



Pursuing excellence.

An independent analysis of Leeds' research
and innovation in health and care

March 2024

**This report was commissioned by
Leeds Academic Health Partnership.
The study team extends its sincere
thanks to all those who provided input.**




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I Executive Summary

The health and care research and innovation landscape in Leeds is more vibrant and better connected than ever. This report shows that Leeds is a leading UK location for health and care research and innovation, and that it is already competing internationally as a healthtech start-up hub.



A woman with curly hair, wearing a grey cardigan, is laughing heartily while talking to a man. The man is partially visible on the right side of the frame, wearing a blue shirt. The background is a blurred office or meeting room with warm lighting.

“Leeds is a big city region, but it still has a strong community and a good healthtech scene – so you have the benefit of both scale and community.”

Healthtech Business Representative

I.1 Key Findings

Leeds has a strong legacy of health and care research and innovation. Since Charles Thackray worked with surgeons at Leeds General Infirmary in the early 1900s to design and manufacture surgical instruments, Leeds has been at the forefront of medical technology research and innovation.

Health and care research and innovation has been a key focus of policy development in Leeds for over two decades. In recent years, this sustained focus has fostered new strategic partnerships and secured investment in state-of-the-art physical infrastructure. These new developments offer unique opportunities to boost health and care research and innovation, in everything from new architectural designs for health and care services, to new test beds for medical devices and AI-enabled diagnostics.

System leaders are committed to economic growth that is inclusive – benefitting people in all local communities.

To harness these opportunities, 59 Leeds-based ecosystem assets provide research and innovation capacity and expertise across health, academia, education and civic society. This includes national NHS offices, the Department of Health and Social Care's (DHSC's) second headquarters, and NHS England, including what was NHS Digital.

Since 2018, Research Organisations (ROs) in Leeds have secured over £200m in funding for health and care research and innovation, including over £80m from the National Institute for Health and Care Research (NIHR). More recently, further investment has been secured for two major NIHR health and care research co-ordinating centres. As well as supporting nationally leading health and care research, this funding has been a catalyst for nine NIHR translational research centres and initiatives.

These initiatives help to ensure broad stakeholder engagement in, and translation of, health and care research and innovation in Leeds and beyond. Leeds is at the heart of a vibrant regional healthtech sector that includes more than 250 locally headquartered companies. These companies generate more than £3bn in turnover and employ around 16,000 people. The city is a hub for innovative, high-growth companies, has a high concentration of healthtech employees, and a growing investment landscape.

Local healthtech companies benefit from pro-active enterprise and innovation support. This includes Nexus – a state-of-the-art 6-floor innovation hub – and tailored digital health acceleration support like Health Innovation Yorkshire and Humber's (HIYaH's) Propel programme.

Education and skills providers across Yorkshire provide a sustainable, end-to-end pipeline of health and care talent and skills. There are novel and varied routes into health and care roles, including more than 10,000 learners involved in relevant T-Level and apprenticeship courses. Leeds-based universities enrol more than 11,000 undergraduates and train around 3,000 postgraduates each year on courses relevant to health and care research and innovation. This includes eight doctoral training initiatives spanning numerous disease specialisms, clinical research expertise and data science techniques.

Skills development extends into the health sector, where Leeds-based NHS Trusts employ almost 12,300 professionally qualified clinical staff and have more than 1,000 staff involved in training (NHS Workforce Statistics, 2023). Leeds Health and Care Academy (LHCA) – the first of its kind in the UK – offers a diverse range of education and skills development programmes for local health and care staff.

Benchmarking analyses suggest that Leeds is already a leading location for health and care research and innovation. Compared to national benchmarking cities, Leeds:



Has the **highest number** of health and care related patents applied for or granted (n~200).

Enrols the **highest proportion** of undergraduate students in bioscience courses.



Has one of the **highest concentrations** of healthtech employees – equivalent to around 2 in every 100 working age people.

Has the **largest proportion** of high-growth healthtech companies securing equity investment.



Compared to eight international benchmark cities, Leeds accounts for 14% of investment raising companies, ranking it third behind Dublin and Zurich.

Ecosystem leaders have brought Leeds health and care research together under the unifying banner of Health Innovation Leeds. This underpins their work towards a shared vision – one in which Leeds is recognised as a leading city, nationally and internationally, for health and care research and innovation. In support of this vision, five high-potential opportunities and corresponding actions have been identified through this study.

1.2 High Potential Opportunities & Actions

Research undertaken to inform this report has identified a number of high potential opportunities and actions, as summarised below.



1. Maintain a collaborative focus on health and care research and innovation.

	Opportunity:		Action:
<p>Strong leadership and effective co-ordination were highlighted as key foundations of the health and care research and innovation ecosystem in Leeds. At a time when so many strategic initiatives are being delivered, stakeholders should be supported to maintain a unified and collaborative strategic focus.</p>		<p>Agree clear mandates for ecosystem co-ordination, back the organisations chosen to deliver, and expand programmes that connect ecosystem stakeholders.</p>	

2. Extend start-up and acceleration support to help scale dynamic, high-potential companies.

	Opportunity:		Action:
<p>Local and international healthtech companies highlighted the quality and effectiveness of start-up support delivered across the ecosystem. Extending this support to help high-potential scale-up companies can deliver further economic growth and capitalise on recent investment trends.</p>		<p>Design and deliver a comprehensive, targeted programme of scale-up support that builds on the success of existing acceleration support. Raising awareness of investment opportunities in innovative local healthtech companies could help increase Leeds' share of investment.</p>	


3. Further leverage healthtech industry sector specialisms.

	Opportunity:		Action:
<p>Leeds has sectoral strengths in medical technology, digital health, software development, data analytics and artificial intelligence. Involving private sector networks in start-up and scale-up activities can help future entrepreneurs benefit from existing sectoral knowledge.</p>		<p>Involve existing private sector collaborations such as the Healthtech Cluster and Leeds Digital Health in the design and delivery of start-up and scale-up support.</p>	


4. Continue building capacity across the ecosystem to support research and innovation activity.


Opportunity:


Effective access to clinical networks was highlighted as an ecosystem strength. There must be sufficient capacity to facilitate research and innovation across the ecosystem in future – from clinical environments to local communities.


Action:

Ensure that provision is made to enable research and innovation across organisational boundaries. This should include adequate clinical time to support research and innovation.


Opportunity:

Leeds is well placed to use data to better understand, plan and deliver care-related research and innovation, particularly across care pathways and organisational boundaries.



Action:

Explore opportunities to raise awareness and use of key datasets, such as the Leeds Data Model, for understanding, planning and delivering care-related research and innovation.

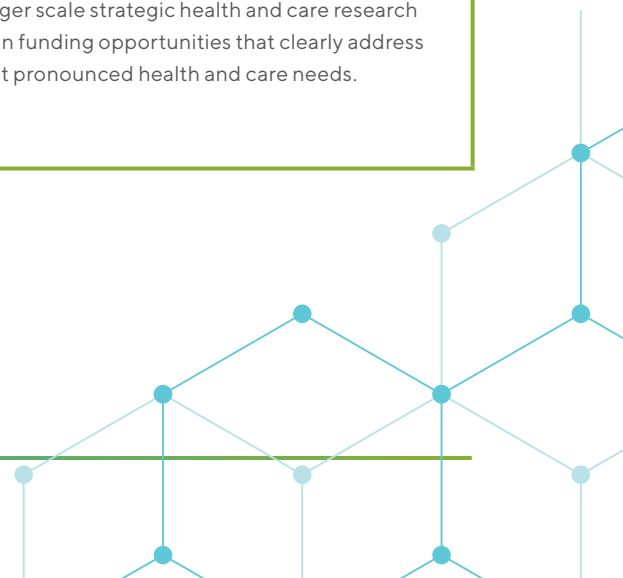
5. Heighten the scale of ambition within research and innovation funding applications, ensuring that research aspirations are informed and guided by the city’s highest health needs.


Opportunity:

Research organisations in Leeds already secure significant levels of funding for health and care research and innovation, but there is some scope to increase the scale of research funding awards.


Action:

Support research organisations to identify and scope a small number of larger scale strategic health and care research and innovation funding opportunities that clearly address the city’s most pronounced health and care needs.



1. Introduction & Background

Leeds aims to be the best UK city in which to live and work by 2030 (known as the 'Best City Ambition'). This includes being recognised as one of the leading cities for health and care research and innovation.



1.1. Background to the Study

Health and care research and innovation has long been recognised as a major strength in Leeds. In 2017 a government sponsored Science and Innovation Audit (SIA) highlighted that Leeds City Region (LCR) Local Enterprise Partnership (LEP) had “*a concentration of knowledge based innovative health sciences organisations, alongside broader healthcare industries and recognised strengths in digital health innovation and the manufacture of medical and dental instrumentsⁱ*”.

