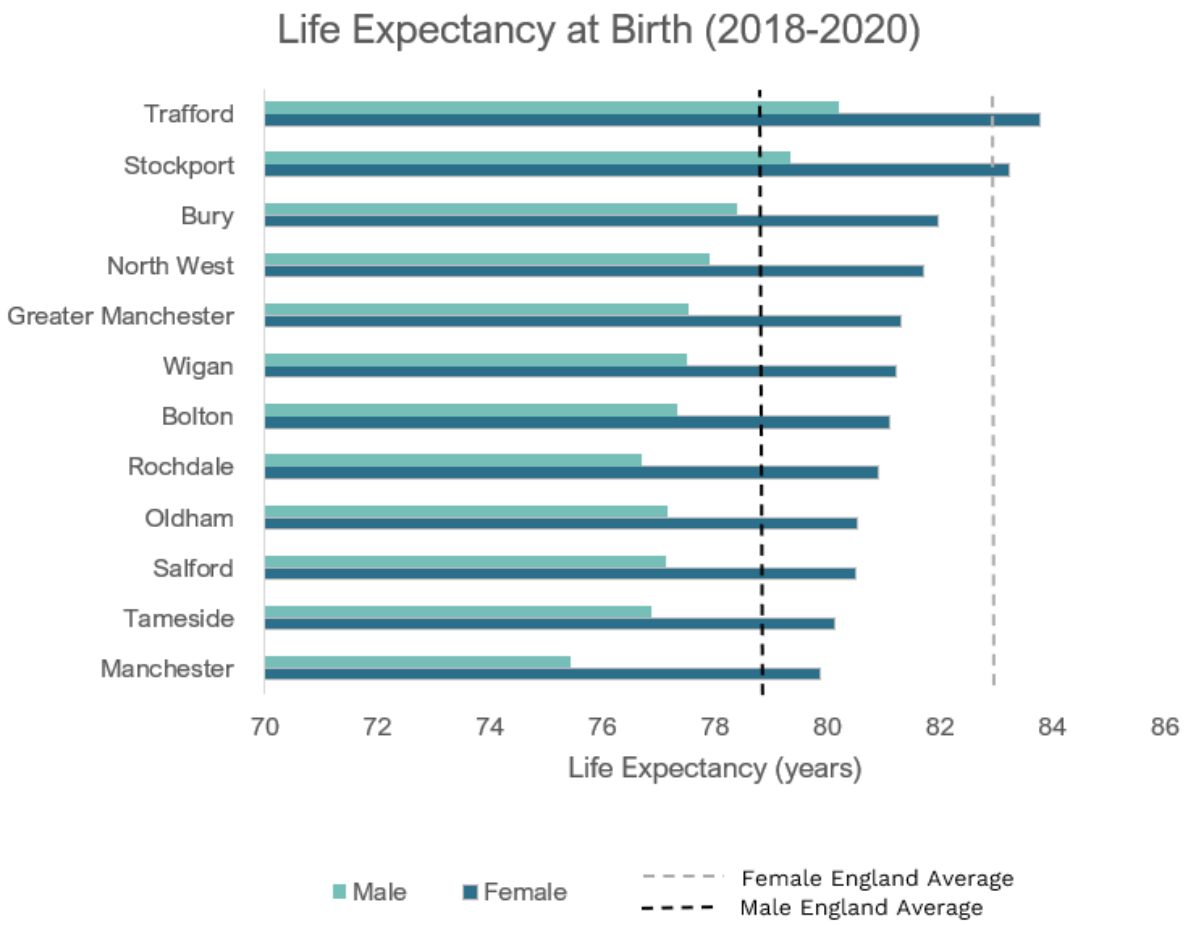
Table 1. The State of The Nation's Health, England, 2018-20

The State of The Nation's Health, England, 2018-20[9]	
Average Life Expectancy (Male)	Average Life Expectancy (Female)
79.5	83.1
Life Expectancy Deprivation Gap (Male)	Life Expectancy Deprivation Gap (Female)
9.7 years	7.9 years
Average Healthy Life Expectancy (Male)	Average Healthy Life Expectancy (Female)
63.1	63.9
Healthy Life Expectancy Deprivation Gap (Male)	Healthy Life Expectancy Deprivation Gap (Female)
17.6 years	16.8 years

[8] Carnall Farrar
[9] ONS

The 2.87[10] million people living in the GM city-region have, on average, among the lowest life expectancies in England. As Figure 1 shows, only Stockport and Trafford had a higher life expectancy at birth than the England average in 2018-20. In GM the life expectancy gap between the least and most deprived areas is 9.5 years for men, and 7.7 years for women[11].

Figure 1. GM Life Expectancy by Borough compared to England average, 2018-20



Source: ONS, 2021

Inequalities between places, boroughs and neighbourhoods were put into sharp focus during the COVID-19 pandemic. Mortality rates were 25%[12] higher in the GM city-region than in England as a whole, and 2.3 times higher in GM's most deprived population decile compared to in the least-deprived decile. Across England there were consistently higher mortality rates from COVID-19 among Black British people and those of South Asian

[10] Census 2021
[11] GMICP Strategy
[12] Institute for Health Equity

descent across England compared with other ethnic groups[13], however the overall relationship between ethnicity and mortality is complex and remains the subject of on-going research[14]. A range of variables can result in differential mortality rates across ethnic groups, however it is often the case that ethnic minority populations are over-represented within disadvantaged communities and the link between poverty and lower life expectancy is well established (see Table 1 above).

The ONS health index for Integrated Care Systems (ICSs) shows that GM had the highest indexed rates of mortality and avoidable mortality of ICS regions in England in 2021; this was also the case in 2019, prior to the pandemic. GM has high rates of the health risk behaviours and low comparative scores on socioeconomic indicators. GM also scores comparatively poorly against indicators relating to early years and childhood physical and mental health and educational attainment.

Analysis of age-standardised population mortality data[15] across benchmark combined authority areas suggests that GM's boroughs have among the highest rates among English location authority areas of mortality from causes including cancer, cerebrovascular disease, cirrhosis and other liver diseases and dementia and Alzheimer's diseases, which all have risk factors which are potentially amenable to lifestyle modification. Manchester[16] had the joint-highest under-75 mortality rate from cardiovascular diseases considered preventable in 2021. Rochdale, Tameside, Bolton, Oldham and Salford also had rates which were categorised as high. Manchester also had the highest rate nationally of premature death of adults with severe mental illness. All GM Boroughs except Trafford were rated as high for this measure.

Table 2 shows the age-standardised mortality rates per 100,000 population for leading cause in which areas of GM see worse outcomes than national levels, with the regional mortality rate also included for reference.

[13] Institute for Health Equity
[14] ONS "Ethnic differences in life expectancy and mortality from selected causes (2021)"
[15] ONS
[16] Office for Health Improvement and Disparities

Table 2. Age-standardised mortality rate by Leading Cause.

Area	Cancer (malignant neoplasms)	Acute respiratory diseases other than influenza and pneumonia	Cerebrovascular diseases	Chronic lower respiratory diseases	Cirrhosis and other diseases of liver	Dementia and Alzheimer disease	Ischaemic heart diseases
England	248.32	6.15	49.80	44.56	17.40	106.25	97.02
North West	269.11	7.31	55.25	54.98	24.06	118.41	114.15
Bolton	259.88	5.58	54.30	63.52	31.95	138.85	127.49
Bury	295.99	6.16	62.84	52.92	24.96	134.26	106.30
Manchester	327.88	5.25	67.33	80.48	23.12	136.66	169.64
Oldham	282.08	6.80	70.41	71.67	33.53	125.05	135.39
Rochdale	291.73	9.51	58.99	59.14	31.08	124.16	128.41
Salford	313.56	12.20	55.61	82.92	23.42	136.86	113.81
Stockport	237.39	6.69	49.46	33.40	22.77	110.59	105.29
Tameside	299.23	2.86	53.18	73.44	19.10	141.05	147.52
Trafford	252.47	6.87	53.19	39.89	17.22	107.35	105.56
Wigan	266.75	8.70	58.82	51.04	26.31	121.63	110.83

The Imperative for Health Innovation

Health innovation is well placed to respond to the economic and social impacts of ill health, whilst also helping to address the pressures within the health and care system and reducing the long-term fiscal cost of state intervention in health. Indeed, given the metrics above, innovation in health can be considered an absolute requirement in the city region, not a 'nice to have'.

Productivity benefits:

Whilst there are significant direct productivity gains to be achieved through the growth of the sector, research commissioned by Office for Health Improvement and Disparities[17] noted that nationally, poor health results in productivity losses of £31-33 billion annually[18] and leads to public service spending of £17 billion a year to address with the consequences[19].

A concerted effort to reduce these deep-seated inequalities across communities by applying health innovation to our greatest health challenges could, over time, significantly reduce costs to the public sector, whilst also improving economic performance and spreading wealth more equitably. It is recognised that this is not an easy ambition to deliver.

Social and state cost:

The social and economic cost of not taking action is significant. Although long-term survival rates for many of society's most serious diseases have improved significantly, numbers of diagnoses are often still rising due to population changes, and the societal and state costs remain high, alongside the impacts on individuals and their families and communities.

[17] Formerly Public Health England; Metro Dynamics "Health and Wealth: The Inclusive Growth Opportunity for Mayoral Combined Authorities"
[18] Frontier Economics (2009) "Overall Costs of Health Inequalities – submission to the Marmot Review"
[19] Early Intervention Foundation (2016) "The Cost of Late Intervention"

Premature cardiovascular disease mortality rates in the most deprived 10% of communities are four times higher than those in the least deprived[20]. Cardiovascular disease costs the health system an estimated £7.4 billion and the economy an estimated £15.8 billion a year[21]. Cardiovascular disease is also a risk factor for dementia. The total annual cost of dementia was estimated at £24.2 billion for 2015, including £10.1 billion attributable to unpaid care[22].

There are around 19,000 additional deaths per year in England because mortality rates are higher in more deprived groups for most cancers[23]. A 2012 Oxford University study found that the annual cost of all cancers to the UK economy, including healthcare spend, was £15.8bn[24].

Health and the economy in GM:

The length of time that GM residents live, and the proportion of their lives that is spent in good health, is both directly linked to causal socioeconomic factors, and itself a causal factor in GM's productivity gap.

The economic impact of this is consequential; GM has consistently been above national levels for the percentage of economic inactivity which is due to long-term and temporary ill health.

The city-region has also mirrored the national trend of people leaving the workforce since the pandemic, with ill-health being one of the main causes. Ill health contributes widely to the North West's productivity gap, which has widened in recent years; GVA per head, per hour[25] worked stood at £31.78 in 2019, almost 10% beneath the national average.

The economic impacts of ill health also directly affect public finances through the requirement for the health and care system to respond to increasing demand, lost Government income from taxation and increased requirements for welfare support.

Health innovation responds to interdependent health, wealth, productivity, and fiscal impacts, delivering individual and societal benefits for the GM population, as well as people nationally and globally who will ultimately benefit from innovations developed in the city-region.

Table 3 demonstrates the intrinsic links between the health and productivity challenge in GM.

[20] The Kings Fund
[21] The Kings Fund
[22] Wittenberg et al 2019
[23] Cancer Research UK
[24] The University of Oxford
[25] The Productivity Institute

Table 3. Health and Productivity Interdependency, GM

Key Statistics on Productivity and Health Interdependencies in GM[26]	
	GM's productivity is around **10%** below the national average
	Raising GM's productivity to the UK average would generate **£8.6bn** of GVA per year
	Lower labour market participation caused by health problems explains around **30%** of the productivity gap
	Research found that as much as **75%** of the variance in employment rates between neighbourhoods in GM is accounted for by physical and mental health.
	Needing to care for ill loved ones can also stop people being able to access and sustain work. There are around **280k** unpaid carers in GM.
	People in the North are **39%** more likely to lose their job after a spell of ill-health than their counterparts elsewhere in England.
	**85%** of GM residents survey respondents who are disabled or economically inactive due to ill health are worried about the cost-of-living crisis.
	It is estimated that the equivalent of £287 per person is spent by the state on late intervention – this equates to more than **£823** million for GM

The National and Regional Response

Addressing the UK's health and productivity challenge cuts across national government policy. The most significant healthcare policy in recent years, the Integrated Care System (ICS) White Paper and Guidance[27], specifically references the need to use technology and wider innovation to meet population health needs. ICSs also have a stated requirement to use data and digital technologies to connect services and understand need. A key part of the rationale for the integration of health and care services is that expectation that they will provide services to meet health, care and prevention needs, and address the wider

[26] *The Health Foundation; UK Government; The Early Intervention Foundation; Bambra, Munford, Brown et al, 2018; The Productivity Institute; GM ICP Strategy 2023-28; GM Independent Prosperity Review*

[27] Integrated Care System Guidance

determinants of health. One of the four core purposes of ICSs in the NHSE ICS design framework is to 'help the NHS support broader social and economic development'[28].

The UK Innovation Strategy[29] and UK R&D Roadmap[30] set out a plan for delivering innovation-led growth by realising the potential of our knowledge assets to deliver societal and economic impact. To deliver this, the conditions to support adoption and diffusion of cutting-edge technologies need to be bolstered, and effective innovation ecosystems need to be developed and strengthened.

This will require the exploitation of emerging technologies and the creation of conditions to support businesses to innovate. Emerging and developing technologies and scientific methods, such as medical, pharmaceutical and bio technologies and genomic healthcare are key drivers in the growth of the Life Sciences sector, and growth is forecast to increase dynamically in the coming years[31] [32].

The development of a strategy for UK Life Sciences[33] demonstrates the importance to the UK of a growing innovation-based Life Sciences sector, and the scale of the potential economic and social opportunities. Delivery planning for the seven missions (Table 4) set out in the UK Life Sciences Vision has direct stated ambitions[34] to build research infrastructure outside the Greater South East, and to address ill health in the North of England. The sector is also a target for the Department for Business and Trade's international activities.

The Levelling Up White Paper[35] of 2022 committed to using innovation-based growth to address the challenge of economic disparity and historic underinvestment in some areas of the country, as well as committing to addressing some of the biggest contributors to poor health, including by setting up at least 100 Community Diagnostic Centres in England by 2025 to improve access to diagnostic services.

Table 4. UK Life Science Vision: Seven Missions

Seven UK Life Sciences Missions:	
	1. Improving translational capabilities in neurodegeneration and dementia.
	2. Enabling early diagnosis and treatments, including immune therapies such as cancer vaccines.

[28] Integrated Care Systems Design Framework
[29] UK Innovation Strategy
[30] UK R&D Roadmap
[31] Deloitte
[32] IBISWorld Biotech Industry Outlook
[33] UK Life Sciences Vision
[34] Accelerated Access Collaborative
[35] Levelling Up White Paper

	3. Sustaining the UK position in novel vaccine discovery development and manufacturing.
	4. Treatment and prevention of cardiovascular diseases and its major risk factors, including obesity.
	5. Reducing mortality and morbidity from respiratory disease in the UK and globally.
	6. Addressing the underlying biology of ageing.
	7. Increasing the understanding of mental health conditions, including work to redefine diseases and develop translational tools to address them.

GM Context:

The national policy landscape is reflected in GM's approach to growth. GM's strategy portfolio is set up to capitalise on changes to health innovation policy and devolution opportunities. Themes running through some of the major GM economic, health and innovation strategies include:

- Strong sector prioritisation of Health Innovation and the Life Sciences as frontier innovation sectors and focus for GM International Strategy and inward investment activities of MIDAS
- Commitment to making growth inclusive and actively addressing inequalities
- Plans for innovation to act as a driving force for growth
- Development of effective innovation ecosystems to maximise knowledge assets and attract investment
- Aspirations to raise GM's global reputation for R&D
- Integrated, place-based approaches to problem-solving

GM also has a clear focus on prevention and early intervention as drivers for improved population health and productivity[36]; these are central concepts in the GM Integrated Care Partnership (ICP) Strategy. Many of the innovative approaches established in GM through the 2016 devolution deal have now been enshrined in legislation in England through the ICS programme. In addition GM has now secured a 'trailblazer'[37] extension to its existing devolution deal in 2023, on top of the general ICS legislation, bringing additional powers to address some of the social determinants of health on top of the city-region's existing powers,[38]. GM is also set to become one of the UK's Investment Zones[39], which are designed to form knowledge-intensive growth clusters.

Through Health Innovation Manchester, GM has pre-dated the national digital focus described above, through establishing effective health and care digital governance at city region level and developing key digital assets, most notably the GM Care Record and the secure data environment programme. These digital and data assets have GM-level governance in place with data controller and public representatives to accept or reject applications for use of the data, for research or non-research purposes. This gives GM an unusual (but not unique), mature digital infrastructure for progressing health innovation through our partnerships.

Our four universities bring capabilities, assets and infrastructure that collectively create strength, breadth and critical mass in research and education for the Greater Manchester ecosystem. From the translational research power of our NIHR infrastructure where The University of Manchester is the main academic partner with various NHS organisations, through to the individual strengths and assets of the Universities of Salford, Bolton and Manchester Metropolitan University that strategically combined bring unique selling points, innovative education and training programmes and opportunity for collaboration to GM that are unrivalled by any other city region.

Manchester has an impressive track record of commercialising its research, achieving the highest growth by proportion of spinouts between 2022 and 2023 of any UK local authority area[40]. There have been a total of 84 companies spun out from the University of Manchester, which makes it the sixth largest for spinouts in the UK after the Universities of Oxford, Cambridge, Imperial, UCL and Edinburgh. Of the 84 resulting companies, 39 have received equity investment since 2011 via 105 deals, raising a total of £478m. However, when it comes to the size of the combined spinouts, UoM does not rank in the top 10. Of the top 20 spinouts by valuation, none are from Manchester, but 16 are in the LS and MedTech sector. Of the 10 most successful spinouts of the last decade, all are in the LS and MedTech sector, but again, none are from Manchester. As a sector, the LS and MedTech sector receives just over half of the total funding going to University spinouts,

[36] GM ICP Strategy
[37] Gov.uk
[38] GM ICP Strategy
[39] Institute for Government
[40] Spotlight on Spinouts 2023; Beauhurst and The Royal Academy of Engineering Enterprise Hub

and IUK is significantly the biggest funder[41]. GM also has its own Life Sciences Investment Fund signalling the region's long standing commitment to sector growth.

In essence, all the national policy drivers described earlier, come together at place level, and GM is well positioned in the assets it has developed and their connectivity. In addition to the health innovation focus, GM is also developing a 'triple helix' approach to innovation-led economic development through Innovation GM, which has recognised Health and LS as a key sector, alongside advanced material and manufacturing, clean growth and digital.

In order to take the available opportunities for health innovation through to fruition and realise maximal benefits for the GM population and economy in their fullest sense, there is a need for a cold-eyed understanding of the strength of the assets within the GM Ecosystem to support targeted development of an ever-stronger collective proposition.