The SIA led to targeted, system-wide action across the health and care landscape, spanning research, innovation and economic development. In response, much has changed within the health and care research and innovation landscape in Leeds and West Yorkshire (Figure 1.1). Major new initiatives have been secured, new strategic partnerships have been fostered, and new infrastructure is being developed. These developments aim to transform health and care for everyone in the city and beyond. In doing so they help make Leeds a world class hub for health and care research and innovationⁱⁱ. These activities are unified under the newly launched banner of Health Innovation Leeds, to strengthen the ecosystem's profile and influence nationally and internationally.

Figure 1.1 – West Yorkshire Geography



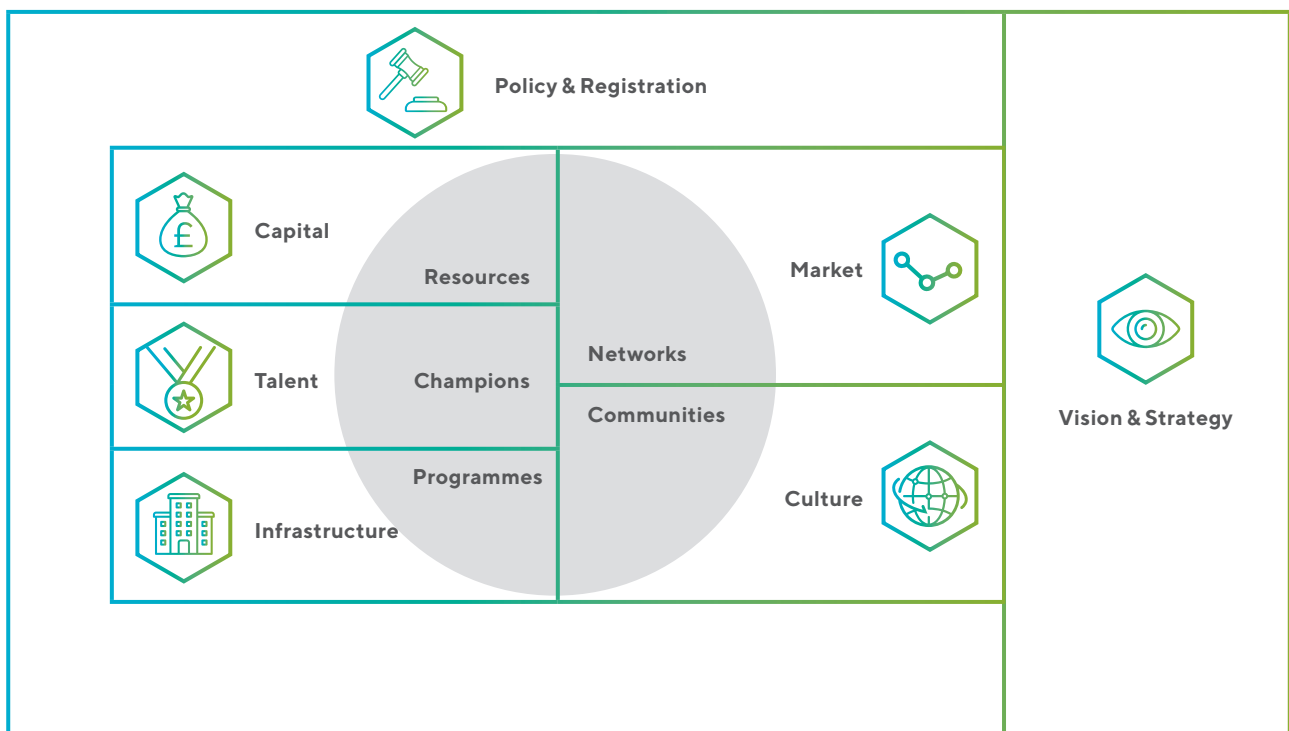
Source: Office for National Statistics (ONS)

1.2. Methodology

Commissioned by the Leeds Academic Health Partnership (LAHP), this report provides an independent, up-to-date analysis of the Leeds health and care research and innovation ecosystem. Research conducted to inform the report included:

- ◆ **Desk-based review of more than 20 local and national health, research and economic development strategies and policies.**
- ◆ **Extensive data collection regarding the health and social care research and innovation ecosystem, combining proprietary data sources and web-intelligence. Data was used to produce a series of benchmarks (see Section 1.3 for details).**
- ◆ **Additional thematic research to inform development of 8 case studies reflective of prominent ecosystem strengths (see Appendix 3).**
- ◆ **Structured in-depth interviews with 20 executive-level strategic research and innovation ecosystem stakeholders from across West Yorkshire, and 15 health technology businesses with headquarters in Leeds and elsewhere nationally and internationallyⁱⁱⁱ. Interviews were structured according to a recognised framework for innovation ecosystem assessment, covering several components (Figure 1.2).**

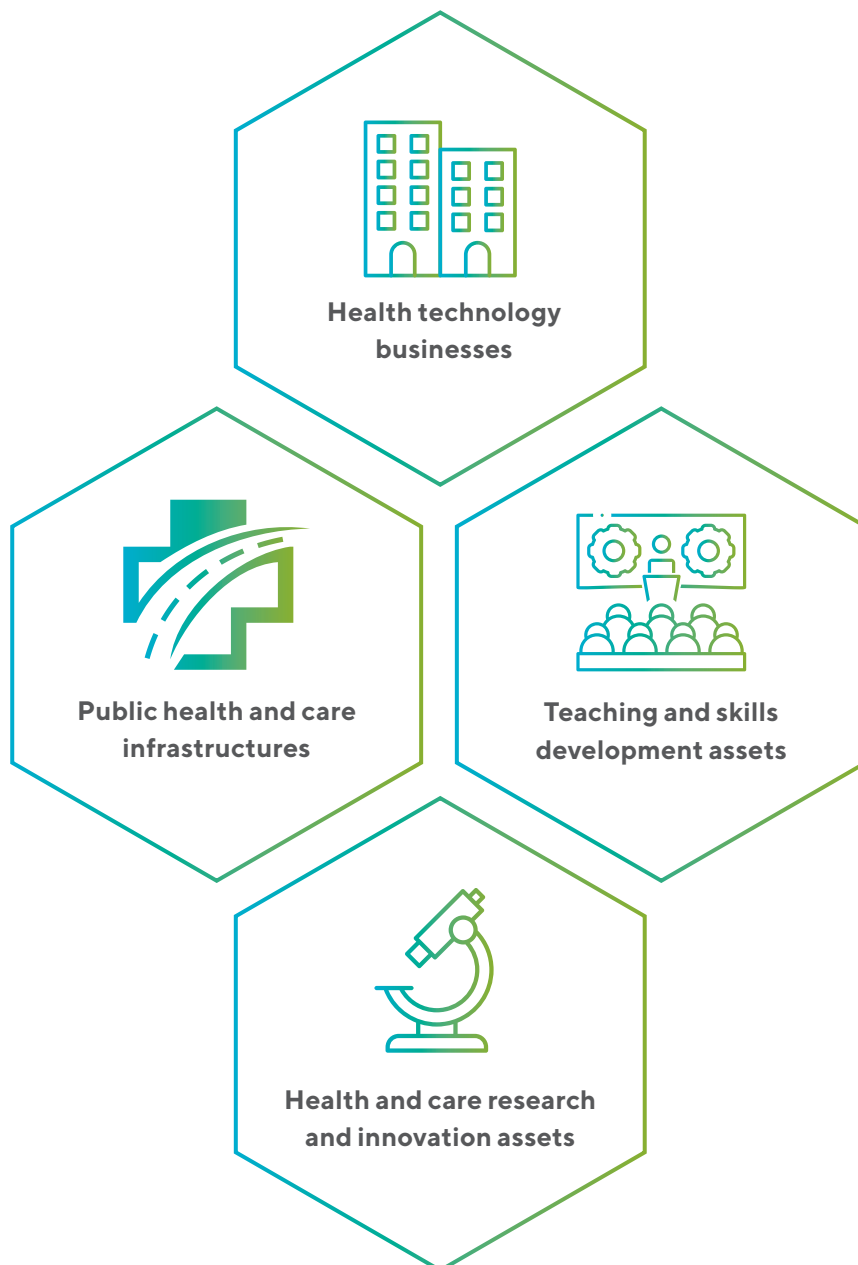
Figure 1.2 – Ecosystem Assessment Canvas



Source: ITU Innovation

1.2.1. Definition of Health & Care Research and Innovation

The study adopts a broad definition of health and care research and innovation, including health technology businesses, health and care research and innovation assets (e.g., universities, centres, institutes), public health and care infrastructures (i.e., NHS clinical and organisational structures), and teaching and skills development assets (e.g., universities, colleges). Note that while the study seeks to encompass both health and care research and innovation, the structured data sources used for quantitative analysis are more focused on health than care.