[41] The university spinout report 2021

3 The Life Sciences and Health Tech Industry

Introduction

The Life Sciences and MedTech sector[42] is a significant and growing part of the UK economy and is forecast to play an increasingly important economic role. UK sector demand is driven by population need, with an aging population placing higher demands on health systems, and there are increasing supply opportunities being generated through emerging scientific methods and technologies. Life Science and MedTech is a high value sector with large export potential. Globally, many sector are under threat, but Life Science and HealthTech is expected to grow. With its heritage of scientific discovery and invention in Life Sciences and the modern day excellence of its university research, the UK has the potential to lead the way globally to the benefit of the national economy and population along with people across the globe. GM must be well placed to capitalise on this growth and focus its assets to nurture and develop areas of expertise which can complement other UK clusters.

Size, Shape and Growth of the Sector

The national Life Sciences sector makes a significant contribution to the UK economy[43]:

- Life Sciences sector turnover has **grown by 16% over the last 10 years**
- Sector turnover reached **£92.4bn** in 2021 and the sector employs **282,000 people**.
- In 2021 it comprised of **6,548 businesses** operating across 7,599 sites.
- The sector shows **sustained growth in employment and turnover** across the UK
- Spatial analysis of the locations of life science businesses shows that **the sector has an important presence across the UK** with multiple identified areas of concentrated business activity centred on major cities and around key national research centres.

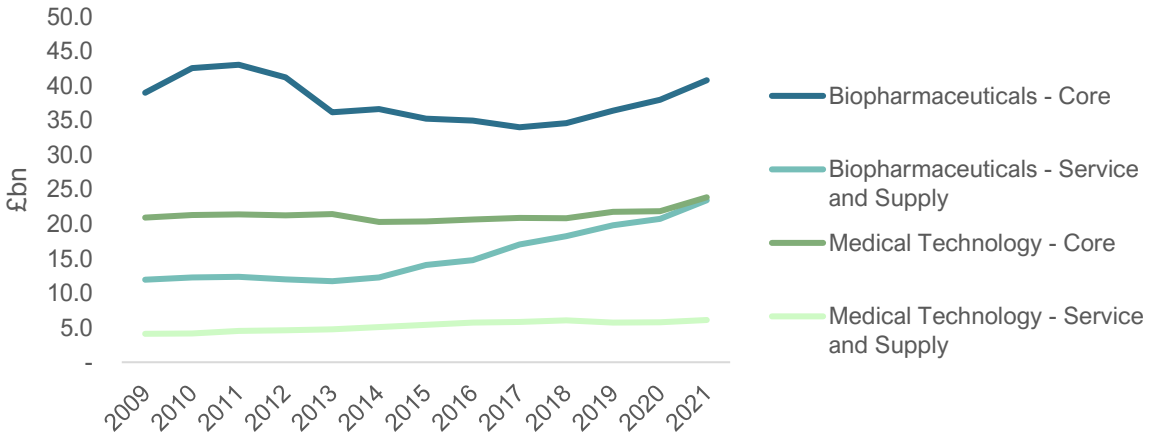
Nationally, turnover has grown in each of the four sub-sectors[44] in recent years driven by factors including the COVID-19 pandemic, technological developments, high demand for products to address population health issues and government support[45].

- The **core Biopharmaceuticals and Medical Technology sub-sectors are larger in turnover** than their respective service and supply sub-sectors (figure 2).

[42] Definitions for both sectors are included in the introduction to this report.
[43] The UK Government publish annual statistics measuring the size and growth of the Life Sciences sector. This bespoke data is an accurate measure of the sector to a regional level.
[44] Biopharmaceutical core; biopharmaceutical service and supply; medical technology core; medical technology service and supply
[45] IBISWorld.

- The **fastest growth was in the biopharmaceutical sectors**, where between 2016-21 turnover grew by 17% for the core sector and 59% for the service and supply sector.

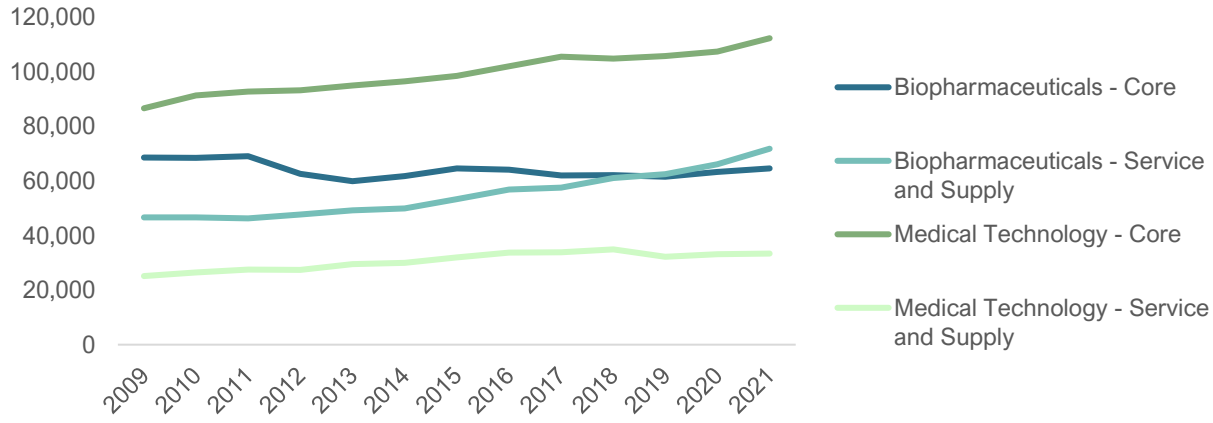
Figure 2. Turnover by sub-sector, UK.



Source: UK bioscience and health statistics

- **Core Medical Technology is the largest sub-sector employer nationally**, providing 40,000 more jobs than the next largest sub-sector (Figure 3).
- **The largest growth in sub-sector employment has been in Biopharmaceuticals - Service and Supply**, which increased 26% between 2016-21. This includes accelerated growth in 2020 and 2021 potentially driven by the COVID-19 pandemic; it is not yet clear whether the current trajectory or level will be sustained.

Figure 3. Employment by sub-sector UK.



Source: UK bioscience and health statistics

There is limited data about the future growth of the sector[46], however the Biotechnology sector, of which 64.8% relates to human health, provides a good proxy. Analysis forecasts revenue increase in the UK at a compound annual rate of 12.2% between 2022-23 and 2027-8 to £35.1 billion. As the sector grows, consolidation is likely, with pharmaceutical companies looking to bolster their own innovation capabilities by diversifying into biotechnology, or to acquire or outsource to smaller firms. Key drivers of future growth for include[47]:

- **Government investment:** The UK government is expected to continue to invest heavily in R&D and on tax breaks to boost the UK's global presence.
- **Technology:** Emerging and complementary technologies and new players will alter the operating landscape. The pace of technological change is high, with new discoveries stimulating R&D.
- Although **total health expenditure** has dipped following a peak during the pandemic, it is forecast to steadily increase in years to come, driven by changing population need.
- **Aging population:** As the population ages and more people face mounting health and care problems, demand for advanced treatments and new technologies will increase. Growing need is indicative that that market is far from saturated, and in the growth phase of its industry life cycle.
- **Regulation:** The UK's exit from the EU could offer opportunities for more favourable regulatory conditions for UK firms, with the MHRA continuing to play an important role.

Potential constraints on future growth include[48]:

- **Business confidence:** strong business conditions increase the extent to which investment funds and venture capitalists are likely to invest in risky start-ups. Business confidence is currently low, however a favourable outlook for sector growth may mean that investors overlook this.
- Separation from EU legislation could place **more significant administrative burdens** on industry, limiting profit growth.
- Revenue growth is likely to be impeded by **increasing competition** from emerging low-cost markets such as China and India.
- **Public confidence** and trust, for example with regard to areas such as stem cell research, could hinder the adoption of emerging solutions.

The strong regional track record of sector growth and projected growth of the UK sector, along with the favourable policy conditions analysed in Chapter Two, suggest that there is an opportunity for GM, as one of the key economic and research centres in the North, to create the conditions to support Life Sciences and Health Tech entrepreneurship, linking

[46] IBISWorld notes that the lines between biotechnology, pharmaceuticals and medical technology are increasingly blurred within the Life Sciences sector; for the purposes of this report we have analysed the biotechnology trends which are indicative of the likely outlook for the Life Sciences industry in its entirety.
[47] IBISWorld
[48] IBISWorld

emerging businesses into supportive networks, and creating the conditions for businesses to flourish, grow and continue to innovate. GM's strength in clinical trials alongside its emerging industry expertise, provides a targeted opportunity to strengthen the ecosystem and drive future growth.

UK Sector Spatial Analysis

The Life Sciences sector has a strong presence across the UK, with dense concentrations of businesses in multiple cities and surrounding key science and technology sites such as Alderley Park and Daresbury Laboratory. Figure 4[49] shows the location of every Life Sciences site[50] recorded in the UK Government's *Bioscience and health technology sector statistics (BaHTSS) 2021*. Whilst this map gives a sense of where concentrations of Life Science businesses are located, it also contains a high degree of noise. By applying a spatial clustering approach[51] we have identified the parts of the country which have a high degree of geographic concentration (Figure 5), which we term as density-based clusters[52]. This approach identifies a concentration of Life Sciences premises in GM, located across the city centre and along the Oxford Road corridor, reflecting the growing city-region cluster: 13.7% of UK Life Sciences sites are located in GM as of 2021.

[49] Site-level data on the sector allows us to look at the distribution of Life Sciences businesses across the UK.
[50] Businesses in the UK can operate over multiple sites. In the BaHTSS data release each individual site has employment and turnover assigned to it and these site level estimates have been used to understand the size of the sector in different- locations.
[51] Using a DBSCAN algorithm we specify a certain number of businesses within a 1 km radius of each other.
[52] Each cluster is indicated by a different colour, the size of dots reflects the number of businesses within the cluster.

Figure 4. Life Science sites in the UK (Diagram A) and national concentrations of Life Science sites (Diagram B), 2021

Diagram A

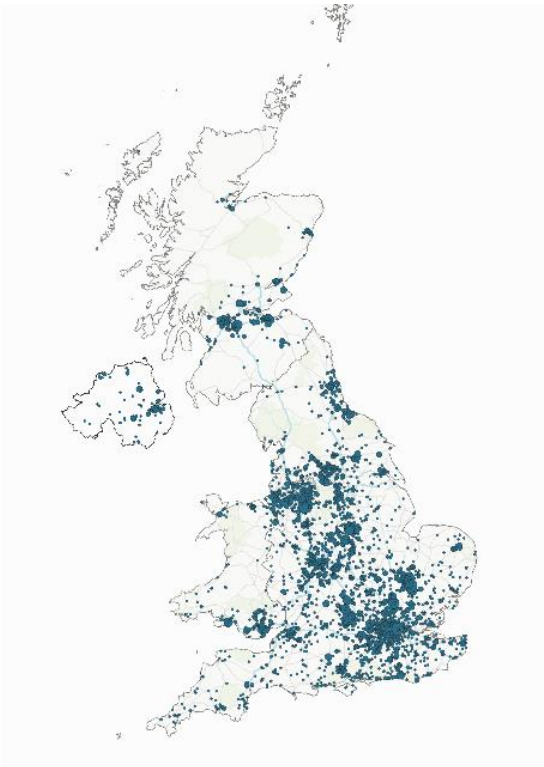
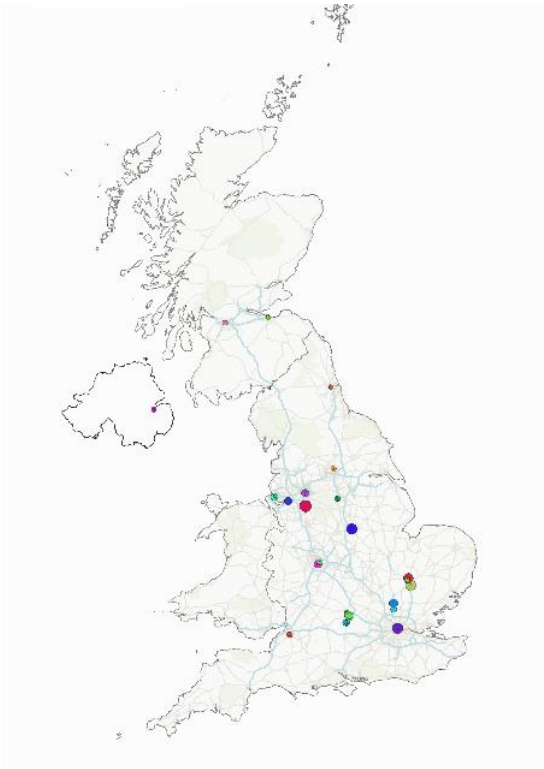


Diagram B



GM is identified as one of the parts of the country which has a density-based cluster in both Biopharmaceuticals and in MedTech[53]. Figure 6 shows the density-based cluster analysis of each of these sub-sectors.

Other parts of the country which have identified density-based clusters in both fields are typically cities with research universities, with businesses located in city centres and in proximity to universities, as well as Manchester, Edinburgh, Belfast and Sheffield and Nottingham fall into this category. Nottingham, while a university city, is an interesting case with a strong concentration of businesses centred around BioCity Nottingham. Founded in 2003 this is the UK's largest bioscience innovation and incubation centre which provides business support as well as specialised lab and office space.

Oxford and Cambridge are also examples of where university research excellence supports the wider sector. In these places we see a wider spread of business density, with analysis identifying multiple areas of concentration in the cities and their immediate surroundings.

[53] Using the national data we can split the sites into those associated with MedTech and those associated with Biopharmaceuticals.

Concentrations in Stevenage and in Cheshire are centred around the Bioscience Catalyst and Alderley Park respectively, two examples with significant private sector leadership.

Figure 5. Density-Based Clusters: Biopharmaceuticals (L) and MedTech (R)

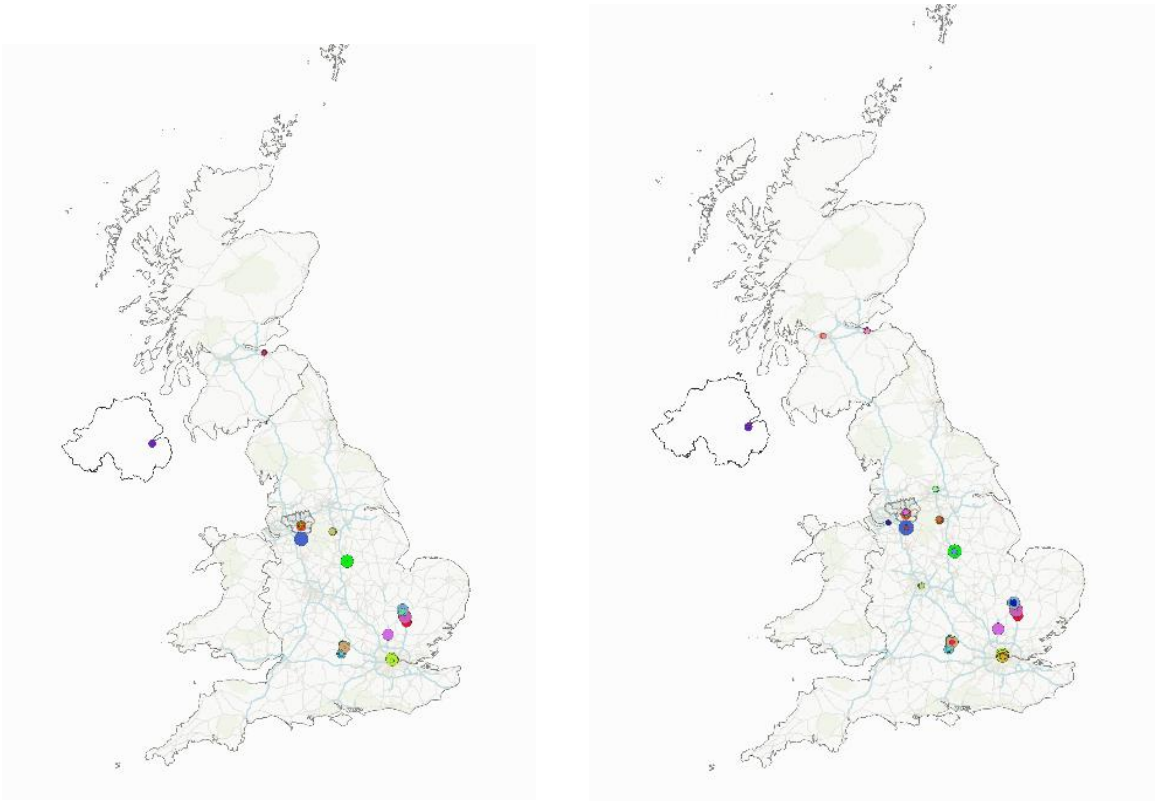


Table 5 shows the percentage of national sites and estimated employment in each of these areas, noting that these are not necessarily the places with the largest sectors but the areas which have a dense concentration of businesses in close proximity, an important condition for an industrial cluster. We examine the size of the sector in the cities (or local authorities) which contain the dense core of notable life science ecosystems (and therefore which may be competitor locations for FDI), as well as examining GM in its entirety for reference.

Table 5. Estimated employment by density-based clusters

Location	% of UK sites	Estimated % of UK employment
Greater Manchester	**3.8%**	**4.2%**
Manchester	1.7%	1.6%
London	14.7%	11%
Oxford	1.6%	1.2%
Cambridge	5.6%	4.8%
Nottingham	1.7%	1%

Sheffield	1.3%	1.4%
Edinburgh	1.5%	1%
Belfast	1%	1%
Stevenage	1%	1%
Cheshire East	2.2%	1.8%

Source: UK bioscience and health statistics

The Life Sciences Sector in the North West

The North West Life Sciences sector has grown at a far faster rate than the national sector, pointing towards the emergence of a core regional strength:

- In the five years to 2021 the North West Life Sciences sector business count grew at **more than double the national rate** (Table 6).
- The North West, home to 11% of the UK's population, now contains **13.7% of the country's life sciences sites** as of 2021, **11% of businesses**, **10% of employment** and **13% of turnover**.
- **Growth in North West business numbers has been reflected in higher employment, although turnover growth has been lower than UK rates.** This is likely a case of newer, smaller business entering the business base.