1.3. Benchmarking

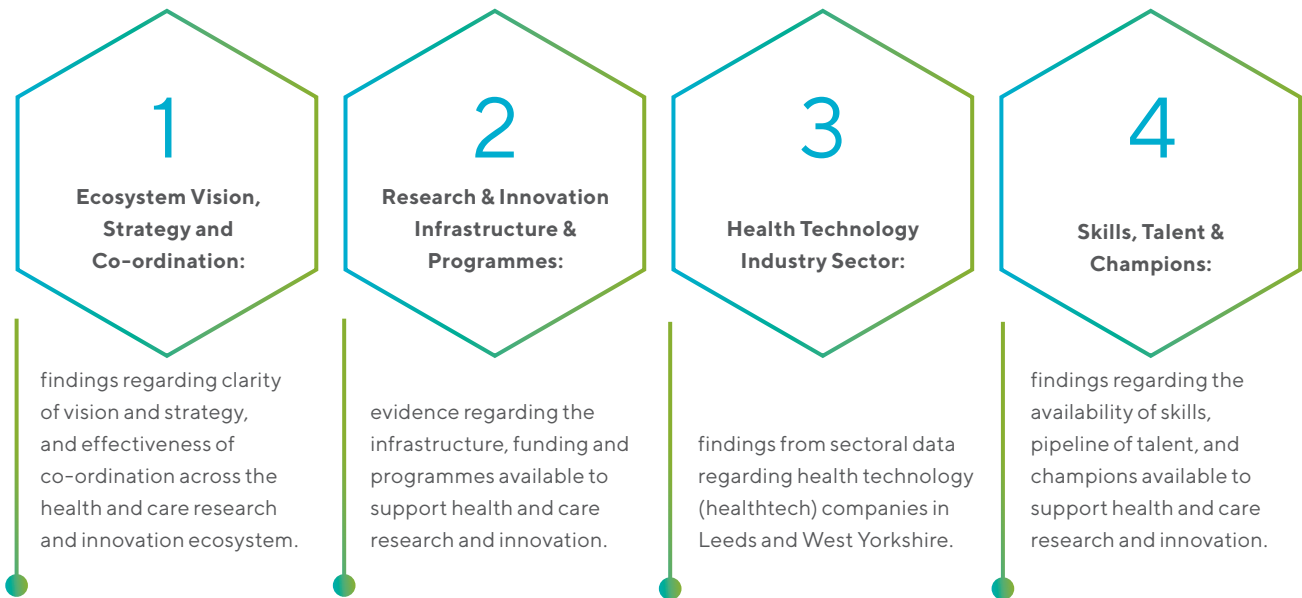
Benchmarking evidence is presented throughout the report to offer an objective view of how the ecosystem in Leeds compares to other locations nationally and internationally. Two main types of benchmarking evidence are used – Study-Specific Evidence and Public Evidence. Study-Specific Evidence refers to data gathered from proprietary sources and web-intelligence. Public Evidence refers to data gathered from publicly available sources. Table 1.1 provides further detail.

Table 1.1– Overview of Benchmarking Evidence

Type & Description of Benchmarking Evidence	Benchmarking Unit / Geography	Metrics (Source)
Study-Specific Evidence: Evidence gathered from proprietary sources and web-intelligence specifically to inform this study	UK Cities (defined using corresponding local authority boundaries) – Leeds, Manchester, Bristol, Birmingham, Glasgow and Newcastle Upon Tyne ^{iv} .	<ul style="list-style-type: none"> ● High Growth Healthtech Companies (Beauhurst) ● Private Sector Healthtech Employees (Glass.ai) ● Healthtech-related Job Posts (Lightcast) ● Inward Investment Projects (FDI Markets) ● Patents (Lens.org)
	International Cities – Boston, Dublin, Zurich, Leeds, Basel, Eindhoven, Oulu, Mainz and Bergen ^{xxiii} .	<ul style="list-style-type: none"> ● Investment Raising Healthtech Companies (Crunchbase)
Public Evidence: Evidence gathered from publicly available sources	UK Universities within Benchmark Cities	<ul style="list-style-type: none"> ● Research Funding (UKRI, NIHR) ● Research Power (Research Excellence Framework) ● Research Impact (Research Excellence Framework) ● Graduate & Postgraduate Student Enrolment (HESA) ● Graduate Outcomes (HESA)
	NHS Trusts (England Only)	<ul style="list-style-type: none"> ● NHS Trust Staffing (NHS Workforce Statistics)
	UK Regions (England Only)	<ul style="list-style-type: none"> ● T-Level Starts (Department for Education) ● Apprenticeship Starts (Department for Education)

1.4. Report Structure

This report collates research findings under four key themes:

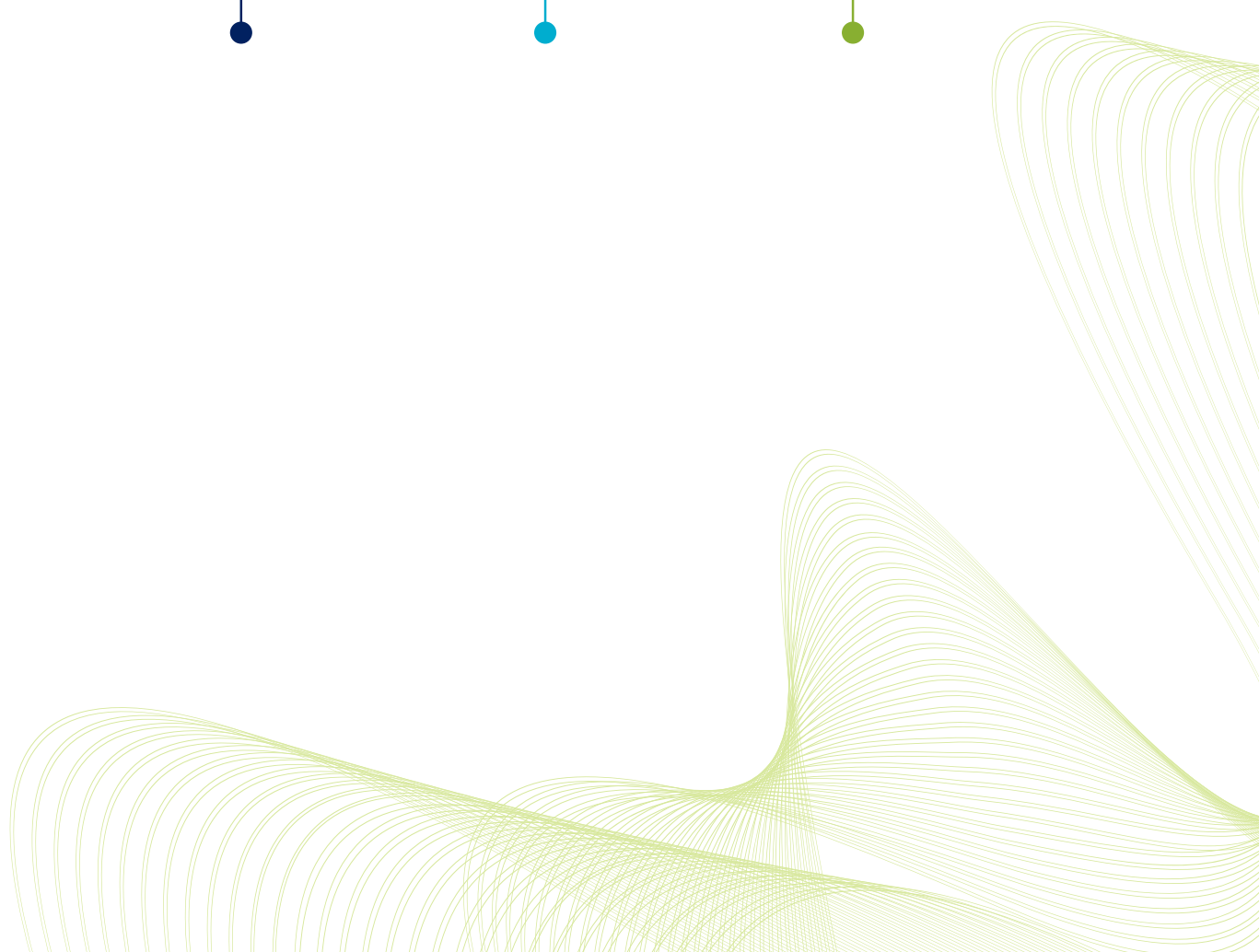


The report concludes by summarising high-priority opportunities and actions that can support Leeds to become a leading national and international location for health and care research and innovation.



2. Vision, Strategy & Co-ordination

Health and care research and innovation has been a key focus of policy development in Leeds and the wider West Yorkshire region for over 20 years.