Table 6. Sector Growth, 2016-21

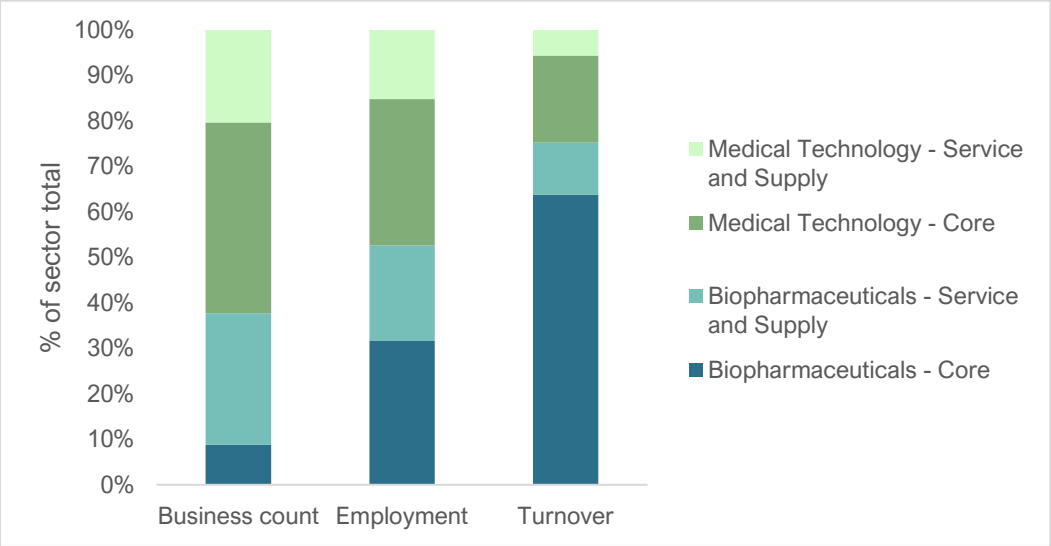
	Measure	North-West	UK
% change 2016 - 2021	Business Count	13%	5.20%
	Employment	10.30%	9.90%
	Turnover	15.80%	23.80%

Source: UK bioscience and health statistics

A comparatively small number of Biopharmaceuticals - Core businesses account for over 60% of regional turnover.

Reflecting national trends, the largest number of NW businesses are in the Medical Technology – Core subsector, but employment and turnover figures suggest these businesses are smaller.

Figure 6. Life Science sector composition: North West

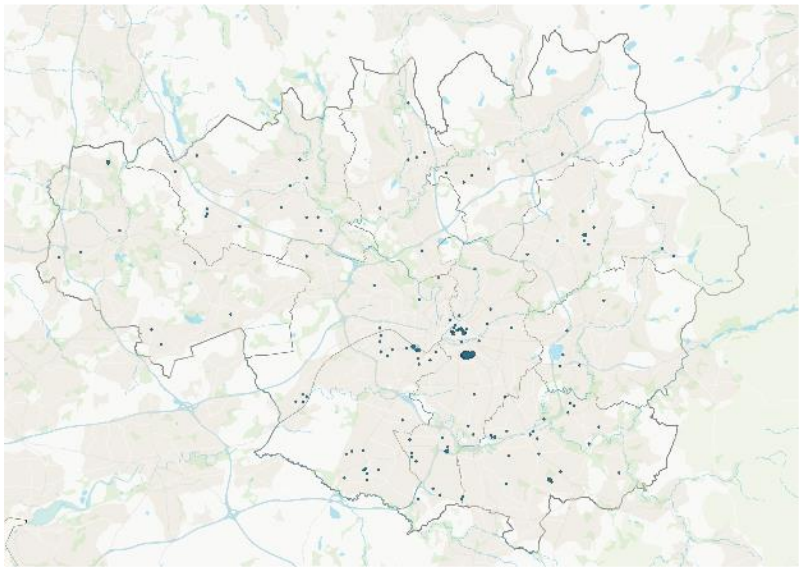


Source: UK bioscience and health statistics

GM Sector Growth

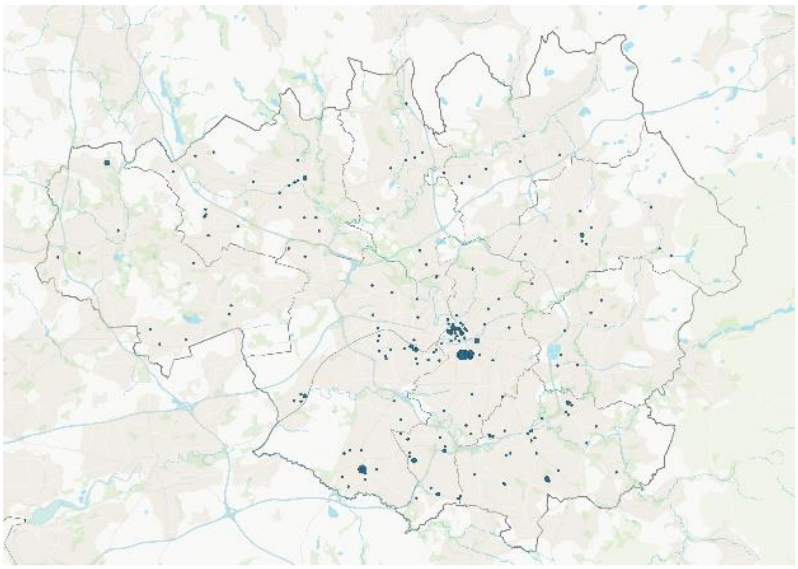
The expansion of the sector's physical presence has occurred across the geography of the city-region (Figure 7[54]). There have been notable expansions in the number of sites in the city centre and in Altringham, in the south of GM.

Figure 7. Life Science sites in GM, 2010 and 2021



2010; The size of the points reflects the number of businesses at the same postcode.

[54] Using the incorporation year of companies we can map the physical presence of the sector in GM in 2010, and visualise changes in the follow eleven years to 2021. To note: this includes only companies that were in GM in 2021 and in 2010, it does not include those that may have been in GM in 2010 and left or ceased operating in the subsequent 11 years.



2021

GM's Significance within the North West

Of the 762 Life Sciences sites[55] across the North West (10% of the UK total) 37.8% are located in GM. 44% of the sites in the North West where R&D was taking place in 2021 are located in GM[56].

While the total number of employees per site is not publicly available, we can use the employment bands to estimate the share of North West employment which is in GM, and we arrive a figure broadly in line with the share of sites: 41.5%. As shown in Figure 8 (overleaf), employment is distributed, with large employers in most boroughs across the city-region; we have estimated approximate employment by Borough in Table 7.

Table 7. Estimated Life Sciences Employment by GM Borough

Borough	Estimated Employment
Manchester	3,647
Trafford	1,373
Bolton	1,244
Stockport	1,086
Salford	611
Oldham	530
Rochdale	372
Tameside	359

[55] National data on the Life Sciences sector is produced at the regional level however the supplementary release contains detail on the 7599 Life Sciences sites[55] across the UK. This enables us to understand the size and composition of the sector in GM. Many businesses in the Life Science operate at more than one location, the site level data contains information for each location where a business in the Life Sciences sector is operating.

[56] The sectoral composition of these sites is similar to the make-up of Life Sciences across the North West, with Medical Technology – Core accounting for the largest share at 47% of all sites and Biopharmaceuticals – Core accounting for the smallest, at 9% of all sites.

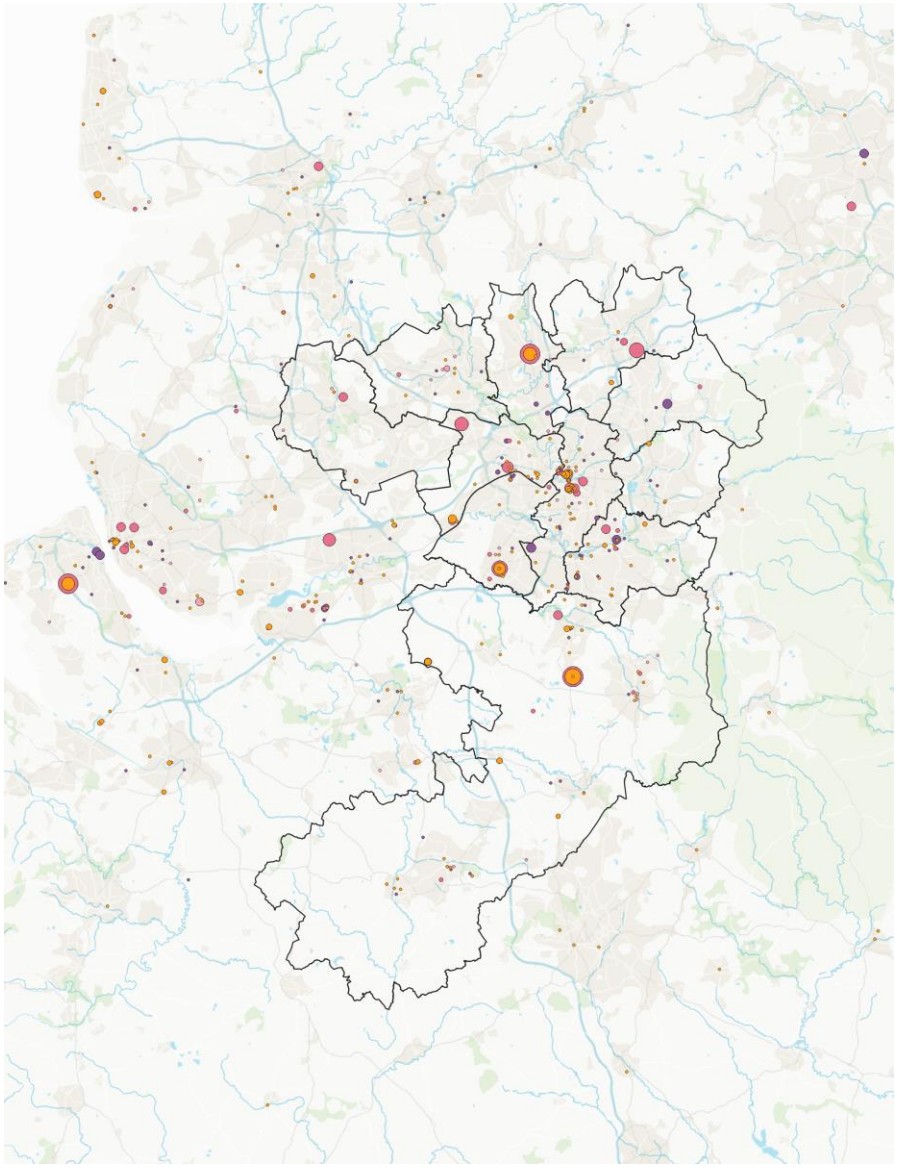
Bury	200
Wigan	123

Source: Bioscience and health technology sector statistics 2021.

NW activity is centred in GM, with a growth hub at Alderley Park in neighbouring Cheshire East and a developing corridor in the west towards Liverpool and the Wirral.

Health Innovation Manchester works with partners based in neighbouring localities through strategic partnerships, such as the one that is in place with Alderley Park.

Figure 8. The life sciences sector in the North West



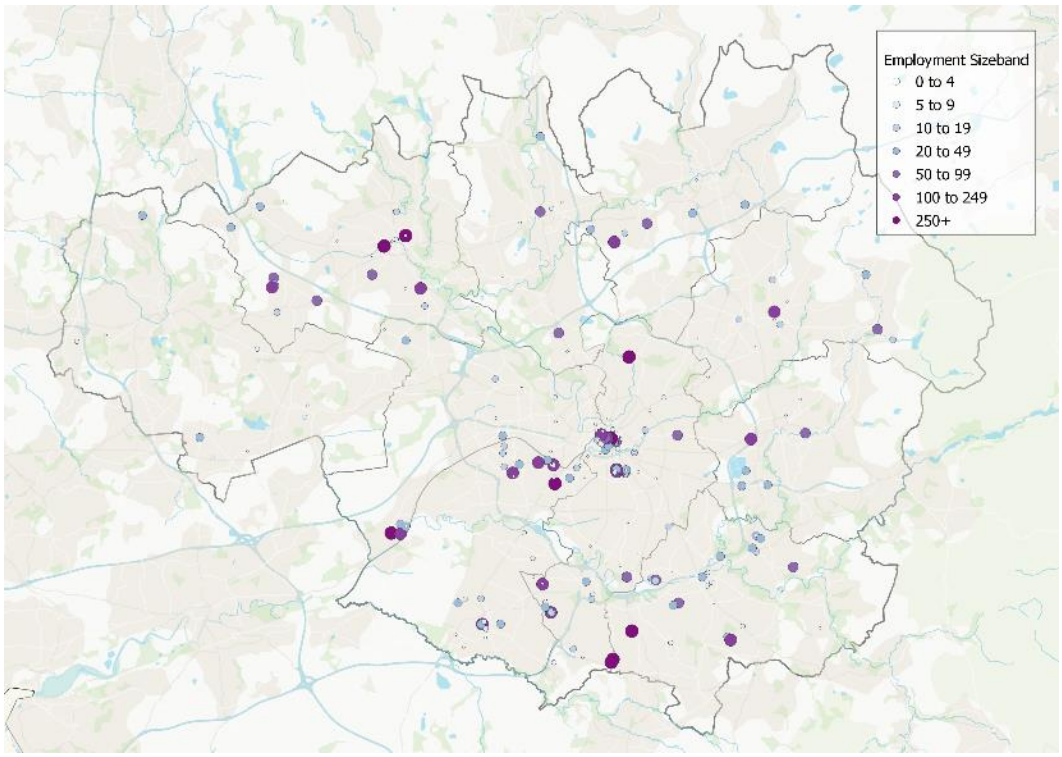
Measured by turnover, GM's life sciences businesses are larger than average. In the North West in 2021 10% of business had turnover above £1m[57], in the same year over 40% of the life sciences sites in GM had turnover above £1m. Taken alongside the growth of smaller businesses, this is indicative of a healthy mix of established and profitable industry players, alongside flourishing entrepreneurship in the GM city-region.

Table 8. GM Life Sciences by sector and turnover band

	Sector	0 to 49K	50K to 99K	100K to 249K	250K to 499K	500K to 999K	1M to 5M	5M+	Total
% of GM	Biopharmaceuticals - Core	2%	1%	2%	1%	0%	1%	1%	9%
	Biopharmaceuticals - Service and Supply	2%	2%	3%	3%	3%	7%	4%	24%
	Medical Technology - Core	5%	4%	6%	6%	5%	10%	11%	47%
	Medical Technology - Service and Supply	3%	2%	2%	2%	2%	4%	4%	20%
	Total	12%	9%	14%	12%	11%	22%	20%	

Bioscience and health technology sector statistics 2021

Figure 9. GM Life Sciences Sites by estimated employment



Bioscience and health technology sector statistics 2021

[57] ONS. UK business: activity, size and location

Using Data City[58] information relating to emerging sectors, we have analysed specialisms within GM and benchmark areas using a Location Quotient (LQ) analysis of HealthTech sub-sectors, a measure of concentration used to identify areas of specialisation. An LQ above 1 indicates that the share of total business in GM that are part of a given sub-sector is higher than the national average level, any value above 1.25 is considered to be high and to indicate a specialism. GM as a whole has been compared to large cities and to the major centres of Life sciences centred around Oxford and Cambridge while Manchester, as the area making up the largest proportion of GM's Life Sciences sites is compared to other local authority areas (outside the Greater South East) with concentrations of Life Sciences sites.

GM stands out in the North West, and the North West has grown at double the national rate in recent years. However, analysis of GM against the benchmark group (Table 9) and of Manchester against other comparable cities outside the Greater South East with density-based Life Sciences clusters (Table 10) indicates that although GM has broad specialism within the Life Sciences against the national average, the city-region does not yet stand out against other cluster areas as having significance in focussed subsector areas. The findings suggest therefore that GM needs to develop density around defined focus areas where there is the potential for growth.

[58] To understand the Health Tech sector we have used data from Data City, a company who provide data on emerging economy sectors, using machine learning models to classify companies into Real Time Industrial Classifications (RTICs). The level of detail available on the Health Tech sector is not the same as that available on the Life Sciences sector but we are able to look at the degree of business concentration in GM and map the businesses which have a trading address within GM, illustrating the economic geography of the Health Tech sector. It should be noted that businesses can operate within several emerging subsectors, and therefore a single business can feature within more than one category.

Table 9. GM specialism against comparator group

RTIC subgroup	London	Birmingham	Cambridge & South Cambridgeshire	Oxford & South Oxfordshire	Greater Manchester
Biopharmaceutical: Advanced Therapy Medicinal Products (ATMPs)	1.35	0.76	12.47	6.15	1.29
Biopharmaceutical: Antibodies	0.71	0.59	23.85	4.41	1.55
Biopharmaceutical: Blood & Tissue Product	0.60	0.63	8.93	0.00	0.00
Biopharmaceutical: Small Molecules	1.31	0.64	25.14	12.02	0.91
Biopharmaceutical: Therapeutic protein	1.02	0.75	35.52	6.48	0.74
Biopharmaceutical: Vaccines	1.22	0.66	12.78	8.48	1.25
MedTech: Advanced Materials	0.47	0.00	9.91	2.68	2.63
MedTech: Artificial Intelligence	1.61	0.72	8.67	5.71	1.08
MedTech: Extended Reality	1.17	1.54	2.72	0.00	0.33
MedTech: Imaging	0.80	1.16	2.45	1.98	1.85
MedTech: Monitoring Technologies	1.40	0.64	2.27	2.77	1.45
MedTech: Photonics	0.62	0.35	4.33	8.27	1.18
MedTech: Robotics	0.80	0.34	5.34	1.44	2.27
Omics: Epigenomics	1.08	0.00	33.59	29.17	1.15
Omics: Genomics	1.37	1.46	24.29	5.66	5.43
Omics: Lipidomics	0.76	0.00	16.49	0.00	0.49
Omics: Metabolomics	0.72	0.00	20.09	2.04	0.20
Omics: Proteomics	0.50	1.22	27.27	8.72	1.03
Omics: Transcriptomics	0.75	2.18	16.77	6.80	1.75
Pharma: Additive Manufacturing	0.55	1.09	10.05	7.52	1.20
Pharma: Artificial Intelligence and Blockchain	1.84	0.81	17.16	6.95	0.75
Pharma: Automation	0.44	1.83	3.24	0.00	1.93
Pharma: Pharma and BioPharma	1.26	0.73	15.02	6.85	0.74
Pharma: Precision Medicine	1.11	1.17	23.85	20.17	1.11
Pharma: Research and Data Analytics	1.37	0.51	8.99	3.50	1.76
Pharma: Targeted Therapies	1.37	1.07	16.72	10.49	0.77

Source: Metro Dynamics analysis of Data City data

Table 10. Local Authority level comparison: Manchester and concentrations outside Greater South East.

RTIC subgroup	Manchester	Belfast	Edinburgh	Sheffield	Nottingham	Cheshire East	Stevenage
Biopharmaceutical: Advanced Therapy Medicinal Products (ATMPs)	0.93	11.04	0.93	2.43	6.91	10.19	13.00
Biopharmaceutical: Antibodies	0.82	1.89	2.39	0.83	2.36	2.06	5.45
Biopharmaceutical: Blood & Tissue Product	0.00	2.71	4.12	5.36	15.26	0.00	0.00
Biopharmaceutical: Small Molecules	1.34	10.28	1.70	0.45	9.66	12.36	10.90
Biopharmaceutical: Therapeutic protein	1.05	0.00	0.82	2.13	3.04	0.71	12.46
Biopharmaceutical: Vaccines	0.92	14.56	1.79	0.00	0.44	9.25	5.43
MedTech: Advanced Materials	0.87	2.67	1.53	9.69	3.76	0.88	3.86
MedTech: Artificial Intelligence	2.00	0.88	0.67	0.87	1.23	1.72	1.27
MedTech: Extended Reality	0.00	0.00	1.26	0.00	0.00	0.00	0.00
MedTech: Imaging	4.19	0.00	2.26	3.92	0.00	1.95	5.72
MedTech: Monitoring Technologies	1.20	2.76	1.40	5.46	0.86	0.00	2.66
MedTech: Photonics	0.49	0.00	1.14	5.94	0.00	0.98	0.00
MedTech: Robotics	2.35	0.72	0.82	3.80	0.68	1.89	4.16
Omics: Epigenomics	1.90	2.91	3.32	0.00	0.00	0.00	8.41
Omics: Genomics	1.23	3.76	2.63	0.41	8.83	0.41	1.81
Omics: Lipidomics	0.00	0.00	5.71	9.90	0.00	22.96	28.90
Omics: Metabolomics	0.00	54.83	0.00	0.00	15.26	54.63	0.00
Omics: Proteomics	2.84	0.00	0.66	0.00	1.64	4.57	5.03
Omics: Transcriptomics	3.32	24.58	3.55	2.80	8.76	20.58	2.45
Pharma: Additive Manufacturing	0.92	5.62	1.78	5.57	4.40	0.61	5.42
Pharma: Artificial Intelligence and Blockchain	1.81	0.69	0.79	0.00	3.26	4.10	4.01
Pharma: Automation	0.00	1.31	0.00	0.86	0.00	3.43	3.78
Pharma: Pharma and BioPharma	1.16	3.27	1.84	0.47	3.48	4.76	8.64
Pharma: Precision Medicine	2.87	6.29	0.96	1.66	0.00	3.30	0.00
Pharma: Research and Data Analytics	0.85	7.41	0.83	0.86	4.51	9.73	2.52
Pharma: Targeted Therapies	0.85	1.96	1.49	1.29	1.23	3.00	3.78

Source: Metro Dynamics analysis of Data City data

GM Life Sciences and HealthTech Sector Analysis

However, GM does have specialisms which provide an excellent basis for development. Table 11 shows **GM's specialism in subsectors across the Life Sciences.**

The city-region has high numbers of businesses operating in Genomics, an area which features strongly in UK Life Sciences policy due to its potential in preventative and personalised medicine. Other specialisms, such as Advanced Materials, Therapeutic Proteins and Robotics align with focusses within the University of Manchester's Research Institutes and other GM based HEIs.

GM also has specialisms in a number of areas where the Life Sciences and Technology converge, again an area with a strong policy focus. To explore this further, we have analysed emerging technology companies which operate at the interface between tech

and the Life Sciences[59]. Table 12 shows that within this specialism, **GM has a high share of businesses working in medical sensors and healthcare software.**

Table 11. Sector Specialisms: All Life Sciences and Pharmaceuticals RTICs

RTIC subgroup	GM	% of businesses with a presence in GM	LQ
Biopharmaceutical: Advanced Therapy Medicinal Products (ATMPs)	32	7%	1.29
Biopharmaceutical: Antibodies	25	8%	1.55
Biopharmaceutical: Blood & Tissue Product	0	0%	0.00
Biopharmaceutical: Small Molecules	27	5%	0.91
Biopharmaceutical: Therapeutic protein	7	4%	0.74
Biopharmaceutical: Vaccines	27	7%	1.25
MedTech: Advanced Materials	20	14%	2.63
MedTech: Artificial Intelligence	25	6%	1.08
MedTech: Extended Reality	1	2%	0.33
MedTech: Imaging	19	10%	1.85
MedTech: Monitoring Technologies	16	8%	1.45
MedTech: Photonics	16	6%	1.18
MedTech: Robotics	32	12%	2.27
Omics: Epigenomics	4	6%	1.15
Omics: Genomics	88	28%	5.43
Omics: Lipidomics	1	3%	0.49
Omics: Metabolomics	1	1%	0.20
Omics: Proteomics	6	5%	1.03
Omics: Transcriptomics	21	9%	1.75
Pharma: Additive Manufacturing	13	6%	1.20
Pharma: Artificial Intelligence and Blockchain	11	4%	0.75
Pharma: Automation	15	10%	1.93
Pharma: Pharma and BioPharma	53	4%	0.74
Pharma: Precision Medicine	9	6%	1.11
Pharma: Research and Data Analytics	41	9%	1.76
Pharma: Targeted Therapies	12	4%	0.77

Source: Metro Dynamics analysis of Data City data

[59] and the sum total of these identified areas

Table 12. GM Sub-sector Specialism

RTIC subgroup	GM Business Count	% of businesses with a presence in GM	LQ
Sensors: Medical	47	7.70%	1.47
Software as a Service (SaaS): Healthcare	16	6.40%	1.23
Artificial Intelligence: Life Sciences	11	3.40%	0.65
Internet of Things: e-Health	8	3.40%	0.65
Wearables and Quantified Self: Medical	3	1.80%	0.34
Immersive Technologies: Healthcare	2	4.50%	0.87

Source: Metro Dynamics analysis of Data City data

GM's Current Industry Strengths in the Health-Digital Interface

Given GM's strengths in data and digital industry subsectors we have looked in detail at the Data Infrastructures, Data Intermediaries and Cyber industry in the city-region to understand the precise areas of strength. Local strengths and specialisation (shown in Table 13) across different areas of cyber security and expertise in data storage and trusted execution environments is likely to be an important growth area for GM, particularly if the sector is able to respond to the market drivers described within Chapter Five.

Although GM has high specialism in health and digital interface subsectors, and is comparable with other health innovation cluster areas, it is significantly less specialised than Cambridge, which is the national market leader in this area (show at Table 14).

Table 13. GM Cyber and Data Specialism

RTIC subgroup	GM Business Count	% of businesses with a presence in GM	Location Quotient
Cyber: Cryptographic Authentication	30	8%	1.50
Cyber: Endpoint Security	98	10%	1.86
Cyber: Identity Management	83	10%	1.93
Cyber: Incident Detection and Response	113	8%	1.52
Cyber: IoT Security	50	7%	1.43
Cyber: Network Security	162	8%	1.55
Cyber: Risk Management	160	6%	1.20
Cyber: Threat Management	89	8%	1.49
Data Infrastructure: Data Centre Cooling	15	11%	2.03
Data Infrastructure: Data Centres	122	12%	2.39
Data Infrastructure: Data Infrastructure Hardware	254	7%	1.35
Data Infrastructure: Data Infrastructure Services	660	11%	2.03
Data Infrastructure: Data Infrastructure Software	274	14%	2.71
Data Infrastructure: Data Storage	325	13%	2.49
Data Infrastructure: Trusted Execution Environments	42	9%	1.82
Data Intermediaries: Data Co-operatives	25	7%	1.33
Data Intermediaries: PDS/PIMS	8	3%	0.66
Data Intermediaries: Undefined Intermediaries	70	7%	1.32

Source: Metro Dynamics analysis of Data City data

Table 14. GM Health-Digital Specialism Benchmarking

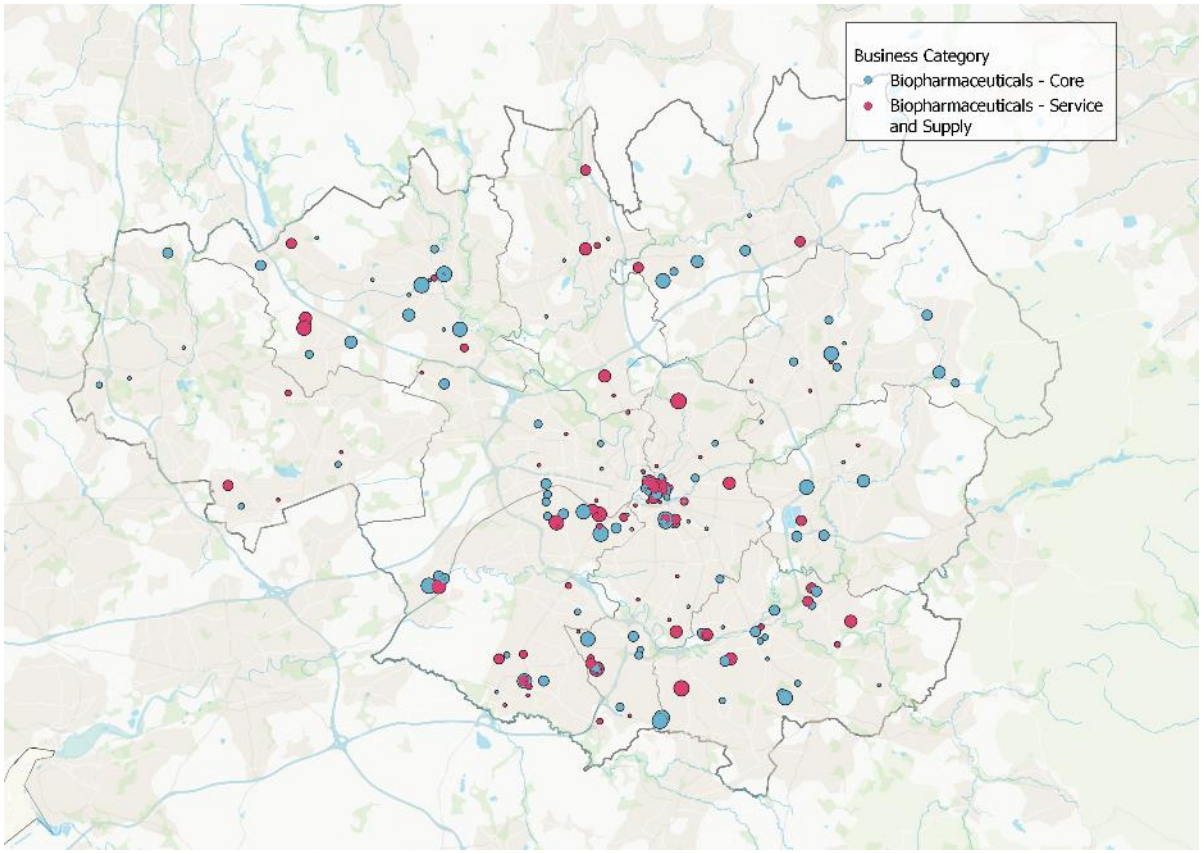
Sector	GM	London	Cambridge & South Cambridgeshire	Oxford and South Oxfordshire	Birmingham
Advanced Manufacturing	1.14	0.54	3.32	1.07	1.61
Advanced Materials	2.10	0.48	7.51	1.64	1.23
Artificial Intelligence	1.00	1.64	15.43	2.54	0.65
Autonomy and Robotics	0.88	0.59	7.33	5.80	1.35
Biopharmaceutical	1.01	1.17	33.84	7.61	0.60
Cyber	1.35	1.39	4.84	1.26	0.91
Data Infrastructure	1.85	1.32	4.66	1.41	1.65
Data Intermediaries	1.37	1.49	6.06	1.90	0.56
Immersive Technologies	0.98	1.30	5.82	2.20	0.72
Life Sciences	1.52	1.00	8.92	3.77	1.21
MedTech	1.40	1.07	11.07	4.38	0.67
Omics	3.11	1.08	45.50	6.51	1.08
Pharma	1.08	1.21	23.86	6.62	0.90
Rehabilitation	1.33	0.88	2.29	5.39	1.87
Sensors	1.49	0.72	12.45	2.66	0.97
Wearables and Quantified Self	0.98	1.30	12.92	0.99	0.46

Source: Metro Dynamics analysis of Data City data

Spatial Analysis of the GM Life Sciences and HealthTech Sector

GM's Life Sciences business are distributed across the city-region, including 'core' businesses, which are generally of higher value (Figure 10).

Figure 10. Life Science Sites by Category

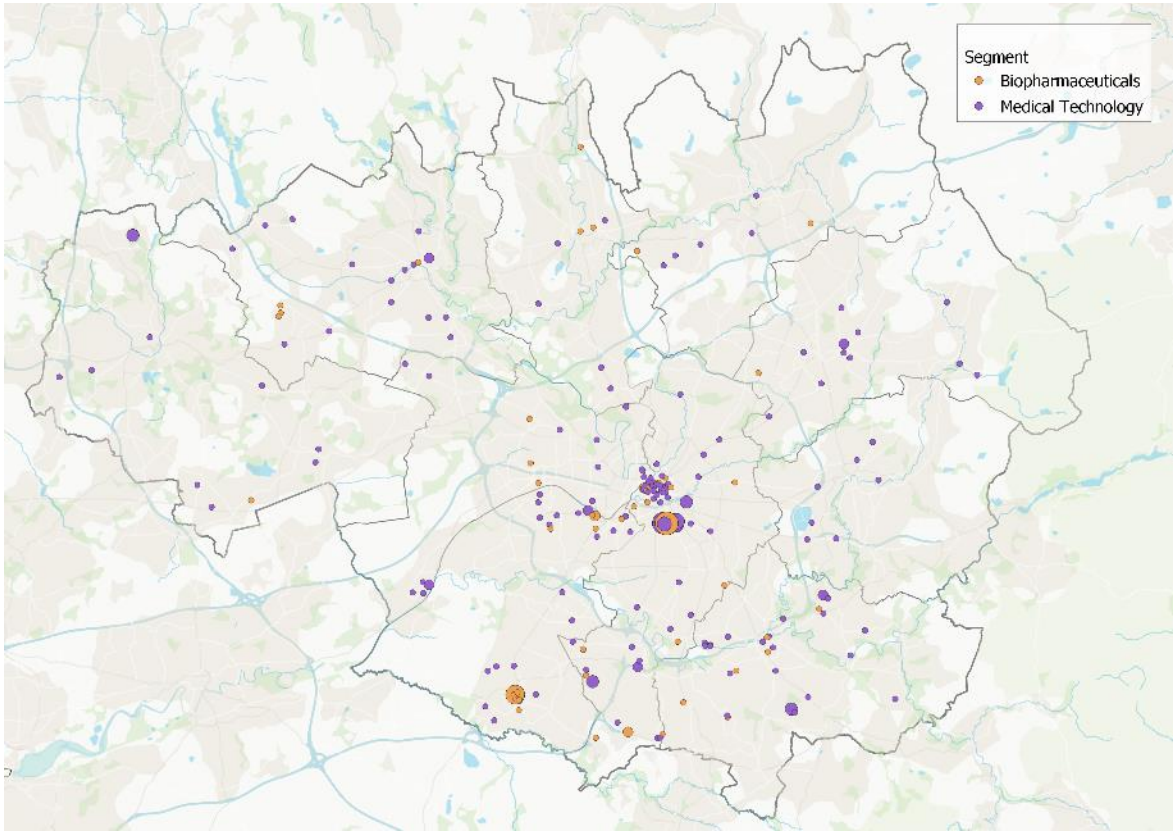


Bioscience and health technology sector statistics 2021

There are concentrations in Manchester City Centre and Oxford Road, Salford Quays and Altrincham (Figures 11 and 12). Of these main concentrations:

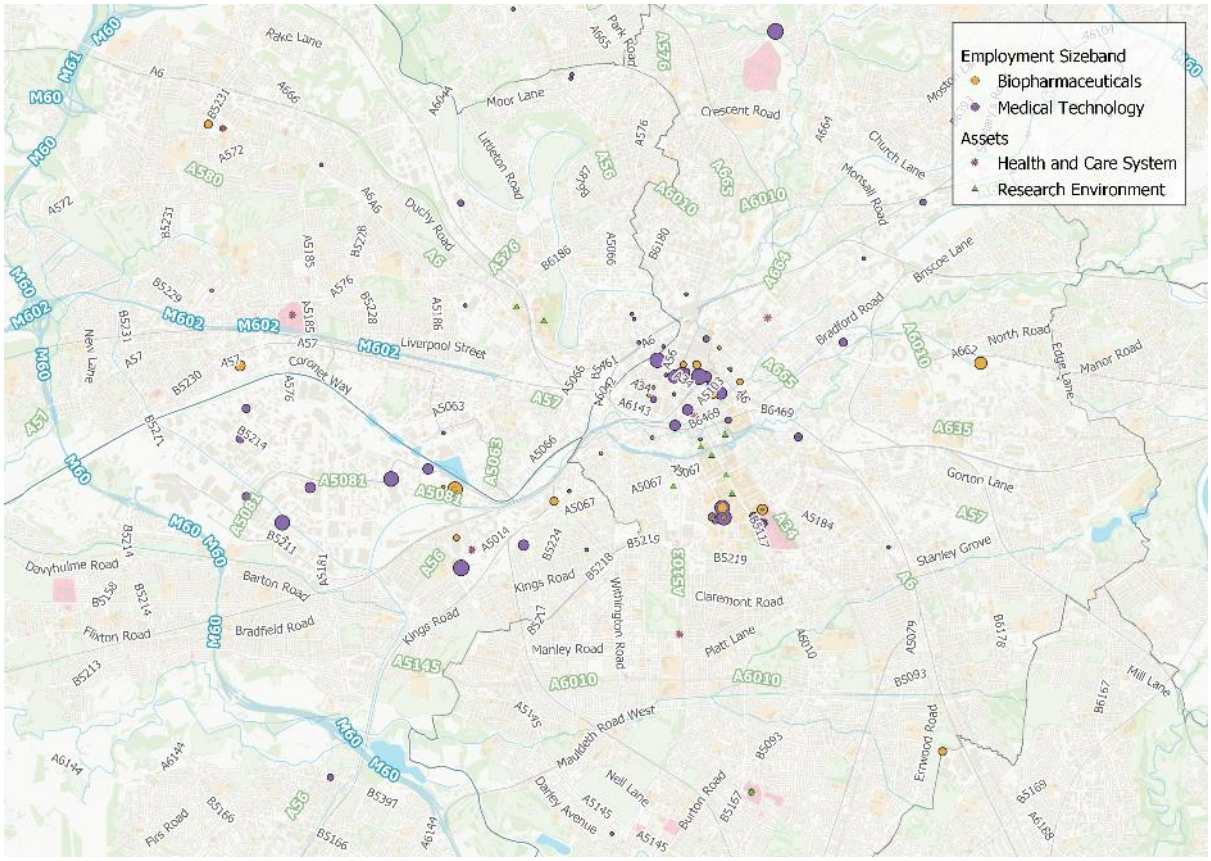
- Manchester City Centre houses a mix of MedTech and Biopharmaceutical businesses the bulk of these located in the city centre, where office locations are plentiful or along the Oxford Road Corridor, in close proximity to University of Manchester buildings and other important research and healthcare system assets. There appear to be more biopharmaceutical businesses towards Oxford Road and more concentrations of businesses located at the same postcode.
- Businesses located around the Salford Quays are primarily service and supply businesses, focused on providing specialised goods and services to the core businesses.
- Altringham primarily hosts biopharmaceuticals sites with a mix of core and service and supply businesses