2.1. Consistent Vision & Strategic Objectives

The sustained focus on health and care research and innovation policy has fostered strong and consistent leadership across health, academia and policy development. Ecosystem leaders have a united vision and a shared passion to turn health and care research and innovation into tangible benefits for local people and the economy. This united, long-term vision is reflected in several current strategies and plans defined by anchor organisations in Leeds and West Yorkshire. For example:

◆ **Leeds Teaching Hospitals NHS Trust (LTHT)** aims to be the best of its kind in the UK for specialist and integrated care. Collaboration in health and care research and innovation is one of the Trust's five values. LTHT's most recent corporate strategy sets a goal of being a centre of excellence for research, innovation, education and specialist services.

◆ **Together, the University of Leeds and LTHT** have developed a shared research and innovation strategy to 2030. Building on a history of collaboration, the shared research and innovation strategy sets out a joint vision for transforming health and wellbeing through health and care research and innovation. Together, LTHT and the University will champion research that reduces health inequalities, embeds research into local communities, supports outstanding care, drives inclusive economic growth, and equips the researchers of tomorrow^v.

◆ **Leeds City Council's (LCC's) Best City Ambition** is the Council's overall vision for Leeds by 2030. At its heart is the Council's mission to tackle poverty and inequality and improve quality of life for everyone who calls Leeds home. Health and wellbeing is one of three pillars of the Best City Ambition, and includes health and care research and innovation commitments such as:

- Investing to ensure better and more equal access to essential services in health.
- Helping businesses and social enterprises to be innovative, creative and ambitious, with access to the skills they need to boost productivity and succeed.
- Growing cross-city research capacity and further developing Leeds as a test-bed for innovation and new technologies, including in healthcare.
- Being an outward-looking global city, operating on the world stage, and attracting inward investors that share the City's values.

- **West Yorkshire Combined Authority's (WYCA's) Strategic Economic Framework (to 2030), Investment Strategy and Innovation Framework** all point to healthtech as a key driver of future economic growth and prosperity. Most recently, WYCA has set out specific objectives for health and care research, innovation and sector development within its 2022 – 2027 Healthtech Strategy. The new strategy recognises the role that health and care research and innovation plays in transforming health and care services, improving health outcomes and supporting patient wellbeing. It sets a commitment to support the best and brightest ideas of clinicians, academics and business innovators to make a difference in the health and care system, with a vision for being the best connected and most innovation-driven ecosystem in the country, providing unrivalled prospects to partner, locate and grow.
- **West Yorkshire Health and Care Partnership's (WYHCP's) Five Year Plan and Integrated Care Strategy (2023)** sets out the vision for the future of health, care and wellbeing in the region. The Five Year Plan explains how local hospitals will be supported by centres of excellence that provide world class care and push the boundaries of research and innovation. In 2019 the WYHCP signed a 'Healthtech Memorandum of Understanding' that sought to leverage healthtech to reduce health inequalities and provide more jobs.

Consistency of vision and strategic objectives for health and care research and innovation, and the extent to which they are embedded within local strategies and plans, should make Leeds and West Yorkshire one of the UK's most stable, forward-thinking and attractive locations for health and care research and innovation in the coming years^{vi}.

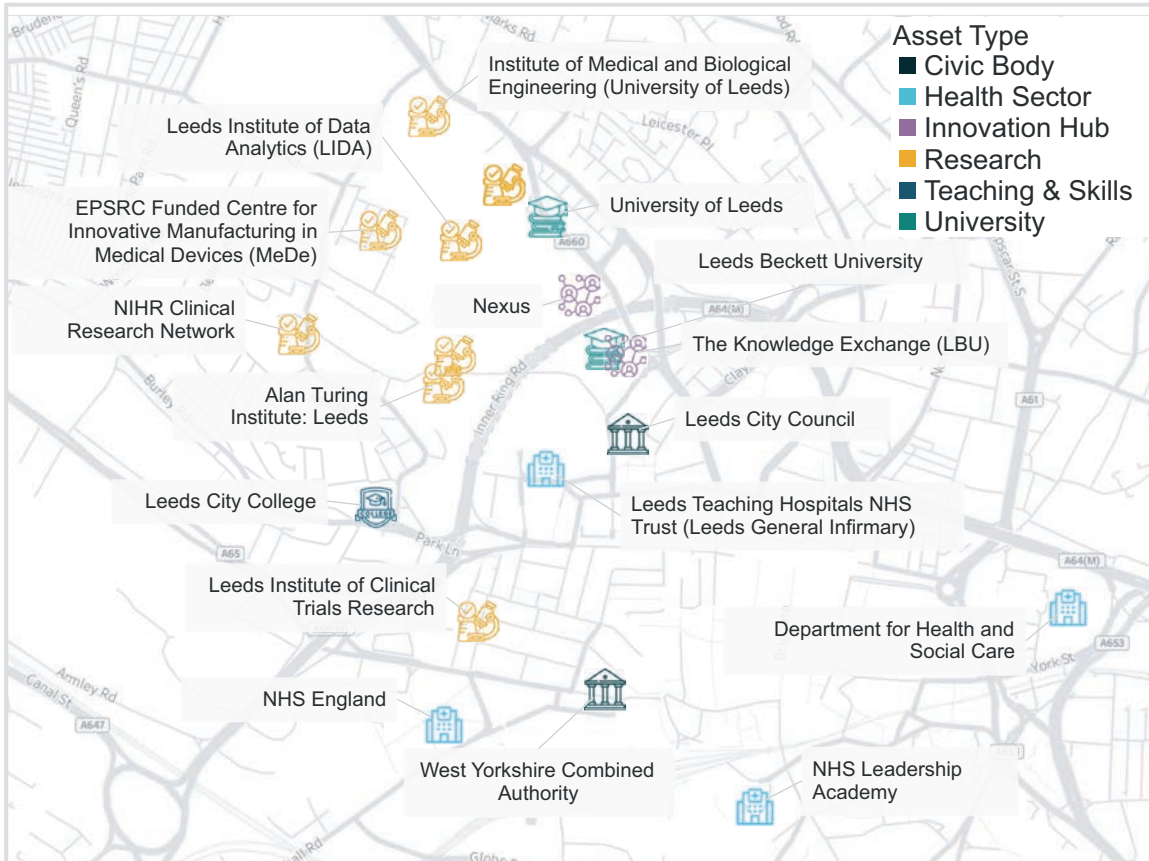
2.2. Strategic Research & Innovation Initiatives

Beyond strategies and plans, health and care research and innovation strengths have also shaped important local and regional strategic initiatives. For example:

- ◆ **The West Yorkshire Healthtech Cluster**, established in 2019 by Leeds Academic Health Partnership in response to the 2017 MedTech SIA, is a diverse network of more than 30 members from across the health and care ecosystem in Leeds and West Yorkshire. The Healthtech Cluster evolved from LCR's first cross-sector healthtech partnership, which saw regional leaders sign a Memorandum of Understanding (MoU) on health and care research and innovation. The Healthtech Cluster is now an active and dynamic network within the innovation ecosystem, and is a vital part of achieving the shared vision set out in the region's 2022 – 2027 Healthtech Strategy.
- ◆ **LTHT's Building the Leeds Way programme** involves the development of a new state-of-the-art hospital, including a new children's hospital, a new adults' hospital and a single-site maternity centre. In July 2023 LTHT also finished building an innovative regional pathology laboratory at St James' Hospital, the Centre for Laboratory Medicine (CLM). The CLM will deliver innovative testing and diagnostics using new technologies and advanced equipment. It will bring together pathology services from Mid-Yorkshire and Calderdale and Huddersfield to create a regional facility that can transform diagnostic testing.
- ◆ **The Leeds Innovation Arc** – orchestrated by the Leeds Innovation Partnership – is a spatial plan for innovation which will boost and leverage the City's significant innovation assets. Several key health and care research and innovation assets will be co-located within the Arc, including LTHT's two new research and innovation-oriented hospitals, a healthtech innovation hub at the Old Medical School, and tailored health and care enterprise support infrastructure at Nexus. Nested within the Innovation Arc, a new Innovation Village will offer a geographic focus for nationally and world-leading health and care research, innovation and technology. The Innovation Village is expected to deliver **4,000 new jobs** and a **£13bn economic boost** for the region. Figure 2.1 overleaf shows how prominent health and care research and innovation assets are co-located within the Leeds Innovation Arc.
- ◆ **Leeds Health and Social Care Hub** – launched in July 2022 – brings the DHSC together with local partners to shape and embed local, regional, and national strategy. This new model positions the DHSC in Leeds and the wider region, adding value through national and local partners working together. This aims to help Leeds and the wider region become a natural choice for people pursuing a career in health and social care where new initiatives address systemic inequalities.