Figure 11. Life Science Sites by sector



Bioscience and health technology sector statistics 2021

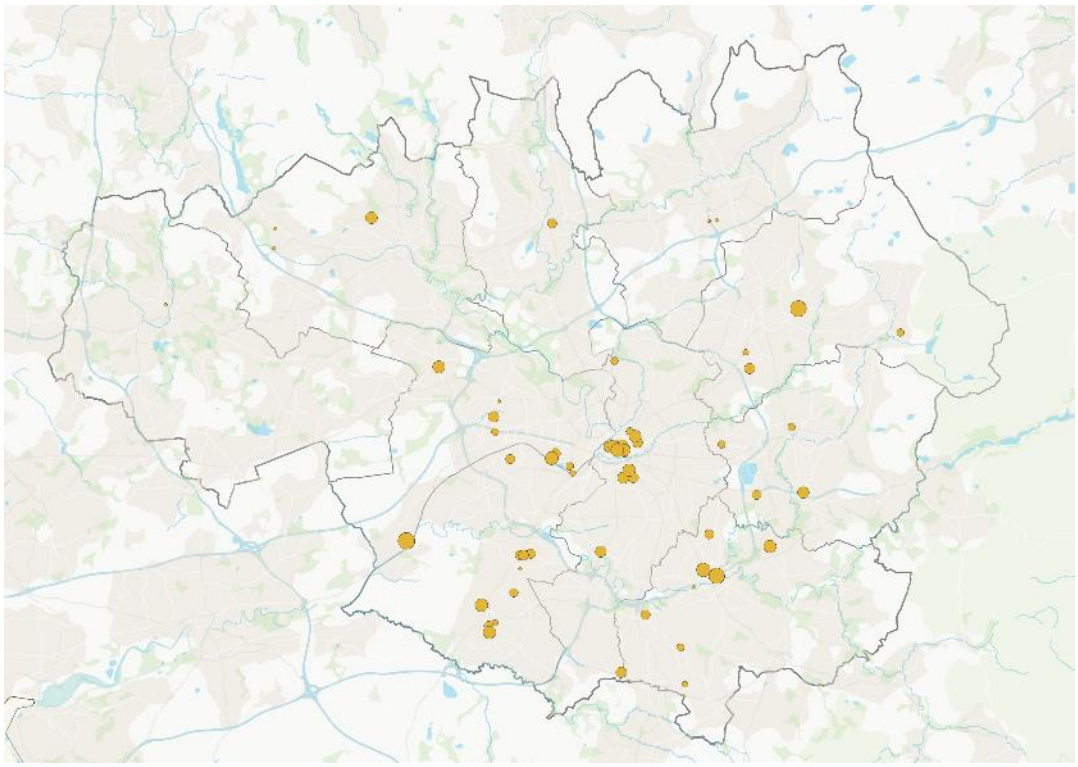
Figure 12. Central Manchester and Salford



Source: Bioscience and health technology sector statistics 2021

The geographical distribution of HealthTech business sites (Figure 13) shows an uneven distribution across the city-region, with **26% of the locations concentrated in the centre of Manchester and the rest primarily located across the southern arc of the city region.** These businesses include manufacturers, service providers and developers and they range from small startups to large and established firms active in these areas.

Figure 13. HealthTech in GM



Source: Metro Dynamics analysis of Data City data

4 GM Health Innovation Ecosystem Preparedness Assessment

Whilst some other sectors have uncertain global economic futures, the Life Sciences and MedTech sector is broadly expected to grow. The question we address in this Chapter is how well GM's Health Innovation Ecosystem is positioned to increase its slice of this expected growth.

Of course, as stated at the outset, we are working primarily currently from published data and reports. A fuller picture of the ecosystem will need to be based on primary research - above all discussions with key stakeholders - to enable us better to understand and interpret the data. Our focus at this stage is applying the data and insights we do have to an appropriate conceptual framework. Within this Chapter we use a model we co-developed with David Cleevely and Andy Neely in the course of Metro Dynamics' work on the Cambridgeshire and Peterborough Independent Economic Review (CPIER) in 2018[60] and developed in our report for Bruntwood Scitech in 2019[61]. The model (Figure 14) outlines what clusters of innovation require to grow, how this can be supported and how an innovation ecosystem should be unique to each place.

Figure 14. The CPIER Innovation Model

Positioned at the base of the model, supporting the three pillars of innovation, is the knowledge engine. Innovation ecosystems need knowledge engines that drive development, acting as fuel or power for innovation at the heart of an innovation district.

[60] Cambridgeshire and Peterborough Independent Economic Review
[61] Place Matters, Metro Dynamics

This is usually a leading organisation, whether a public institution, a business, or a university.

Often, the knowledge engine is largely research focused, hosting an experienced set of researchers and people with the expertise to exploit opportunities in their field. The knowledge engine acts as a hub for talented and highly skilled people, attracting them to one place and providing the right resources to undertake high quality research. This creates a localised labour pool that businesses and institutions outside of the knowledge engine can extract talent from, producing a healthy foundation for an innovation ecosystem to develop.

In many places the engine is a university, but it can also be a major inward investor looking to build a supply chain or an existing core of specialist businesses, perhaps with historical roots, to build out from. The key point is that the base engine must be anchored in the area, embedded into local heritage, talent pools, businesses and capitalising on local activities that will provide the basis for further innovation.

We have broken out the basic elements of the model into more detailed aspects of the GM Health Innovation ecosystem and used these to develop a RAG rating. These judgements are inevitably subjective but are supported as far as possible by the data in previous sections of the report and our knowledge of the city region.

Preparedness Assessment

Innovation Model Category	Ecosystem Requirement	GM Preparedness	RAG
Knowledge Engine	Research quality	• University of Manchester (UoM) research rated over 93% 4*/3* (REF 2021) and achieved excellence across health areas: ○ Biological Science: 95% ○ Clinical Medicine: 89% ○ Public Health, Health Services & Primary Care: 86% ○ AHPs, Dentistry, Nursing and Pharmacy: 96% ○ Psychology, Psychiatry and Neuroscience: 89%	
	Research environment and interdisciplinary infrastructure	• National Institute for Health and Care Research (NIHR) One Manchester includes around £150m of assets in the GM city region (detailed at Annex B). • This includes the Clinical Research Network (CRN), highly regarded nationally and called out in O'Shaughnessy's clinical trials review as an area of good practice, which enabled 51,200 participants to be part of research in 2022/23, across more than 1,000 studies covering all health and care specialty areas[62]. • This includes the Clinical Research Facilities (CRF). The NIHR Manchester CRF was awarded £15.5m to expand the delivery of clinical trials (2022-2027). Whilst this is strong, there should be potential to attract further funding to GM due to population factors and other favourable conditions.	

[62] NIHR

Innovation Model Category	Ecosystem Requirement	GM Preparedness	RAG
Knowledge Engine		• Health Innovation Manchester includes one of England's 15 Academic Health Science Networks (AHSNs), established by NHS England in 2013 to spread innovation at pace and scale. • GM is again leading nationally in securing investment and progressing its Secure Data Environment, including data from the GM Care Record, which provides significant and new opportunities for research and non-research (eg planning), for both academic and industry partners. • UoM has research beacons in Biotechnology and Cancer, and there are 25 research centres and institutes across the city-region's universities working on research related to Health Innovation (detailed at Annex C), including the interface with digital technologies.	

	Research impact and reputation	• UoM ranked 2nd in the UK for Impact (THE)
		• UoM ranked 5th in the UK for research power (REF)
		• UoM ranked 6th in UK for total research grants and income
		• UoM ranks lower for Research Council funding in health-specific areas
		• UoM ranked 32nd in the current QS World University Rankings and has high world rankings in relevant subject areas:
		  ○ Materials Science: 21st
		  ○ Life Sciences and Medicine: 35th
		  ○ Computer Science: 65th
		• In addition to GM's research intensive institutions, research impact is also supported by the region's wider HEI's including the Universities of Salford, Bolton and Manchester Metropolitan	

	Commercialisation through spinouts	• Manchester has an impressive recent track record of generating spinouts (196 in 2021/22 based on HESA data across all GM HEIs), with the largest proportional growth in spinouts of any local authority area in 2022-23 (11.5% based on 2023 Sifted data). • Further research will be needed to understand how these are scaling and whether the finance available is fully supporting the growth of these companies.	
	Knowledge Transfer	• UoM is engaged in 15 'live' KTPs valued at £2.3m with approximately 4 within the health sector. Manchester Metropolitan University is currently a partner in 24 KTPs valued at £3.4m with 3 focused on the health sector. • Our questions in this area are not about GM's abilities in a UK context (although there may be scope to increase the number of KTPs targeting life sciences and HealthTech), but whether the UK's way of doing this is a globally effective way of ensuring the transfer of knowledge.	
	Commercialisation through contract research and consultancy	• Contract research and consultancy, income from collaborative research and IP revenue as a proportion of university income are broadly in line with comparators. • There could be potential for GM's knowledge engine to be strengthened if there were more consultancy-based companies providing market share, business heft and ultimately finance of other longer-term projects.	

Innovation Model Category	Ecosystem Requirement	GM Preparedness	RAG
	Talent Pipeline	• GM's four universities collectively have a higher proportion of students enrolled in both Biological and Medical and wider STEM subjects than comparable city-regions.	
	Specialism within Industry (breadth)	• GM has a specialism across a broad range Life Science and HealthTech subsectors	
	Specialism within Industry (depth)	• GM has emerging depth in some areas but does not yet stand out against the other cluster areas as having stand-out significance in focussed subsectors.	
	Specialism within complementary industry	• GM has specialism in interface areas such as health and advanced materials, Genomics and health and computer science, which also align to national policy areas, UoM strengths and research institute focusses. • GM also has strengths in digital and data industry, which will be a key enabler in the future of the industry and broader ecosystem.	
	Local impact including supply chains, commercialisation and diffusion	• GM creates knowledge through its research base and industry. There is insufficient evidence of activity driving local impact further down the supply chain, including within manufacturing.	

Innovation Model Category	Ecosystem Requirement	GM Preparedness	RAG
Physical Space	A pipeline of investment in creating physical innovation assets	• Developments at the Science Park including the attraction of UK Biobank, the completion of Circle Square, and the arrival of ID Manchester are suggestive of a rich investment on the Oxford Road corridor and aligned areas, this is complemented by developments at Alderley Park, Altrincham, with whom Health Innovation Manchester have a strategic relationship, and at Salford MediaCity and other locations across GM including health innovation developments in Bolton.	
	Availability of office and industrial space	• Availability is increasing according to CoStar analytics, with 11m sq. ft currently vacant in GM. Under construction square footage is also increasing.	
	Business Incubators and Science Parks	• The number of business incubators and science parks in GM are broadly in line with benchmarked areas although there are twice as many sites in the West Midlands and qualitative feedback that there is a shortage of high quality lab space. • Further research is required to robustly assess the quantity and quality of provision as well as demand trends.	
	Proportion of premises with Gigabit broadband coverage	• Gigabit broadband coverage is above the UK average, but broadly in line with benchmarked areas.	

Innovation Model Category	Ecosystem Requirement	GM Preparedness	RAG
Finance and IP	IP	• GM is below national average for IP revenue as a proportion of university income, and far below industry leaders such as Cambridge, however it is in line with some other areas with Russell Group Universities. • UoM scores better than some other universities because it gives beneficial ownership to individual academics. This should stand it in good stead for the long term. • GM has higher IP revenue relative to university income compared to benchmarked city-regions in the Midlands and North of England, however it lags behind areas in the Greater South East, and the city-region's universities are significantly behind Life Sciences and STEM specific Higher Education Institutions (HEIs) such as The Institute for Cancer Research and Imperial College of Science, Technology and Medicine in IP income capture.	
	Patents	• GM is below half the national average for university patent applications per 1000 businesses. • UoM ranks behind a number of comparator Russell Group Universities for filing and registering patents.	
	Seed Funding	• The strong performance in spinouts is indicative of availability of seed funding.	
	Health Innovation Manchester leveraged funding	• Over £100m leveraged in the last reported year to support Health Innovation activities.	
Finance and IP	Venture Capital	• Northern Gritstone, the investment business founded by the Universities of Manchester, Leeds and Sheffield, announced a first close of £215 million in investor funding following its launch last year. The company is focused on the commercialisation of university spinouts in the north of England, creating new jobs and opportunities in the UK's most exciting emerging sectors including health technology. • It is true that GM does better than other areas, however it still lags significantly behind the Greater South East.	
	Innovate UK Funding	• Innovate UK Grants to GM businesses ranked behind comparator city-regions. Innovate UK spend per capita in the North West of England was the joint lowest in the UK in 2018-19.	
	Gross Domestic Expenditure on R&D	• GM secured £976.8m in total GERD, 2.5% of UK total in 2018 (approximately 4% of the UK's population lives in GM). Of this: ○ Higher Education sector: 574.2m, 6.6% of UK total ○ Business sector: 378.4m, 1.5% of UK total	

		• In any economy the existing business stock is normally the primary source of investment. GM's weak business base historically is causing a lag in this regard.	

Innovation Model Category	Ecosystem Requirement	GM Preparedness	RAG
Capability Development Programmes	Sector Support	• Health Innovation Manchester and the Manchester Growth Company codeveloped the STEP INto Healthcare programme, which helps SMEs from all sectors across GM to improve their value proposition and increase their chances of success in the healthcare and life sciences market. • Health Innovation Manchester support access to European Regional Development Fund (ERDF) and Association of the British Pharmaceutical Industry (ABPI), Bionow, NHSE's National Innovation Service, the National Innovation Accelerator (NIA) and Clinical Entrepreneur (CEP) programmes. • Despite there being a number of sector support programmes in operation, they are not strategically linked to focused on key regional opportunities.	
	General support	• General cross-sector startup, innovation and growth support is offered through the Growth Company Business Growth Hub • GM is heavily dependent on generic programmes, broadly in line with elsewhere. The innovation accelerator and investment zone provide the opportunity to more specifically target this.	
Capability Development Programmes	IP commercialisation support	• In addition to IP support available at HEIs across GM, The Innovation Factory, which was launched in 2020, has the core mission of taking IP that was developed at the University of Manchester and commercialising it to create positive social, economic and environmental impact. The Innovation Factory collaborates with academic inventors to find valuable research and transforms it for societal benefit through technology licensing or new spinout companies.	
	Accelerators	• Funded by Government in 2023 as part of the GM Innovation Accelerator, the GM Advanced Diagnostics Accelerator will develop a step-change in the development and deployment of novel diagnostics in GM, targeted to the needs of local people but with national and international relevance. The programme will add value to academic research and sector strengths (notably the two UK technology families - diagnostics & genomics, and AI, data & advanced computing, and GM's digital and genomic frontier sectors) and leverage the GM Care Record and other data assets to transform patient care, unlock new market opportunities for businesses, and strengthen GMs position as a world-leading centre for health innovation. • Previous accelerators such as the MSP cancer accelerator.	
	Complementary Support	• Made Smarter, hosted in Manchester, provide support to digital manufacturing industry.	

Innovation Model Category	Ecosystem Requirement	GM Preparedness	RAG
Networks and Linkages	Business Networks	• There are some effective business networks in GM and the North, including Bionow, Medilink and also the Health and Life Science Cluster (Science and Technology Facilities Council / Daresbury) and linkages with Alderley Park • Although GM has one of the two largest Chambers in in the country, for a city as large there is little of the organised serendipity that characterises the best innovation ecosystems.	
	Soft Power	• There are no mechanisms nationally to build links between the most successful (and constrained) places – above all Cambridge and Manchester. Innovation is needed to rectify this and create the ability for knowledge, investment and business to flow between places.	
	System Partners	• GM has among the most mature ICSs and Mayoral Combined Authorities in England (an overview of healthcare providers is included at Annex G). The city-region recently acquired new powers through its trailblazer devolution deal. Innovation GM needs to be developed to ensure that this strength in brought to bear in the health innovation economy	

Additional Observable Characteristics

Population Scale, Attributes and Participation

Among the major system requirements for successful Health Innovation is access to participants for clinical trials and generation of real-world evidence. As detailed in the Industry and Supply Chain analysis below, clinical trials are changing, however human engagement is still essential, and will remain so – particularly in late-stage trials as simulation becomes increasingly able to be used to predict drug feasibility and effectiveness.

GM has an excellent record of clinical trial participation, with more than 250,000 people taking part in research studies in city-region healthcare facilities over the five years to 2020[63]. GM's population of 2.87[64] million people will continue be a key enabler for, and beneficiary of, health innovation developments in the city-region. The variations in health across GM analysed in Chapter 2 of this paper also highlight the case for harnessing the benefits of health innovation to drive healthier lives and a stronger economy as referenced

[63] Health Innovation Manchester
[64] Census 2021

earlier this has been recognised in delivery plans for some of the missions within the UK Life Science Vision.

Data Assets

GM has one of the largest and most technically advanced single ICS-wide digital and data assets in England, the Integrated Shared Care Record, which contains longitudinal patient records, and a Secure Data Environment which provides remote access to health data for approved researchers to use in health and care research, within a highly secure computing environment. Considered alongside the size and attributes of GM's population, and the city-region's industry strengths in digital health industry, this suggests a highly significant asset which could be positioned to show GM's strength in an area which is of key interest to investors.

Future Market Needs

To maximise growth, GM's health innovation ecosystem will also need to be conscious of, and able to pivot toward in some cases, changes in market demand. Key anticipated trends are as follows:

R&D

R&D is crucial within the Life Sciences sector[65], with innovation being crucial to business models. In a survey conducted by Deloitte, 91% of Life Sciences executive said that their companies are planning to invest more heavily during 2023. The pressure to achieve sustainable returns on investment, and the drive to scale the impact of investment, is driving change in traditional R&D models:

- Real World Evidence (RWE) is playing an increasing role in clinical trial design, helping Life Sciences organisations to understand the effects of treatments in different populations at pace and informing pricing assumptions.
- AI is expected to have a growing role in drug development, through the provision of data insight at pace and scale.
- A drive for faster development and testing of therapies post-pandemic is incentivising interagency collaboration. Global regulators are working more closely together, relaxing some barriers and increasing establishing ways of sharing data with private sector companies. This is driving increased demand for shared services provision of capabilities such as robotic cloud labs or Lab-as-a-Service.
- Life Sciences organisations are increasingly looking to scientific partnerships, including those with universities, to optimise their innovation capabilities.

These drivers for changes to the market all have strong digital dependencies, cementing the need for knowledge discovery and application to capitalise on fast-paces technological developments. They are also indicative of a fast-emerging future where knowledge generation will be faster-paced and deeply enabled by technologies such as AI,

[65] Deloitte, 2023 Global Life Sciences Outlook

emphasising the importance of interdisciplinary research in medical and health technologies.

Industry and Supply Chains

As detailed in Chapter 3, GM has a vibrant and entrepreneurial Life Sciences sector, with specialisms in the interface between health and digital, health and advanced materials and key emerging areas such as genomics. Although less specialised than Cambridge and Oxford, GM is comparable with other density-based Life Sciences industry clusters in the Midlands and the North.

To position GM as a natural home for Health Innovation outside the Greater South East the city-region needs to build on its record of entrepreneurship, supporting existing companies to grow and generate increasing sector employment. To achieve this goal, the city-region should position itself to respond to anticipated market drivers in the wider global Life Sciences sector. Alongside the commercialisation of new MedTech and MedTech knowledge, emerging technologies are likely to drive significant changes to the supply chain and clinical trials, which will have implications for the Life Sciences industry:

In response to the volatility seen in recent years, industry is pivoting to alternative demands of the supply chain. Known as the probabilistic approach, this new model centres on increased flexibility and adaptability, streamlined manufacturing processes, and enhanced real-time tracking. These changes respond to disruption to supply chains and issues with logistics, which are a concern of major businesses, due to associated rising costs.

As with other sector changes, digital technologies play a key driving role here, with AI driving new opportunities in production. To improve insight into supply chain vulnerabilities, Life Sciences companies are exploring practices which enable proactive scenario planning and risk mitigation. As noted in Deloitte's analysis, among the emerging and transformative trends include the acceleration of digital investments, the deployment of human-centred and AI-enabled digital automation, trust-based supply chain systems that are responsive and agile to changing stimuli in the business environment, the embedding of sustainability into supply chains, the expansion of connected networks to reinforce system-wide supply chain cohesiveness, and development of technologies to increase supply chain security against geopolitical threats.

If GM industry is able to respond to these emerging demands within its supply chain businesses, it is likely to build its inward investment.

Reshaping Clinical Trials[66] and Real-World Evidence generation

Clinical trials were originally designed to test mass-market drugs. Although they remain a crucial part of the sector, the emergence of personalised and precision medication will require trials to focus on individualised, rather than averages responses[67], lessons from the

[66] Deloitte, Life Sciences Outlook 2023
[67] Nature

COVID-19 pandemic response, and developments in digital technology, are driving the emergence of more agile clinical trial methods:

- **Rapid feasibility assessment**, targeting trial recruitment and faster, more democratic and cheaper trials using the underlying capabilities of the CRN and the GM digital assets.
- **Digital Trials** gathering data through wearables, app technology and medication management are making trials more convenient for patients, increasing the amount of data collected and building greater insight into patient safety.
- **Trial Simulation** is enabling the feasibility of human trials to be assessed through simulated organ responses using AI to optimise dosing and predict disease progression.
- **Clinics located in community facilities** such as supermarkets, which are more convenient for potential participants, are well-suited for trials for drugs to treat diseases such as skin cancer, diabetes, asthma, or hypertension. This approach could also address inequalities through making clinical trial participation more accessible to different population groups.
- **Intelligent Trials** use real-world data and predictive AI algorithms to accelerate the understanding of diseases, identify suitable patients, assist in site selection, and support novel study designs. The algorithms collect and analyse clinical data more quickly and from more inputs while also reducing the potential for human error. AI can also improve patient monitoring, medication adherence and retention.

The future of clinical trials will be the utilisation of technology to collect, monitor and analyse data more quickly, with AI expected to have a growing role in vastly increasing the efficacy of trial processes.

Taking the Assessment Further

The preparedness framework provides an appraisal of quantifiable and accessible attributes of the GM Health Innovation Ecosystem; however it should be noted that the picture presented is partial. The Ecosystem is not empirically observable in its entirety, and much of its preparedness to act and practical efficacy will be determined by the links, relationships, behaviours and ease of navigation associated with the assets. For this reason, the next step should be to undertake supporting field work to develop a deep understanding of not just what GM has, but how it is deployed.

5 Where Next for GM Health Innovation?

Health Innovation Manchester is one of the city region's unique institutions. It was founded by leaders from across academic, healthcare and local government and is a product of, and responsible for, cooperation across those partners, working collectively with business; a partnership few other areas of the UK can match. The UK Government's aim is to strengthen research and innovation infrastructure outside the Greater South East. With GM's strong knowledge assets, talent pipeline and industry specialism in Health and MedTech and prominent policy areas such as Genomics, Health Innovation Manchester and its partners are well placed to add significant value in the period ahead.

The assessment made by Metro Dynamics, of what Health Innovation Manchester and its ecosystem partners should do to achieve shared goals is primarily framed by our assessment of the current state of the Health Innovation economy, and the ecology set out in Chapter Four. In respect of all activity that we have reviewed we have asked the following questions:

- what are the things done at the moment which should be continued,
- what are the new things that should be started and
- what, if any, activities that we have seen should be stopped.

As we think about these issues we also must frame our current ecosystem and its achievements, both against national performance, and the potential size of the global opportunity in the global context.

This report draws upon extensive reading of both published material and of available data. Metro Dynamics have drawn on their knowledge of the city region but have not, yet, undertaken any primary research. Whilst Health Innovation Manchester has added further local context, the analysis presented here is, to an extent, provisional. There is no compelling case for Health Innovation Manchester to stop any of its current activities. In what follows, therefore, we have addressed the range of possible choices facing as a partnership by prioritisation between those strategic activities that should be continued on a case-maintenance basis, those which should be continued more actively, and those, few, areas where there is a case for significant expansion of activity.

To further guide prioritisation there are three dimensions of possible change:

Strategic choices facing Health Innovation Manchester	
Wholesale: activity which is principally focused on the creation of a strong business base creating health innovation	**Retail**: Activity whose main aim is to bring health innovation into clinical practice and commercial use focused on end-users
Creating the conditions: essentially this is about the pillars of the model set out in the	**Supporting businesses directly**: this could be in relation to start-ups, scale ups or a good

previous section, particularly finance, premises and programmes	investment, with activity designed to directly improve the business base
Short-term: With a focus on delivering results in the next 1 to 3 years	**Long-term**: Focusing on activity which may have little payoff but deliver a more fundamental change over a larger number of years.

Given the context of this review and that of other organisations in GM, Metro Dynamics favour a menu of possible future activities which is more focused on wholesale as opposed to retail change, and on building the business base more than adaptation. We think a balance is needed between short and long-term, but that the priority should be balanced as between creating the conditions for growth and supporting businesses directly. Initial focus should be on creating the conditions for growth and the attraction of new businesses to the city region.

We conclude this report by setting out the six areas we think Health Innovation Manchester should explore with Ecosystem partners:

The Knowledge Engine: Continue

GM has fostered, and benefits from, world-leading research and civic-minded universities, who collectively generate talent in the Life Sciences and complementary disciplines at scale. Clearly in recent years areas such as spinout performance demonstrate this knowledge being turned into real-world solutions. The challenges apparent through this research are around further development of research commercialisation. Health Innovation Manchester should support and continue to work with GM universities to maximise the efficacy of Health Innovation commercialisation. A deeper analysis on this is underway already, but based on the analysis presented, this will in part require greater industry engagement.

To significantly strengthen knowledge transfer into business, there are options to develop models that go beyond the existing UK approach to knowledge transfer. Stimulating research consultancy is an approach that could be additive in increasing the pace of commercialisation without some of the risks associated with the longer-term benefits realisation and higher risk appetite associated with startups.

Next step: Analysis indicates that industry investment in R&D in GM is below comparator regions and the national average. GM HEIs also deliver fewer research and consultancy projects with businesses (both SMEs and non-SMEs) and these projects have a much lower value. Critically within this and building on the work of the advance diagnostic innovation accelerator specifically, HInM and partners should seek to increase the value of Innovate UK grants secured by industry partnerships within the region by at least 20% pa.

Confident prioritisation: Start

Analysis shows that GM has a broad base of research and industrial expertise across Health and Life Sciences but, in comparison to other city region economies, does not *yet* have areas of stand-out significance in focussed subsectors. These are clearly emerging – for example in key policy areas such as Genomics. Notably, these align with broader GM specialisms such as advanced materials, computer science and data technology.

It is clear at this point that digital technologies – and particularly use of AI to interpret and deploy health data – are a transformative emerging capability for Health Innovation.

From the ability to undertake population health management and risk stratification within the community, the role of wearables and advanced diagnostics in prevention, the emerging changes to clinical trials and supply chains, through to genomics and personalised and precision medicine, every major sector evolution requires advances in digital and data technologies. Whilst UoM in particular has recognised this potential with the creation of the Pankhurst Institute, the remains significant potential for development.

Next step: Moving forward, Health Innovation Manchester should prioritise with confidence – building those emerging activities to become the embedded, recognised Health Innovation strengths for GM. HInM and partners should agree target sub-sectors and undertake deep dives to co-design targeted sub-sector growth plans. This will require them to be brave enough to define the areas where they do not wish to be competitive.

Creating Vibrant Start and Scale ups: Continue and Accelerate

GM has a strong track record of successful business startups and is recognised as having one of the strongest tech startup ecosystems in the UK, *particularly* in the areas of computing, life sciences, engineering and manufacturing, and physical and social sciences. In 2022, 8 out 20 of Manchester's top tech start-ups were health related, covering diagnostics, data, pharmaceuticals and wearable technologies, and were alongside other starts in related tech strengths such as AI and Software as a Service.

Maintaining a strong pipeline of startups to deepen the Health Tech blend will be critical to building GMs strengths. However, there must also be emphasis on encouraging and supporting business to scale. Per recent analysis from the Scale-Up institute, GM's performance on scaling is 'moderate' – showing few instances of above average growth either in employment or turnover. This is an area where acceleration of support has the potential to offer significant return: scale-up businesses tend to be more productive, more innovative, more diverse and create more high-quality jobs. Scaling of businesses of this type requires generation of evidence of the compelling value propositions as part of the Product Lifecycle Management processes. Whilst HInM and its partners have a positive track record in this regard, things could accelerate.

Next step: Despite strong start-up and spin-out performance, spinouts tend to generate less turnover and attract less investment than spinouts within many other research-intensive HEIs. Partners should consider a targeted support offer to spin-out and scale new businesses within the sector, creating a one-stop-chop for entrepreneurs and innovators to access the advice, networks and finance they need for growth as well as a prioritised approach to targeted proof of value studies and generation for real world evidence. Targets should be developed in this regard.

Crowd in National and International Companies and Finance: Continue and Accelerate

Understanding the data on early-stage finance without engagement is near-on impossible. Data indicates that Manchester is among the largest city recipients of early-stage venture capital outside the Greater South East, but that growth has been slow, and further research would be required to fully understand the state of play. Some things are clear. The level of venture capital going into companies outside the Golden Triangle, and especially outside London, is lower than is ideal. But there is evidence that Manchester is

making progress, and perhaps better progress than other areas. Northern Gritstone is an important development. The Innovation Factory and Life Science Investment Fund are also creating a pipeline, and we are aware of anecdotal examples of GM entrepreneurs changing their investment patterns away from property retail and leisure and sport into tech-based companies. How prevalent this is, is not yet clear, but if it happens at scale it is important.

In the next phase of work we will need to understand, through consultation, where the balance lies between several factors: the available level of investment and loan finance; the corporate and technical expertise needed to ensure it is both structured into fundable deals, and that access to the subject matter expertise to make projects fundable is available; and the role of networking, considered below, in catalysing this process.

Building Innovation Assets: Continue

One of the strengths in the revival of GM over the last two decades has been the renewal of the physical infrastructure of the city region. This will be an ongoing part of the development of the science and technology ecosystem in general and will subsequently be an important contributor to the health innovation economy. However, there has been considerable investment in Manchester Science Park, the first phases of Circle Square are complete and filling well, while ID Manchester is now approaching the point of being developed. If we add to this the renaissance of town centres such as Altrincham and the proximity of a rejuvenated Alderley Park, the quantity of investment into the physical capital stock of the innovation economy looks high. Further investment will be needed but, supporting and shaping aside, and when taken alongside some of the facilities within the healthcare and NIHR system, this may not be the highest priority for Health Innovation Manchester.

Whilst the digital infrastructure is mature by compared to many UK localities, there is further opportunity to make further advances, through enhancement of the underlying system of record, strong data linkage, and development of effective operating and business models for increasing data usage and engagement. This work must continue.

Next step: there is a need to understand the extent to which the accommodation requirements of businesses within the sector are being met and where there are opportunities to more closely connect GM's HealthTech and digital assets. The development of the Central Growth Corridor may provide a focus for this and an opportunity to explore how health and life sciences assets within the city centre could better connect with digital expertise in Salford and the developing non healthcare digital sector across the city region.

The Power of Focussed Collaboration: Continue and Accelerate

Our work on successful innovation ecosystems has repeatedly identified that the active creation of connections between academia, businesses and support agencies is key.

Cutting across all this should be the facilitation of deeper, quicker and more dynamic connections. As opportunities arise, innovation partners need to be able to respond quickly particularly within rapidly changing sectors such as Health Innovation. An example where this has been used to supercharge digital supply chains was Cisco's work in Berlin

which brought together more than 80 people to think of ways in which manufacturers could manage global inventory in a more flexible manner:

"The collaborators sought ways to enable companies to track shipments more precisely with sensors and authenticate the sources of components with blockchain technology. The possible uses of blockchain technology in supply chain management are wide-ranging. In the near term, companies will be able to use secure, digitized supply chains to monitor and authenticate specific spare airplane parts, for instance, or the origins of the diamonds used in jewellery. Such breakthroughs would not have been possible without an ecosystem of uncommon partners" [68]

A UK example of focussed collaboration in action is the conditions which exist to support collaboration in Cambridge.

Learning From Elsewhere: Cambridge

Innovation in Cambridge is oriented around an established research-intensive community and attracts a specialist talent pool, but the triumph of its innovation ecosystem can be traced to its innovation networks. A strong and proactive relationship between the commercial research sector and the academic research sector is the bedrock of the Cambridge innovation ecosystem.

It's early success in the Cambridge of what is generally referred to as the "Cambridge Phenomenon" arises from a combination of academic excellence and commercial success. Much of this report looks at the role of business and academia in creating new economic activity. However two overlooked aspects of the story are the role of consultancy companies and networking. The role of networking is now well understood and forms the basis of Metro Dynamics' recommendations for future focus by Health Innovation Manchester. As part of the next phase of work, they have suggested a discussion on the implications of some research undertaken in 2010 in Cambridge on the role of consultancy companies which is set out in the report "Exploding the Myths". [69] This is not considered further here.

Cambridge Enterprise, the University of Cambridge's commercialisation team, and business angel investors Cambridge Angels facilitate knowledge transfer to make innovation commercially successful, providing consultancy services and seeking seed funding from private investors. There is now cross-fertilisation of Cambridge Angels into Manchester and the Innovation Factory through Simon Thorpe's role. How can this be accentuated?

As important as anything in Cambridge has been a series of private sector led networks principal among which are the Cambridge Network and Cambridge Ahead. Relatively modest private sector funding allied to the active engagement of some of Cambridge's most prominent entrepreneurs and academics alongside the myriad opportunities of dinners and seminars organised by the University's Colleges and the Centre for Science and Policy (CSaP) have led a relatively small city of 150,000 people to have a highly developed

[68] https://sloanreview.mit.edu/article/building-the-right-ecosystem-for-innovation/
[69] https://www.cbr.cam.ac.uk/wp-content/uploads/2020/08/specialreport-explodingthemyths.pdf

form of organised serendipity. There is nothing like any of these in Manchester, although there is a nascent project in which we are involved to connect Cambridge and Manchester. CSaP are also thought to be developing a sister project in Manchester jointly with The University of Manchester. A further deep dive into the Cambridge ecosystem and the possibilities this offers Manchester, both for Manchester and bilaterally with Cambridge, seems an important next step.

Next step: Partners should facilitate opportunities for focused collaboration to connect industry with academic expertise and key customers.

Next Steps

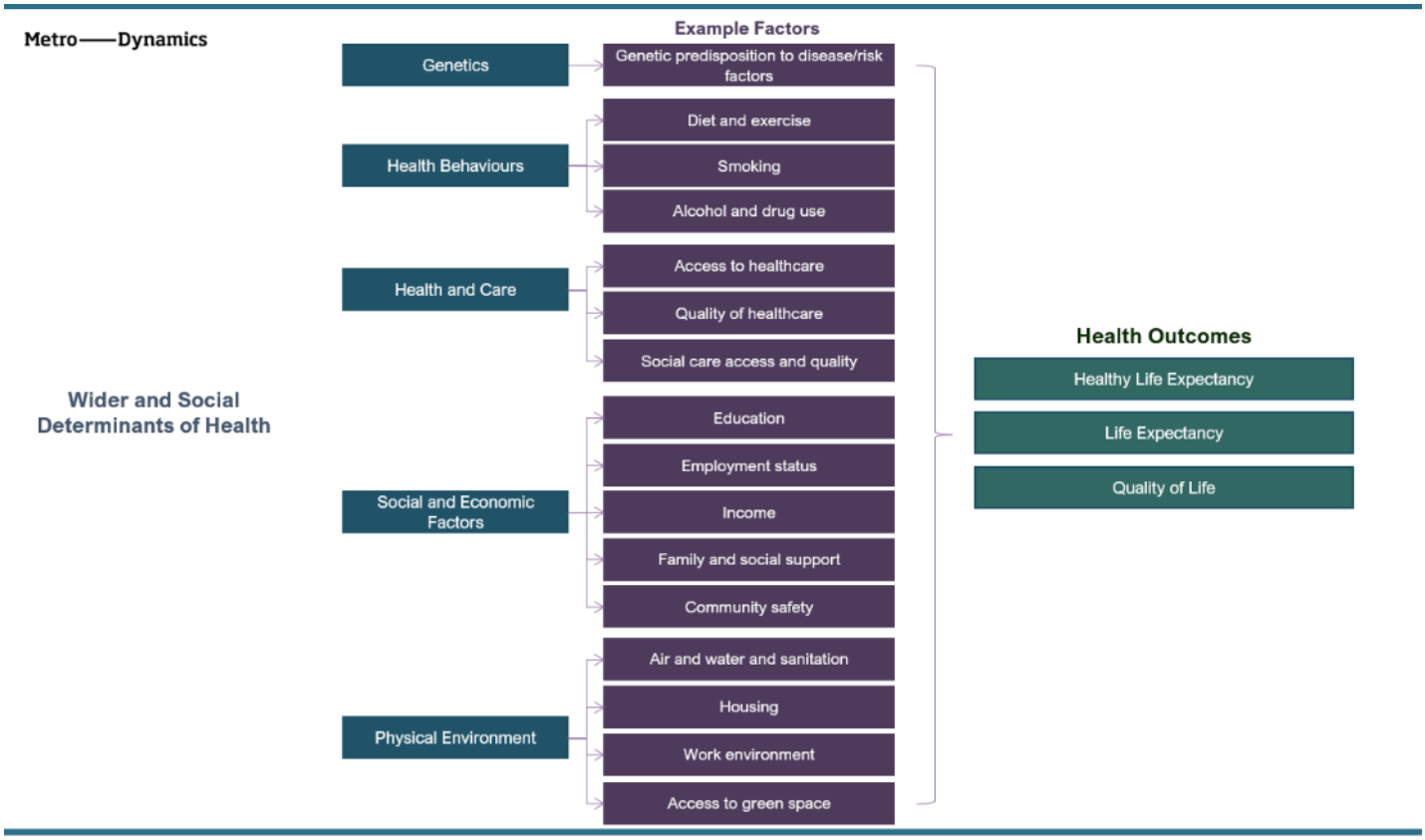
We set out to produce this report with a view to analysing GM's HealthTech industry in depth, framing this with a high-level review of GM's health innovation ecosystem, and considering the ecosystem's preparedness to support future sector growth. The suggested next steps above reflect the provisional areas which Health Innovation Manchester and Metro Dynamics believe merit exploration with our partners in the short term.