Figure 2.1 – Innovation Arc: Co-Location of Health and Care Research & Innovation Assets



Source: Perspective Economics



2.3. Ecosystem Co-ordination

Most of the study's 35 interviewees recognised strong engagement and collaboration by leaders across the ecosystem as a key strength of health and care research and innovation in Leeds. Interviewees pointed to the role of the LAHP and the healthtech team at West Yorkshire Combined Authority (WYCA) as key co-ordinating mechanisms.

- ◆ **Leeds Academic Health Partnership** is one of the largest partnerships of its kind in the UK. It brings together leading expertise from three of the city's universities, NHS organisations, Leeds City Council, Health Innovation Yorkshire and Humber (HIYaH) and Leeds City College (LCC). Wider membership also includes the West Yorkshire Combined Authority (WYCA), West Yorkshire Health and Care Partnership (WYHCP), Yorkshire Cancer Research and St Gemma's Hospice.
- ◆ **West Yorkshire Combined Authority** employs a dedicated team to help coordinate and advance healthtech cluster opportunities across West Yorkshire. The Combined Authority's 2022 – 2027 Healthtech Strategy and accompanying action plan sets out clear regional priorities and tangible actions that seek to maximise co-ordination across the healthtech ecosystem^{viii}.

“[We made] a very conscious decision to choose Leeds as a place’... ‘Being [based] in Leeds was all about the network of people who knew how to get things done. The ecosystem itself is not a one-way channel that takes you from A – B, it’s a network that interacts with each other – [you] need to find the one person who understands the value you’re proposing and can help you to navigate that network – taking you to places that you didn’t even know existed.”



3. Infrastructure & Programmes



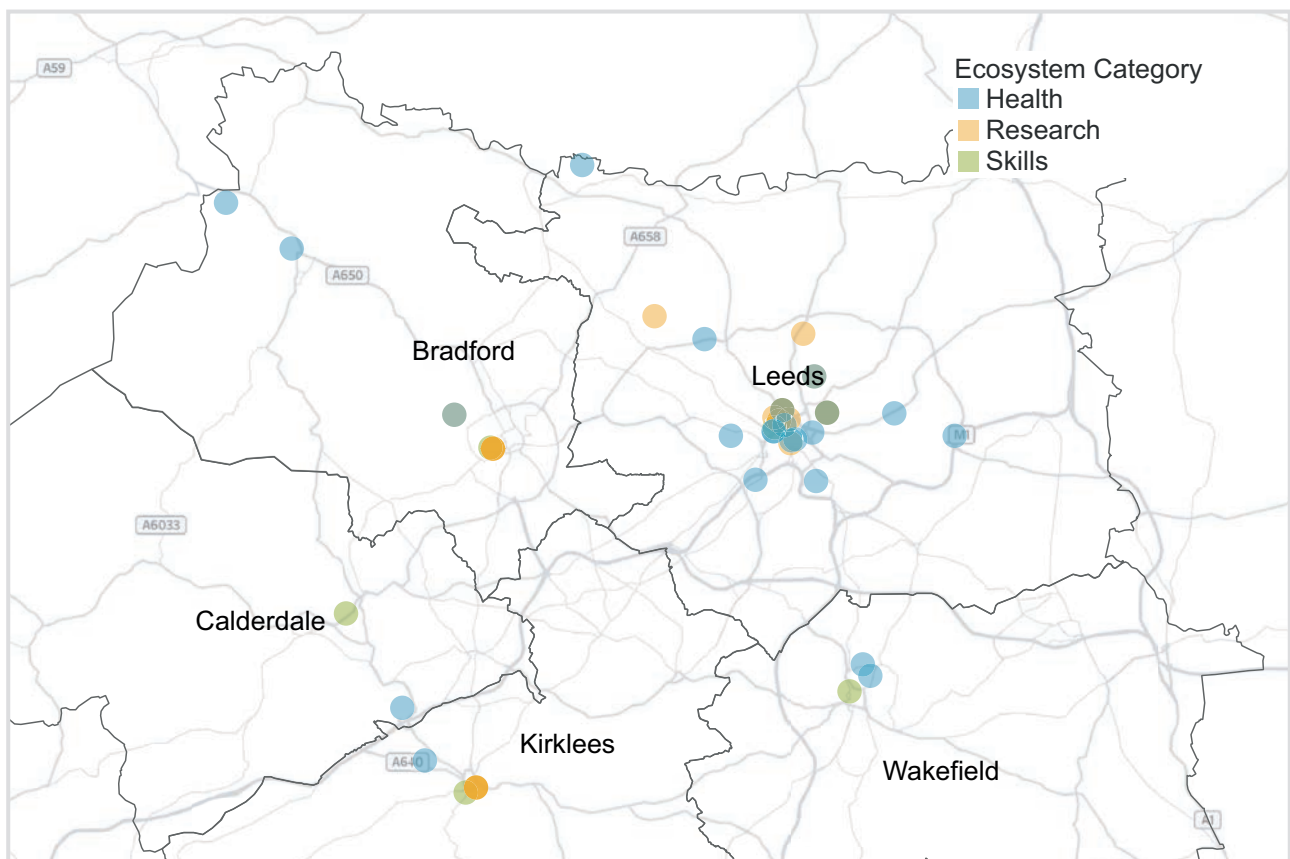
Strategic developments outlined in Section 2 offer unique opportunities to spur health and care research and innovation activity. These opportunities include everything from new architectural designs for health and care services, through planning systems and innovative care pathways, to new test beds for medical devices and AI-enabled diagnostics.

To fully leverage these opportunities, the health and care ecosystem in Leeds offers supporting infrastructure and funding to create and commercialise research and innovation activity. This section presents evidence regarding the scale and quality of infrastructure and programmes available to support health and care research and innovation in Leeds and across West Yorkshire.

3.1. Research & Innovation Assets

Almost 90 ecosystem assets support health and care research and innovation activity across the region^{ix}. These include 30 health sector organisations, approximately 40 research organisations, nine teaching and skills assets and at least nine supporting economic development infrastructures and initiatives. Two thirds of these assets are in Leeds.

Figure 3.1 – Location of West Yorkshire Health & Care Research & Innovation Assets



Source: Perspective Economics (deeper colour = more than 1 asset at location)

3.2. Health & Care Sector Anchors

Key health sector anchors in Leeds and West Yorkshire, such as LTHT and Bradford Teaching Hospitals NHS Trust (BTHFT), provide access to clinical leaders and research environments that support leading-edge health and care research and innovation.

3.2.1. Leeds Teaching Hospitals NHS Trust

LTHT is one of the largest and busiest acute hospital trusts in the UK. With a budget of £1.6bn and a 21,000-strong workforce, the Trust treated more than 1.7m patients in 2022 across seven hospitals and five sites.

Beyond its investments in new physical infrastructure set out in Section 2, LTHT is central to both research and teaching within the Leeds health and care ecosystem. Since 2018, LTHT organisations have been involved in UKRI funded research projects to the value of almost £19m, and in 2023 LTHT had almost 1,300 staff in training, equivalent to ~7% of its total workforce. LTHT is also involved in other strategically significant health and care research and innovation activities, including:

- ◆ **Innovation Pop-Up: having recently celebrated its second birthday, the LTHT Innovation Pop-Up works with digital health and care businesses to support: i) clinical communications; ii) virtual care; iii) operational logistics; iv) SMART buildings; v) inpatient central monitoring; vi) patient flow; and vii) network infrastructure.**

- ◆ **Centre for Healthtech Innovation (CHI): The CHI is a joint research initiative between the University of Leeds and LTHT to accelerate new health technologies. The CHI draws on expertise of ~150 scientists and clinical academics from across the University and the Trust.**
- ◆ **LTHT Research Academy: The LTHT Research Academy provides a variety of education and training for people doing clinical research in health and care. LTHT's Research Academy aims to encourage high-quality performance in clinical research and leadership through an innovative, multi-disciplinary training programme.**

Crucially, LTHT also takes a lead role in ensuring that health and care research and innovation is focused on reducing health inequalities. It does this through its roles as a secondary care provider, as an anchor institution, and as a health system partner. LTHT is working with partners in Leeds to become the best in the UK for specialist and integrated care^{xi}.

3.2.2. Bradford Teaching Hospitals NHS Foundation Trust

BTHFT has been actively involved in research and innovation for over 25 years, recruiting thousands of participants onto clinical studies each year. In 2007 BTHFT established the Bradford Institute for Health Research (BIHR) which is strong in applied research regarding child health, care for older people, and healthcare quality and safety. The BIHR has a unique research partnership with the primary and secondary care NHS Trusts in Bradford and Airedale, and with the University of Bradford, University of Leeds and the University of York. Flagship research initiatives include the **Born in Bradford (BIB) study hosted at the University of Bradford's Digital Health Enterprise Zone, and Born and Bred In (BaBi) Longitudinal Research Studies**. BIHR is responsible for *Born in Bradford* – one of the largest research studies in the world which tracks the lives of 30,000 local people to understand what influences their health and wellbeing. In 2022, Leeds, Wakefield, Doncaster and East London formed the wider BaBi study, which has recently reached a milestone 20,000 participants across its five recruiting sites. Long-term investment in research studies like these provide valuable insights into a wide range of health and wellbeing issues, and demonstrate the region's commitment to large-scale population-based evidence generation.

3.2.3. Other Strategic Research & Innovation Assets

West Yorkshire Integrated Care Board (ICB)

Research & Development: LTHT is a key partner in the West Yorkshire ICB, which has recently formed a team specifically focused on increasing evidence-based innovation and knowledge exchange within clinical and care settings. The team supports the West Yorkshire ICB to develop, govern, deliver and translate research into tangible health and care commissioning decisions^x. The ICB, together with HIYaH, have created the West Yorkshire Innovation Hub to develop and deliver innovative ideas and solutions to improve the health and wellbeing of the 2.4 million people living across West Yorkshire.

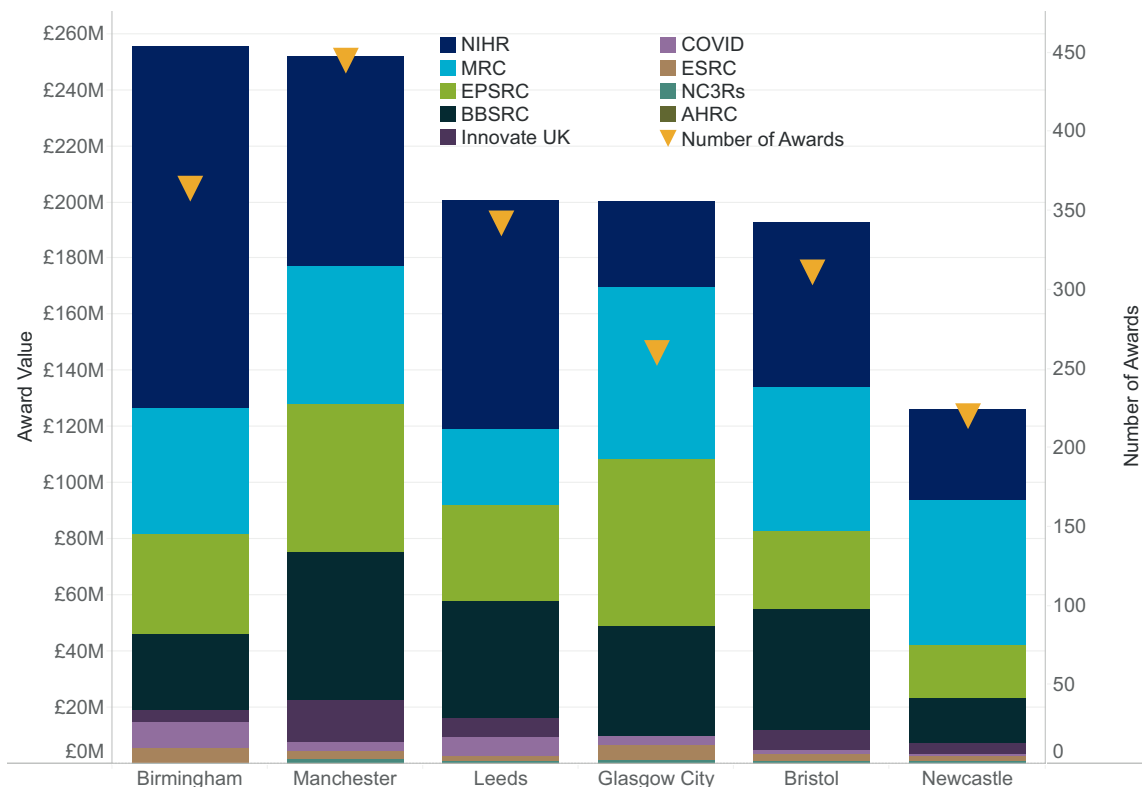
Calderdale and Huddersfield NHS Foundation Trust (CHFT) also has a strong focus on health and wellbeing research and modernising health services. Recent research and innovation developments at CHFT include a groundbreaking new partnership with the **University of Huddersfield's National Health Innovation Campus** and **Centre for Applied Research in Health**. The National Health Innovation Campus will facilitate partnership between the University and its health and care research and innovation partners, improving health outcomes and leading innovation in health and care for the North of England.

Study-specific benchmarking data compiled from UKRI, Innovate UK and NIHR shows that Leeds ranks third among national benchmark cities for both the number and value of health-related research awards secured.

3.3. Research & Innovation Funding

Since 2018, research organisations (ROs) in Leeds have secured 342 research projects totalling more than £200m in funding for health and care research and innovation. This includes significant funding from the National Institute for Health and Care Research (NIHR), the Medical Research Council (MRC), the Engineering and Physical Sciences Research Council (EPSRC) and the Biotechnology and Biological Sciences Research Council (BBSRC).

Figure 3.2 – Research, Development & Innovation Funding for Health and Care



Source: Gateway to Research, Innovate UK, NIHR (2018 – 2022)

Research awards have been secured by a range of health and care organisations in Leeds. Beyond private sector businesses and higher education institutions, organisations such as Leeds and York Partnership NHS Foundation Trust, Leeds Community Healthcare NHS Trust contribute significantly to health and care research and innovation. For example:

- Leeds Community Healthcare NHS Trust secured £3.4m from the NIHR to set up a temporary long COVID service that involved research from the outset. With private sector partners, the team developed the world's first tool for measuring, monitoring and managing long COVID. Now made permanent, the Leeds Long COVID Community Rehabilitation Service employs a 30-person team and has research embedded.

The service has received numerous awards, including a BMJ award for clinical leadership, and has had its 'long COVID rehabilitation' booklet adopted by the World Health Organisation.

- Leeds and York Partnership NHS Foundation Trust is the main provider of specialist mental health and learning disability services in Leeds and provides specialist services across the north of England. The Trust's research and development team supports a range of high-quality studies involving service users, carers, friends and family, into mental health, learning disabilities and neurodiversity. The Trust has been recognised for its transformational work in several areas, including community-based mental health recovery through Leeds Recovery College and medication support via specialised pharmacy care.

Leeds also secures significant amounts of research and innovation funding from other sources not reflected in the above data. This includes charitable and voluntary sector funding secured by organisations such as Yorkshire Cancer Research. For example, Yorkshire Cancer Research pioneered lung screening work via the Leeds Lung Health Check – a £10.4m investment in a mobile screening unit that provides convenient lung check-ups for local people. This project provided part of the evidence that resulted in the Government announcing a national lung screening programme in 2023.

3.4. Translational Research & Innovation Assets



Among national benchmark cities, Leeds has secured the **second highest level of NIHR** research awards, totalling at least **£83m** across **139 awards**.



These initiatives **support nationally leading expertise** in the design and delivery of health and care research spanning clinical and applied research, across numerous specialist disease areas and research environments.

In addition, further funding has been secured for NIHR translational research infrastructure (not shown in Figure 3.2)^{xiii} across Leeds and West Yorkshire. Therefore, across both NIHR research and infrastructure awards, the ecosystem in Leeds and West Yorkshire is estimated to have secured **more than £100m in NIHR funding since 2018**.

NIHR funding focusses on ensuring broad stakeholder engagement in, and effective translation of, health and care research and innovation activity. West Yorkshire benefits from **nine NIHR translational research centres and collaboration initiatives – six of which are in Leeds**.