This report, therefore, provides a starting position. Our most important next step will be to test and challenge our thinking with key ecosystem partners, applying the knowledge of those we work with to settle on a series of focussed partnership actions, and to use these discussions to help shape the priorities that will be delivered through Health Innovation Manchester's next business plan. Throughout the undertaking of this research it has become clear that the task at hand – supercharging our collective strengths – and the next steps required to achieve that goal, are not within the gift of any single organisation within GM. We need to move beyond individual organisational excellence and calibrate our place-based approach and the effectiveness of our partnership to truly make the GM health innovation ecosystem much more than the sum of its parts.

Annex A Drivers of Ill-Health and Inequalities

While estimates vary, it is commonly recognised that 10-20% of a person's modifiable health outcomes[70] are determined by their access to healthcare, and the quality of care that they receive. Among the social and wider determinants of health, studies have estimated that unequal distribution accounts for 30-55% of variation in health outcomes[7172].

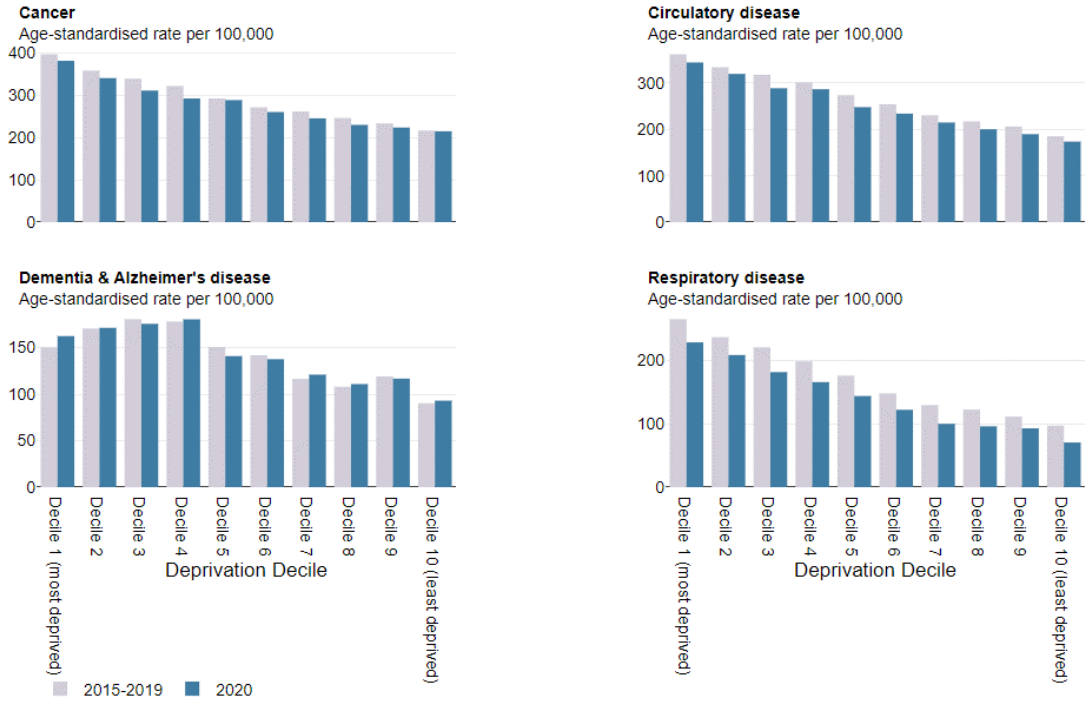
Figure 15. Metro Dynamics analysis of social and wider factors determining health outcomes[73]



[70] NHS England
[71] Marmot, M., Donkin, A., and Goldblatt, P. Inequalities Update 2017, via Office for Health Improvement and Disparities
[72] WHO
[73] Gov.uk; Office for Health Improvement and Disparities

Socioeconomic inequalities are also directly linked to many of the diseases which most commonly cause mortality and sustained ill-health, both nationally and in the North West[74]:

Figure 16. Age-standardised mortality rate per 100,000 population, by deprivation decile, Office for Health Improvement and Disparity



[74] Office for Health Improvement and Disparities

Annex B NIHR Infrastructure

The NIHR has around £150m of assets in the GM city region, which corresponds to £30m per annum:

NIHR Manchester Biomedical Research Centre (BRC) - £60m over 5 years: Awarded more than £60 million (2022-27), Manchester houses the largest NIHR BRC outside the South East of England. NIHR BRC Manchester brings together world-leading researchers based at The University of Manchester and six of the country's foremost NHS Trusts to drive health improvements. Manchester BRC is driving forward pioneering research in the areas of cancer (prevention and early detection, advanced radiotherapy, precision medicine, living with and beyond cancer), inflammation (rheumatic and musculoskeletal disease, respiratory medicine, dermatology, integrative cardiovascular medicine), high-burden under-researched conditions (hearing health, mental health, rare conditions) and disease complexity and multimorbidity (next generation phenotyping and diagnostics, next generation therapeutics).

Applied Research Collaboration GM (ARC-GM) - £9m + partner investment over 5 years: supports applied health and care research that responds to, and meets, the needs of local populations and local health and care systems.

GM Patient Safety Research Collaboration (PSRC) – £4.9m over 5 years: a partnership hosted by Northern Care Alliance NHS Foundation Trust alongside the Universities of Manchester, Nottingham and Leicester. The collaboration works with patients, carers, and health and social care staff, and researchers to design, test and evaluate new ways of delivering care (interventions). This approach across the four research themes aims to narrow the gap in health inequalities, resulting in safer health and social care for everyone.

Research themes:

- Improving medication safety
- Enhancing cultures of safety
- Developing safer health and care systems
- Preventing suicide and self-harm

Clinical Research Network GM - £20m per year: provides practical support to enable high-quality research to take place in NHS, public health and social care settings across GM, East Cheshire and East Lancashire. This is so we can gather evidence that leads to new and better care and treatments for patients and the public.

In 2022/23, the Clinical Research Network supported the recruitment of over 51,000 participants on to research studies.

NIHR GM Clinical Research Facilities (CRFs) - £15.5m over 5 years: NIHR Manchester CRF is the largest and most comprehensive NIHR CRF in the UK, comprised of:

- NIHR Manchester CRF - Christie, the largest single-site comprehensive cancer centre in Europe (Organisation of European Cancer Institutes accredited), treating more than 60,000 patients annually.
- NIHR Manchester CRF – Manchester Royal Infirmary, which supports adult and paediatric studies across a diverse range of clinical speciality areas, and provides a

dedicated space and a safe, quality-assured environment, for delivering studies across all phases of research in patients of all ages – particularly Phase I and II complex and high-intensity clinical research studies.

- NIHR Manchester CRF – Wythenshawe, which specialises in early phase research in clinical areas including respiratory medicine (Asthma, chromic cough, COPD), cystic fibrosis, and breast cancer.
- NIHR Manchester CRF – Royal Manchester Children's Hospital, which is the first specialist children's facility in the North West and one of only a handful across the UK, enabling children to take part in research studies alongside on-going treatment (other sites include at MFT North and NCA Salford).

School for Primary Care Research - £21.8m over 5 years: a partnership between nine leading academic centres for primary care research in England. Established in 2006, it works to increase the evidence base for primary care practice through high quality research and strategic leadership, and to build capacity in primary care with a well-established training programme.

School for Social Care Research - £15m over 5 years: (Phase III, 2019-2024) is a partnership between the University of Manchester, London School of Economics and Political Science, King's College London and the Universities of Birmingham, Bristol, Kent, and York. It works to develop the evidence base to inform and improve adult social care practice in England by commissioning and conducting internationally leading research.

Research Design Service North West (Research Support Service from October 2023), covering Manchester, Liverpool and Lancaster, gives free and confidential design and methodological advice, providing tailored support to health and social care researchers from initial idea to final application.

Policy Research Unit in Health and Social care Systems and Commissioning - £3m-£5.5m over 5 years: a collaboration between The University of Manchester, London School of Hygiene and Tropical Medicine, the Centre for Health Services Studies at the University of Kent and the Personal Social Services Research Unit. It provides evidence to the Department of Health and Social Care to inform the development of policy on the health and social care system and commissioning, focussing on maximising outcomes for the public and patients.

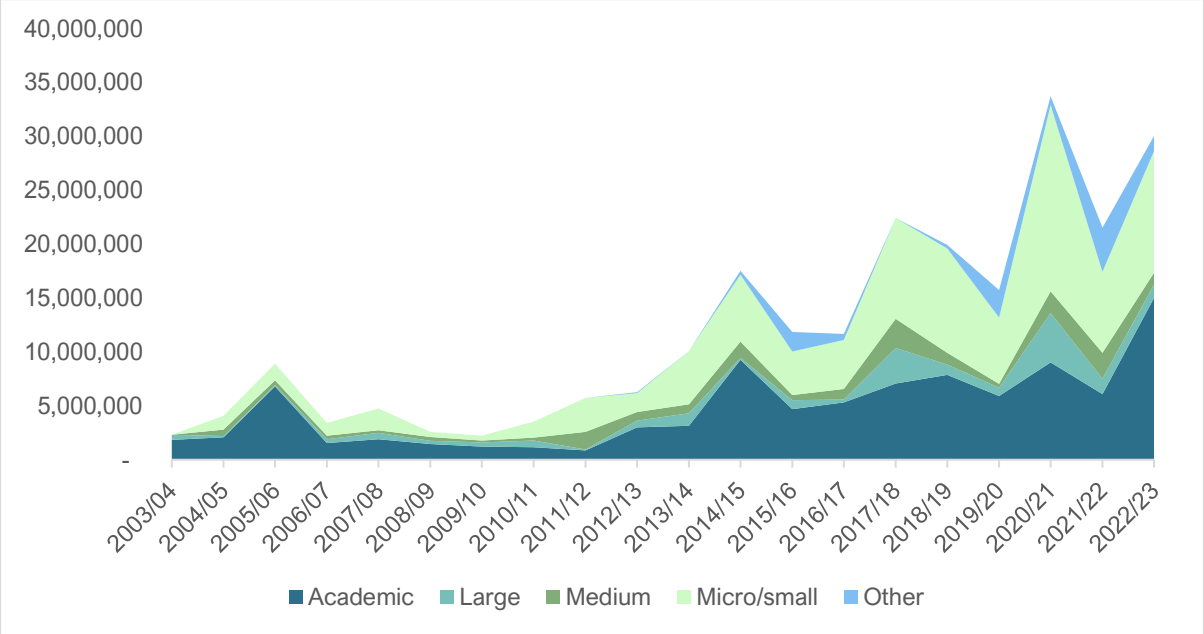
Annex C GM Institutes and Centres Undertaking Health Innovation Research

Host University	Institute/Centre	Notes
UoM	Cancer Research Manchester UK Institute	Leading cancer research institute within The University of Manchester, spanning the whole spectrum of cancer research - from investigating the molecular and cellular basis of cancer, to translational research and the development of therapeutics.
UoM	Cathy Marsh Institute for Social Research (CMI)	Includes a Lifelong Health Research Group.
UoM	Christabel Pankhurst Institute for Health Technology Research and Innovation	A unique partnership that aims to build on the University of Manchester's research strengths in digital technologies, AI and advanced materials to develop transformative solutions to health and care challenges.
UoM	Henry Royce Institute	Specialising in materials innovation, including within healthcare.
UoM	The Institute for Data Science and AI	Includes research in advanced data analytics and data-driven research in Health and Biology
UoM	Lydia Becker Institute of Immunology and Inflammation	Unites basic, translational, and clinical research to address the complex and ever-increasing role immunology plays in modern medicine.
UoM	Manchester Cancer Research Centre	Includes £150m building housing the largest concentration of scientists, doctors and nurses in Europe.
UoM	Manchester Institute of Biotechnology	Purpose-built, interdisciplinary research institute working to advance the biotechnology agenda and contributing to economising healthcare.
UoM	Manchester Institute of Innovation Research	Recognised international centre of excellence for the study of Science, Technology and Innovation (STI) policy and management. The Institute informs science and innovation policy by engaging with key policymakers, in the UK, Europe and further afield.
UoM	Manchester Urban Institute	Includes research on urban health and wellbeing
UoM	Graphene Institute	Includes research in emerging areas such as nanomedicine and photon science
UoM	Photon Science Institute	Biophotonics and bioanalytical spectroscopy
UoM	Productivity Institute	Includes a focus on the links between health and productivity
UoM	Thomas Ashton Institute	Health and work research
UoS	Autonomous Systems and Advanced Robotics Research Centre	Applied research, including in Health and Social Care

UoS	Centre for Health Sciences Research	Multidisciplinary group, focused on improving health outcomes through innovation, research and partnerships. The centre has a strong focus on technological advancement, often working closely with NHS and industry partners to develop and test new treatments and to create innovative healthcare products and services.
UoS	Centre for Social and Health Research	Includes research into health inequalities.
UoS	Centre for Human Movement and Rehabilitation	Delivers research addressing important health challenges which limit mobility, are associated with pain, and which can prevent people from living independently. The work encompasses rheumatic and musculoskeletal diseases, long-term conditions, such as limb loss, diabetes and stroke, along with health states associated with ageing, such as frailty.
UoS	Centre for Applied Health Research	Works across professions and disciplines to conduct and support research that addresses challenges across health, well-being and social care.
UoS	Biomedical Research Centre	Research addressing diverse problems in biomedical sciences and health, including identifying cancer stem cell metabolism processes and molecular biomarkers through to understanding the impact of zoonotic and pathogenic microbes on human health.
MMU	Centre for Advanced Computational Science	Includes HealthTech research.
MMU	Advanced Materials and Surface Engineering Research Centre	Includes catalysis group - improving pharmaceutical products
MMU	Centre for Bioscience	Research to improve understanding and inform the treatment of the most widespread diseases affecting the UK population.
MMU	Health, Psychology and Communities Research Centre	Research and knowledge exchange to improve the health and wellbeing of individuals and their communities
MMU	Musculoskeletal Science and Sports Medicine Research Centre	Molecule-to-society research into human movement to optimise health, performance and vitality across the human lifespan.

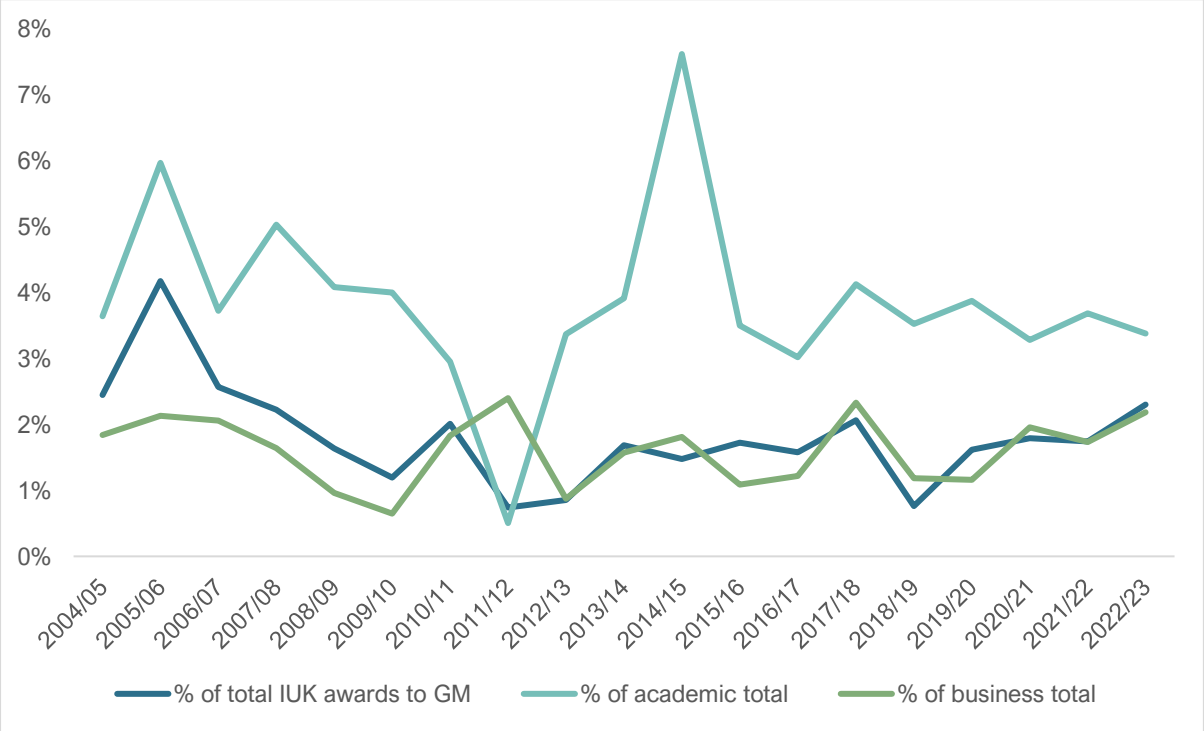
Annex D Data on GM Access to Finance

Figure 17. GM Innovate UK awards



Source: Innovate UK funded projects since 2004

Figure 18. GM Innovate UK awards as % of UK total



Source: Innovate UK funded projects since 2004

Table 15. R&D tax credits by Region (tax year 2020 - 2021)

	Number of SME Scheme claims	Cost of SME Scheme claims	Number of RDEC claims	Cost of RDEC claims	Number of RDEC claims by SMEs	Cost of RDEC claims by SMEs	Total Claims	Total Cost	Total Expenditure
North East	3%	2%	3%	1%	3%	3%	3%	2%	2%
North West	**11%**	**9%**	**9%**	**5%**	**9%**	**7%**	**11%**	**7%**	**7%**
Yorkshire and The Humber	8%	6%	7%	2%	6%	4%	7%	4%	4%
East Midlands	7%	6%	6%	4%	6%	4%	7%	5%	5%
West Midlands	9%	7%	8%	7%	7%	7%	8%	7%	7%
East of England	9%	11%	8%	13%	9%	11%	9%	12%	12%
London	21%	30%	26%	34%	21%	29%	21%	31%	31%
South East	14%	16%	17%	24%	16%	18%	15%	18%	20%
South West	8%	6%	6%	4%	8%	5%	8%	5%	5%
Wales	3%	2%	2%	1%	3%	3%	3%	2%	2%
Scotland	5%	4%	7%	5%	9%	5%	5%	4%	5%
Northern Ireland	3%	2%	3%	2%	4%	3%	3%	2%	2%