Health & Care Research Expertise

	<h3>NIHR Leeds Clinical Research Facility (CRF)</h3>	
<p>a £9m investment in a state-of-the-art centre to facilitate high-quality clinical research. The NIHR CRF carries out high-quality early stage and experimental clinical trials to help new treatments and tests reach patients more quickly. Located within LTHT, the CRF runs over 100 early-stage, experimental or complex trials each year spanning cardiovascular, musculoskeletal, oncology, haematology and dental health research.</p>		

	<h3>NIHR Research Support Service (RSS) Hub</h3>	
<p>in partnership with the Universities of Sheffield and York, a new £8m NIHR RSS Hub at the University of Leeds provides expert clinical research design, methodological support, advice and collaboration throughout the NIHR funding application process. The University of Leeds is also a partner on the NIHR Mental Health RSS – a separate research support service that offers expertise in designing and delivering research regarding mental health and brain disorders.</p>		

	<h3>NIHR Research Delivery Network Co-ordinating Centre (RDNCC)</h3>	
<p>following an open competition the University of Leeds was selected by the Department for Health and Social Care to lead the wider NIHR Regional Research Delivery Networks (RRDNs) across England. The new co-ordinating centre will work with staff in all settings to support the effective and efficient initiation and delivery of research.</p>		

	<h3>NIHR Yorkshire & Humber Regional Research Delivery Network</h3>	
<p>after an open competition, LTHT was successful in its bid to become the RRDN for Yorkshire and the Humber. In collaboration with research partners the network will offer unparalleled reach into the region’s large and diverse population, transforming the way research is delivered to meet the needs of local communities.</p>		

	<p>In 2012 St Gemma’s Hospice partnered with the University of Leeds to create the UK’s first formally recognised teaching hospice. Since then, the Academic Unit of Palliative Care (AUPC) has been conducting internationally-leading research and training to improve care of those nearing end of life. As one interviewee put it</p>
<p>“there is some world-leading research taking place in Leeds – St Gemma’s hospice in palliative care, for example, is driving policy towards integrated care”.</p>	

Applied Health & Care Research Expertise

	<p>NIHR Leeds Biomedical Research Centre (BRC)</p>	
<p>opened in 2008 to support translational research across musculoskeletal disease, cardiometabolic disease, surgical technologies, haematology, pathology and antimicrobial resistance. The BRC is an international centre of excellence with the goal of translating innovative research into individually targeted, patient focused therapies. Bringing together LTHT with the Leeds Institute of Rheumatic and Musculoskeletal Medicine (LIRMM) and the Institute of Medical and Biological Engineering (iMBE) the BRC is a £20m investment in translating research and innovation into improved patient outcomes and quality of care in Leeds and beyond.</p>		
	<p>NIHR Healthtech Research Centre (HRC)</p>	
<p>announced in November 2023, LTHT and the University of Leeds were awarded £3m to create a national hub for surgical innovation to develop new health technologies that improve surgical care within the NHS. The HRC will support industry, including small and medium sized enterprises, and local innovation clusters to develop new medical technologies and diagnostics, and increase the chance of adoption in the NHS and other health and care settings.</p>		
	<p>NIHR Yorkshire and Humber Patient Safety Research Collaboration (PSRC)</p>	
<p>NIHR PSRCs are NHS / University partnerships that undertake high-quality translational, applied and health services research on patient safety that addresses strategic patient safety challenges within the health and care system. Hosted by BTHFT with the University of Leeds, the Yorkshire and Humber PSRC is a £6m investment in translational health and care research and innovation and is also the national co-coordinating centre.</p>		
	<p>NIHR Health Determinants Research Collaboratives (HDRCs)</p>	
<p>HDRCs boost research capacity and capability within local government. There is a cluster of HDRCs in the region and surrounding area. Two HDRCs were created in the first stage in Yorkshire: Bradford and Doncaster. Hosted within the City of Bradford District Council, the £5m Bradford HDRC will embed a culture of evidence-based decision-making to inform policy decisions that have a bearing on health and health inequalities. A further two HDRCs joined in Stage 2 in 2023 - Wakefield City Council with Leeds Beckett University, and North Yorkshire with Universities of Hull and York.</p>		
	<p>NIHR Applied Research Centre (ARC) Yorkshire and Humber:</p>	
<p>hosted within the Bradford Institute for Health Research (BIHR) the £9m NIHR investment in the region created one of fifteen ARCs across the UK. The Centre supports applied health and care research that responds to and meets the needs of local populations and local health and care systems. The Yorkshire and Humber ARC includes 38 partner organisations spanning local NHS providers, care services providers, NHS commissioners, local authorities, universities, the private sector and charities^{xiii}.</p>		

The University of Leeds is one of the top UK universities for health and care related research, and universities across Leeds all have a focus on making a tangible difference through health and care research.



3.5. Research Excellence & Impact

Leeds universities all contribute excellent and complementary research. Research across Leeds universities is complementary. The subsections below provide an illustration of research excellence in Leeds.






3.5.1. Research Excellence

In 2021 a total of 157 higher education institutions (HEIs) made submissions^{xiv} to the Research Excellence Framework (REF). Analysis of ‘research power’ using 2021 submissions shows that

the University of Leeds is consistently within the top 10% of UK HEIs for research relevant to health and care.




For example, the University of Leeds ranks :

 <p>8th in the UK for overall research excellence in mathematical sciences (foundational for health informatics and computer science);</p>	 <p>9th in the UK for overall research excellence in biological sciences and for overall research excellence in engineering (including medical engineering);</p>	 <p>10th in the UK for overall research excellence in information management;</p>	 <p>12th in the UK for overall excellence in clinical research;</p>	 <p>13th in the UK for overall excellence in public health, health services and primary care.</p>
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3.5.2. Research Impact

Analysis of REF impact case studies shows that almost one third of all case studies submitted by Leeds-based universities are health related.

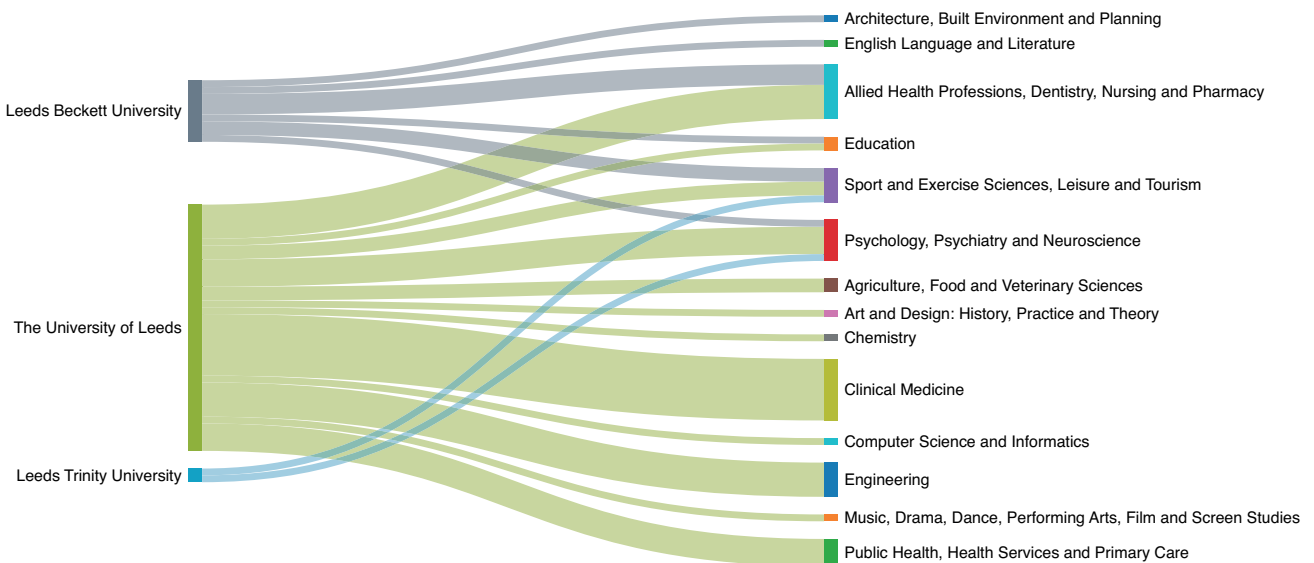
This includes one third of impact case studies submitted by the University of Leeds, **one quarter** of case studies submitted by Leeds Beckett University and **one in six** case studies submitted by Leeds Trinity University.



The University of Leeds is particularly strong for engineering-related health and care research impact. Approximately two thirds (63%) of all engineering Units of Assessment (UoA) case study submissions made by the University of Leeds are health related – **a higher proportion than any other national benchmark city**^{xv}.

All Leeds-based universities are having an impact on health and care products and services from across disciplines – from Allied Health Professionals and Clinical Medicine, to Engineering, Computer Science and Informatics. Figure 3.3 below shows the flow of health-related impact case studies from each university across Units of Assessment^{xvi}.

Figure 3.3 – Leeds REF Impact Case Studies - Health



Source: REF 2021

3.5.3. Commercialisation



Between 2018 and 2022, across health, academia and private sector research organisations, Leeds had 183 health and care related patents either applied for or granted - **more than any other national comparator location**^{xvii}.