Source: Research and Development Tax Credits Statistics 2022

Annex E Baseline Scorecards

Table 16. Baseline Scorecard - City Region Comparators

Indicator	Greater Manchester Combined Authority	West Yorkshire Combined Authority	West Midlands Combined Authority	Cambridgeshire and Peterborough Combined Authority	England
Business R&D expenditure per full time employee (2018)	409	524	926	3609	1218
% of students enrolled in Biological and Medical Sciences	27.5%				24.3%
% of students enrolled in STEM subjects	49%	41%	48%	52%	46%
Total IP revenue of universities per £100k of income	£277	£86	£128	£1752	£754
University patent applications per 1000 businesses (2021/22)	0.37	0.73	1.28	8.39	0.77
Total Innovate UK grants to business (5-year total)	£67,867,629	£72,104,343	£133,054,465	£210,308,728	£3,516,615,418
Proportion of Innovation jobs (2021)	3.4%	3.7%	3.5%	11.3%	GB: 4.5%
Pct. change no. of innovation jobs (2016-21)	26.4%	24.4%	18.3%	36.4%	GB: 7.5%
GVA per job filled (2021)	£52,224	£50,794	£50,970	£56,522	UK: £58,326
Job density (jobs per 16-64 population) (2021)	0.86	0.82	0.78	0.9	UK:0.84
% of the population aged 20-34 (2021)	21%	20.3%	20.8%	20.3%	UK: 19.5%
Average weekly workplace earnings for full time workers	£602	£587	£647	£666	UK: £640
Employment rate (2021)	72.4%	73.4%	69.2%	80.1%	UK: 75.5%
Innovation jobs	47,660	40,495	45,015	52,040	GB: 1,366,250
Proportion of the working age population with NVQ4+ (2021)	39.1%	38.3%	36.9%	43.5%	43.6%

% of the area in most deprived 10% (IMD) (2019)	50%	20%	29%	0%	10%
Economic complexity index rank of core city (2020)	21 (Manchester)	63 (Leeds)	53 (Birmingham)	13 (Cambridge)	1 (City of London)
Proportion of premises with Gigabit broadband coverage	82.8%	85%	93.3%	79.6%	UK: 76%
Total scaleups (per 1,000 businesses)	38.7	38.7	32.8	44.4	UK: 37.9
Total number of science parks (average per local authority)	3	2	6	5	UK: 128
Total business incubators & accelerators	16	12	31	7	UK: 476

Sources: Subregional productivity, ONS, 2023, Population estimates, ONS, 2023, Annual Survey of hours and earnings, ONS, 2023, indices of Multiple Deprivation, 2019, Metro Dynamics analysis of BRES, 2020, House of Commons Library, 2023, Thinkbroadband, 2023, ONS Business Demographics 2021

Table 17. Baseline Scorecard: University Contract Research, Consultancy or Facilities with Businesses

	SMEs		Non-SME Commercial Business		Non-Commercial Organisation		Total	
	No.	Value (£000s)	No.	Value (£000s)	No.	Value (£000s)	No.	Value (£000s)
Manchester Metropolitan University	19	237	13	1,194	62	1,316	94	2,747
The University of Bolton	3	7	3	23	2	37	8	67
The University of Manchester	56	3,857	297	22,632	328	23,169	681	49,658
The University of Salford	13	807	13	277	42	658	68	1,742
The University of Oxford	79	4,232	724	97,342	2,257	179,985	3,060	281,559
The University of Birmingham	160	4,776	350	30,384	1,219	73,404	1,729	108,564
The University of Sheffield	124	6,409	416	35,347	203	9,491	743	51,247
The University of Leeds	80	2,879	243	11,558	658	28,471	981	42,908

Source: HESA, 2021/22

Table 18. Baseline Scorecard: University income from collaborative research

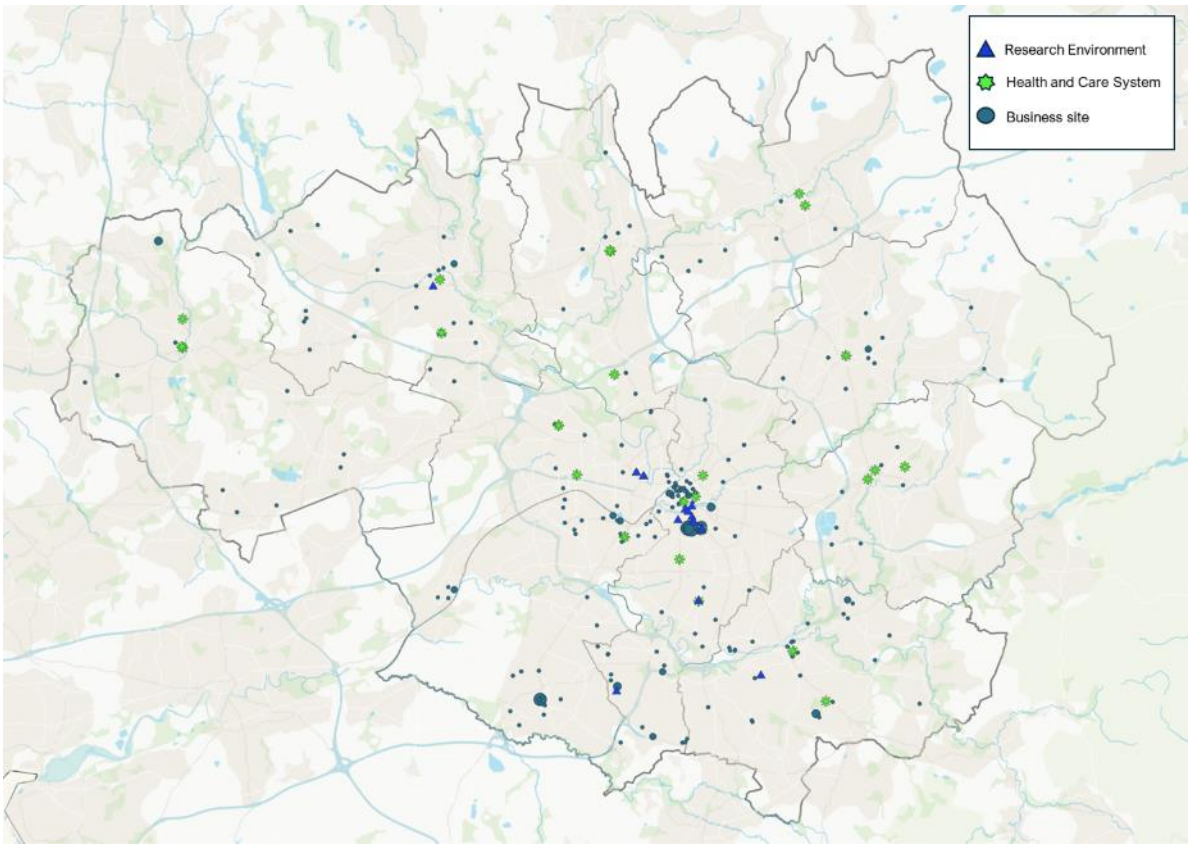
					£000s
	Public funding	Collaborative contribution - Cash	Collaborative contribution - in kind	**Total**	Previous year's total
Manchester Metropolitan University	4,169	600	449	**5,218**	4,322
The University of Bolton	0	84	0	**84**	227
The University of Manchester	65,416	5,471	16,626	**87,513**	90,795
The University of Salford	2,195	244	1,864	**4,303**	7,321
The University of Oxford	24,334	3,498	4,870	**32,702**	37,170
The University of Birmingham	52,275	2,154	1,073	**55,502**	55,184
The University of Sheffield	45,748	3,222	49,941	**98,911**	100,900
The University of Leeds	32,569	1,610	20,062	**54,241**	42,566

Source: HESA, 2021/22

Annex F Ecosystem Map

The below map shows the geographic distribution of GM's Health Innovation Ecosystem, including the locations of Research and Healthcare System assets alongside industry locations.

Figure 19. Life Sciences businesses and ecosystem assets



Source: Bioscience and health technology sector statistics 2021

Annex G GM Integrated Care Partners

Type	Locality	Organisation	Major units (eg practices, sites, hospitals)	[75]Workforce	Population	[76]Annual Income	Source/more info	Description
Primary Care Provider - General Practice	GM	Various	400+				https://gmpcb.org.uk/general-practice/general-practice-overview/	The Greater Manchester Primary Care Provider Board (PCB) is centred around one shared vision of: Primary care providers working collaboratively and in partnership at neighbourhood, place and system level to improve health and wellbeing throughout our communities. Established in 2015, we are England's first primary care collaborative. We give Greater Manchester's 1,800 primary care provider organisations (across community pharmacy, dentistry, general practice and optometry) a single voice. Our delivery team brings together programme management disciplines, quality improvement, change management, clinical and provider leadership into a single function. This subject matter expertise is underpinned by large-scale change methodologies. The team works alongside and has strong relationships with key system improvement partners, including Strategic Clinical Networks (SCN), the Clinical Research Network (CRN) and Aqua, as well as thought leaders in the area of primary care development, including the NHS Confederation and the Royal College of GPs. Health Innovation Manchester are also key partners and enablers in our primary care transformation programmes, and our teams are integrated to support delivery. Through these networks and the connections formed by the PCB, the Delivery Team has a strong reach across primary care and can respond to current thinking and be relevant to primary care today. In addition, the Delivery Team supports Greater Manchester locality teams, making sure there are links across localities and mutual support is available, along with a culture of continuous improvement and development.
Primary Care Provider - PCNs	GM	Various	67				https://gmprimarycare.org.uk/	
Primary Care Provider - Community Pharmacy	GM	Various	673				https://gmpcb.org.uk/community-pharmacy/community-pharmacy-overview/	
Primary Care Provider - Dentistry	GM	Various			58% of pop		https://gmpcb.org.uk/dentistry/dentistry-overview/	
Primary Care Provider - Optometry	GM	Various	300				https://gmpcb.org.uk/optometry/optometry-overview/	
Primary Care Provider - Out of Hours	GM	Various	3				https://gmupca.co.uk/	

[75] Most recently published at time of writing (21/22 or 22/23) Annual Reports
[76] Most recently published at time of writing (21/22 or 22/23) Annual Reports

NHS Provider Trust - Ambulance	NW	North West Ambulance Service NHS Foundation Trust	3			£458m income	https://www.nwas.nhs.uk/	North West Ambulance Service (NWAS) serves a population of more than seven million people providing emergency response covering 5,400 square miles of the North West. It also makes more than 1.3 million patient transport journeys every year and delivers the NHS 111 service across the region. As part of its digital vision to radically improve how the needs of patients, staff and partners are met every time they interact with its digital services, NWAS' electronic patient records (EPR) enable paperless working using iPads to complete EPR forms on scene with patients, whilst allowing receiving locations to view records electronically. NWAS has also updated it's sat nav and reverse camera systems to Mobile Data and Vehicle Solutions (MDVS) providing improved communications between ambulances and control rooms. The trust is also rolling out a smart programme following a successful pilot and is now implementing various smart solutions which support staff to use digital technology to make their jobs easier. The programme, although not complete, has scooped a Health Service Journal Digital Award (June 2023).
NHS Provider Trust - Acute and Community	Bolton	Bolton NHS Foundation Trust	1	6,000	296,000	£440m income	https://www.boltonft.nhs.uk/	
	Bury, HMR, Oldham, Salford	Northern Care Alliance NHS Foundation Trust	4	20,000		£1.4bn income	https://www.northerncarealliance.nhs.uk/	Northern Care Alliance NHS Foundation Trust serves a population exceeding 1 million people in Greater Manchester and beyond with 4 hospitals, specialist, acute and community services. Our Research and Innovation is recognised internationally with key programmes embedded in our specialist centres for dermatology, intestinal failure, renal medicine, stroke and neurosciences, and inherited metabolic disease. We have research centres for nephrology, brain disorders and trauma and emergency medicine, have experience in delivering early phase trials across various specialties, and are partners in the NIHR Manchester Biomedical Research Centre, Clinical Research Facility and Patient Safety Research Collaboration. We have experience in developing health apps, including patient wearables to generate data and support clinical care. Cross cutting themes include population health and reducing health inequalities. Our NCA Research Collection provides tissue and data to facilitate translational research, with 14 established collections of samples and capacity to facilitate bespoke collections. As home to the forthcoming Greater Manchester Major Trauma Hospital, we will have the UK's first hybrid major trauma (RAPTOR) theatre and share innovative approaches to caring for very unwell patients. Our centre for 3D Surgical Planning and Innovation (3dSPIN) develops new devices and techniques to support surgical planning, leading to safer procedures, increased efficiency and improved outcomes.
	Manchester, Trafford	Manchester University NHS Foundation Trust	10	28,000	790,000	£2.6bn income	https://mft.nhs.uk/	
	Stockport	Stockport NHS Foundation Trust	3	6,300	500,000	£452m income	https://www.stockport.nhs.uk/	Stockport NHS Foundation Trust runs Stepping Hill Hospital, and other specialist centres, as well as community health services across Stockport. With a budget of over £360 million, and over 5000 members of staff it's an integrated provider of acute hospital and community services to the people of Stockport, as well as serving the populations of East Cheshire and the High Peak in North Derbyshire, and surrounding areas of Greater Manchester. Other hospital services it runs are the Devonshire Centre for Neuro-rehabilitation, and the Bluebell Transfer to Assess Unit. It also runs the Swanbourne Gardens respite centre for disabled children and families, the only one of its kind in the North West.

								It is a specialist `hub` centre for emergency and high risk general surgery, one of only four in Greater Manchester, covering the South East region. It one of the three main stroke centres in Greater Manchester, with its stroke services consistently rated as one of the best in the country.
	T&G	Tameside & Glossop NHS Integrated Care Foundation Trust	1	4,200	250,000	£325.7m turnover	https://www.tamesideandglossopicft.nhs.uk/	Tameside and Glossop Integrated Care NHS Foundation Trust serves a population of 250,000 across both rural and urban settings. It provides acute hospital services from Tameside Hospital and community healthcare services across the local area. Recent innovative developments for the benefit of our patient population include: • Our electronic prescribing service allows patients to collect medicine newly prescribed by the hospital team directly in a community pharmacy of their choice • The Trust led the way in national COVID studies and was recognised as the lead recruiter for the RECOVERY trial across England. • The Trust has invested in RemPods - a unique service which transforms clinical environments into therapeutic and reminiscent spaces, helping to change the quality of life for people living with memory loss. • Acute Frailty Same Day Emergency Care Unit reduces demand on the Trust's accident and emergency service by diverting appropriate patients to a same day care service provided by a multi-disciplinary team, with a view to patients continuing their care in an appropriate community setting. • Digital Health provides a wide range of services, including remote video assessments; telemonitoring of patients with long term conditions, in their own homes; streaming patients in the emergency department to appropriate service providers in the hospital and community; supporting GPs for referrals to Same Day Emergency Care and the registered medical practitioner in the hospital; referral of patients to the wider multi-disciplinary team, inclusive of the community crisis team. We have further developed our own bespoke inpatient and intermediate care electronic touch screen ward boards and live control tower. The recent developments include patient flow which now captures escalation delays and red/green days. New electronic patient transport requests are captured and visible live on the control tower. Clinically we capture cognitive concerns, improved palliative care and extensivist care and alerts for 35-day anti-coagulation medication. We have also developed our own solution for electronic clinic outcome and an in-house solution for Cardio-Respiratory named CRI-HALO.
	Wigan	Wigan, Writhington and Leigh NHS Foundation Trust	3	6,800	329,000	£522m income	https://www.wwl.nhs.uk/	
NHS Provider Trust - MH Acute and Community	Bolton, Manchester, Salford, Trafford, Wigan	GM Mental Health NHS Foundation Trust	1	6,600	1,682,000	£443m income	https://www.gmmh.nhs.uk/	Greater Manchester Mental Health NHS Foundation Trust (GMMH) is one of the largest specialist mental health providers in the country, providing inpatient and community-based mental health care for people living in Bolton, Manchester, Salford, Trafford and Wigan, and a wide range of specialist mental health and addiction services across Greater Manchester, the north west of England and beyond. Research & Innovation (R&I) is at the heart of everything we do at GMMH, and we are the host of ten specialised Research Units. More than 1,600 service users, staff and carers have taken part in over 100 studies in this past year alone. GMMH is the first NHS trust to roll out gameChange virtual reality therapy across six of our mental health services and played an instrumental role in trialling Lumi Nova, an immersive mobile game that enables children to self-manage anxiety. We want to make sure that our service users, carers, and staff have every opportunity to take part in and benefit from research and innovation that transforms the way we understand and treat mental health.
	Bury, HMR, Oldham, Stockport, T&G	Pennine Care NHS Foundation Trust	1	3,600	1,300,000		https://www.penninecare.nhs.uk/	

								The Christie is Europe's largest single-site cancer centre and the UK's first accredited comprehensive cancer centre. We treat more than 60,000 patients a year and have more than 650 clinical trials open to patients. Based in Manchester, we are a beacon of innovation and excellence in oncology and are dedicated to advancing cancer research, early diagnosis, and treatment. With a 120-year history, The Christie has consistently pioneered innovation, setting the standard for cancer treatment and care. In the 1930s, we introduced the 'Manchester Method' for radium treatment, and in the 1970s, we led Tamoxifen trials for breast cancer. Our commitment to innovation endures. In 2018, we opened the UK's first high-energy proton beam therapy centre, and our revolutionary MR-linac machine delivers MR-guided radiotherapy to 'see and treat' cancer. We're among a handful of centres offering CAR-T therapy. And we opened a £150m state of the art transformational cancer research facility for world-leading scientists and clinicians this year. Our specialist surgical teams focus on rare cancers and complex procedures, and our pioneering surgical research hub, a UK-first, will transform surgical practice through cutting-edge translational research. Working with partners like Health Innovation Manchester, The University of Manchester and Cancer Research UK, The Christie is harnessing the power of innovation to shape the future of cancer care.
NHS Provider Trust - Specialist	GM	The Christie NHS Foundation Trust	1				https://www.christie.nhs.uk/	
VCSE	GM	Various						
NHS GM Integrated Care	GM	NHS GM Integrated Care	1	1778	2,868,400	£5231m	https://gmintegratedcare.org.uk/nhs-gm/	
Local Government	GM	GM Combined Authority	1				https://www.greatermanchester-ca.gov.uk/	
	Bolton	Bolton	1		296,000			
	Bury	Bury	1		193,800			
	Rochdale	Rochdale	1		224,100			
	Oldham	Oldham	1		242,100			
	Manchester	Manchester	1		549,900			
	Salford	Salford	1		270,800			
	Stockport	Stockport	1		295,200			
	Tameside	Tameside	1		231,200			
	Trafford	Trafford	1		235,500			
	Wigan	Wigan	1		329,800			
Social Care - independent providers	GM	Various	700				https://hub.gmintegratedcare.org.uk/asc/	
Hospices	GM	Various	7					

At Metro Dynamics, we **care** about places, our clients, and our colleagues.

We are an **independent** organisation, **curious** about our work, and **collaborative** in our approach. We strive to **make a difference** in all that we do.

Orega

1 Balloon Street

Manchester

M4 4BE

0161 413 6440

3 Waterhouse Square

138 Holborn

London

EC1N 2SW

020 3865 3082

metrodynamics.co.uk