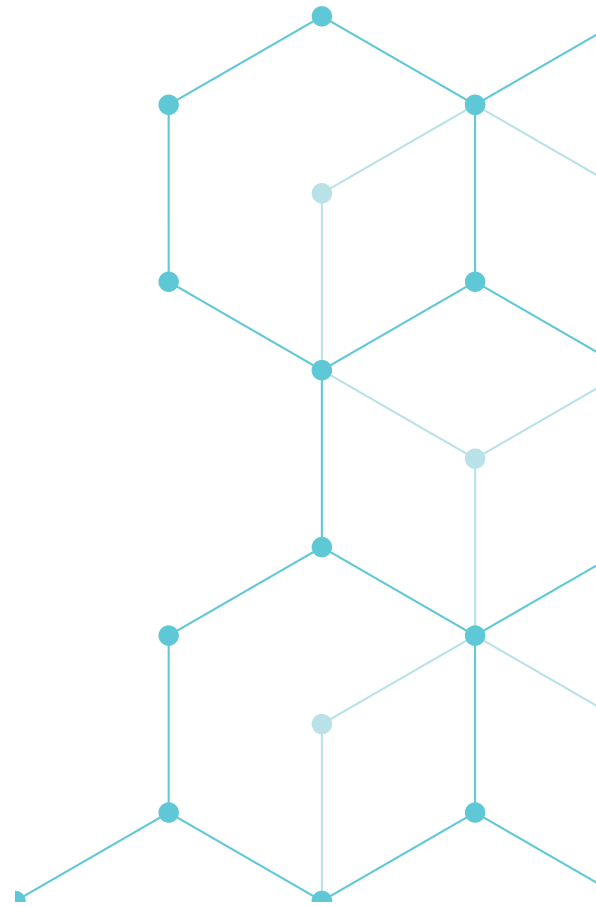


Figure 3.4 – Patents Applied for or Granted by Academia or Health 2018 – 2022

Location	2018	2019	2020	2021	2022	Grand Total
Leeds	34	29	38	47	35	183
Glasgow City	15	14	14	25	7	75
Birmingham	13	18	12	14	14	71
Manchester	9	9	12	17	14	61
Bristol	6	19	7	13	8	53
Newcastle	9	13	7	9	7	45

Source: Lens.org

Study interviewees indicated that Leeds has placed significant emphasis on the role of data in health and care research and innovation. This focus on data-driven research complements local healthtech industry sector strengths in data science, software development and artificial intelligence. It also provides a productive foundation for entrepreneurs, start-ups and scale-up businesses developing data-driven health and care products and services.



3.6. Research & Innovation Data Resources

Among the most prominent data-oriented infrastructures and initiatives are:

- ◆ **The Leeds Office of Data Analytics** has been involved in the creation of the Leeds Data Model and the Networked Data Lab initiative.

 - The **Leeds Data Model (LDM)** is an analytical resource used across the Leeds health and care system, helping to advance data capabilities for health and care research and innovation. The LDM enables better understanding of health in Leeds and supports better use of data to improve health outcomes.
 - **NHS West Yorkshire Integrated Care Board** (formerly NHS Leeds Clinical Commissioning Group) and **Leeds City Council** are two of five partners in the **Networked Data Lab (NDL)**. NDL is a UK-wide network of analytical teams using linked datasets to understand and address key issues facing health and care services. The NDL represents a £400k investment in making better use of data to improve health and care in Leeds^{xviii}.
- ◆ **The Leeds Institute for Data Analytics (LIDA)**^{xix} is the home of data science at the University of Leeds. LIDA has been involved in pioneering health and care research across the UK, including studies into defibrillator access, and the link between access, health inequalities and deprivation^{xx}.
- ◆ **The Leeds Observatory**, developed by Environmental Systems Research Institute (ESRI) and hosted by Leeds City Council, provides extensive data on the Leeds population and economy. Data includes but is not limited to population demographics, health and wellbeing, deprivation and children and young people^{xxi}.
- ◆ Leeds has been at the forefront of digital pathology and artificial intelligence (AI) research and innovation for over 15 years, with **St James University Hospital** being one of the world's first fully digital pathology labs. Established in 2019 and hosted by LTHT, the **National Pathology Imaging Co-Operative (NPIC)** - a unique collaboration between NHS, academic and industry partners - develops, deploys and evaluates digital pathology systems across the country to improve pathology services and patient outcomes.
- ◆ The award-winning **100% Digital Leeds** programme is led by the digital inclusion team in the Integrated Digital Service (IDS) at Leeds City Council, Leeds Health and Care Partnership and WYICB. Nationally acknowledged as exemplary, 100% Digital Leeds works with a range of partners across the city to strengthen digital inclusion infrastructure in communities to increase access, engagement and participation^{xxii}.

Leeds has been at the forefront of digital pathology and artificial intelligence for over 15 years.

4. Healthtech Industry Sector

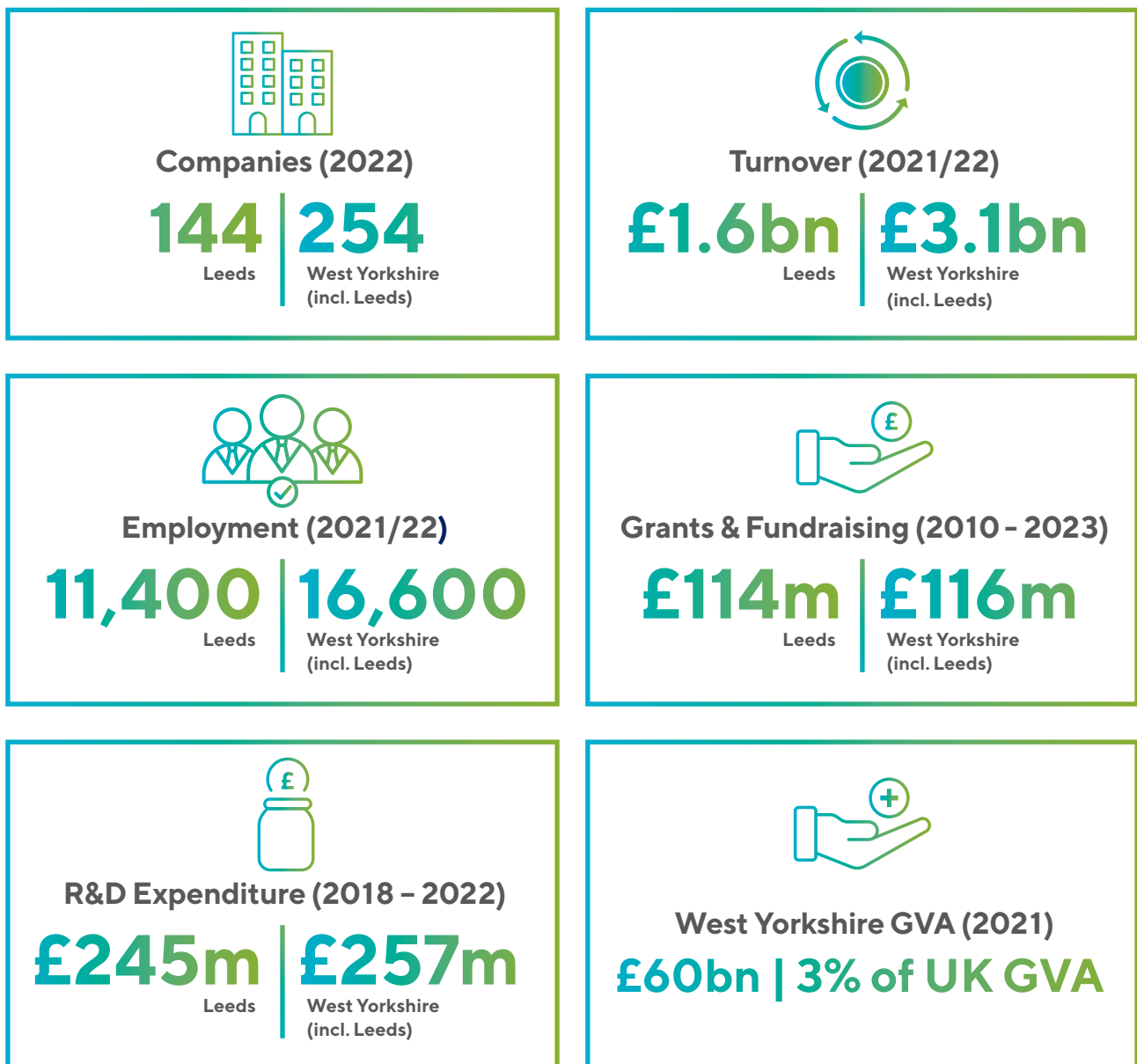
Leeds is at the heart of a vibrant regional healthtech sector that includes more than 250 locally headquartered companies. These companies generate more than £3bn in turnover and employ around 16,000 people. The city is attracting innovative, high-growth companies, has a high concentration of healthtech employees, and a growing investment landscape.



4.1. Economic Profile

The study has identified 300 healthtech businesses with a trading presence in Leeds and across West Yorkshire. Of these, 254 are headquartered in West Yorkshire. These companies generate more than £3bn in turnover, employ more than 16,000 people, and contributed an estimated £1.4bn in Gross Value Added (GVA) in the latest year for which data is available (2021 or 2022).

Table 4.1 - West Yorkshire Healthtech Business Profile

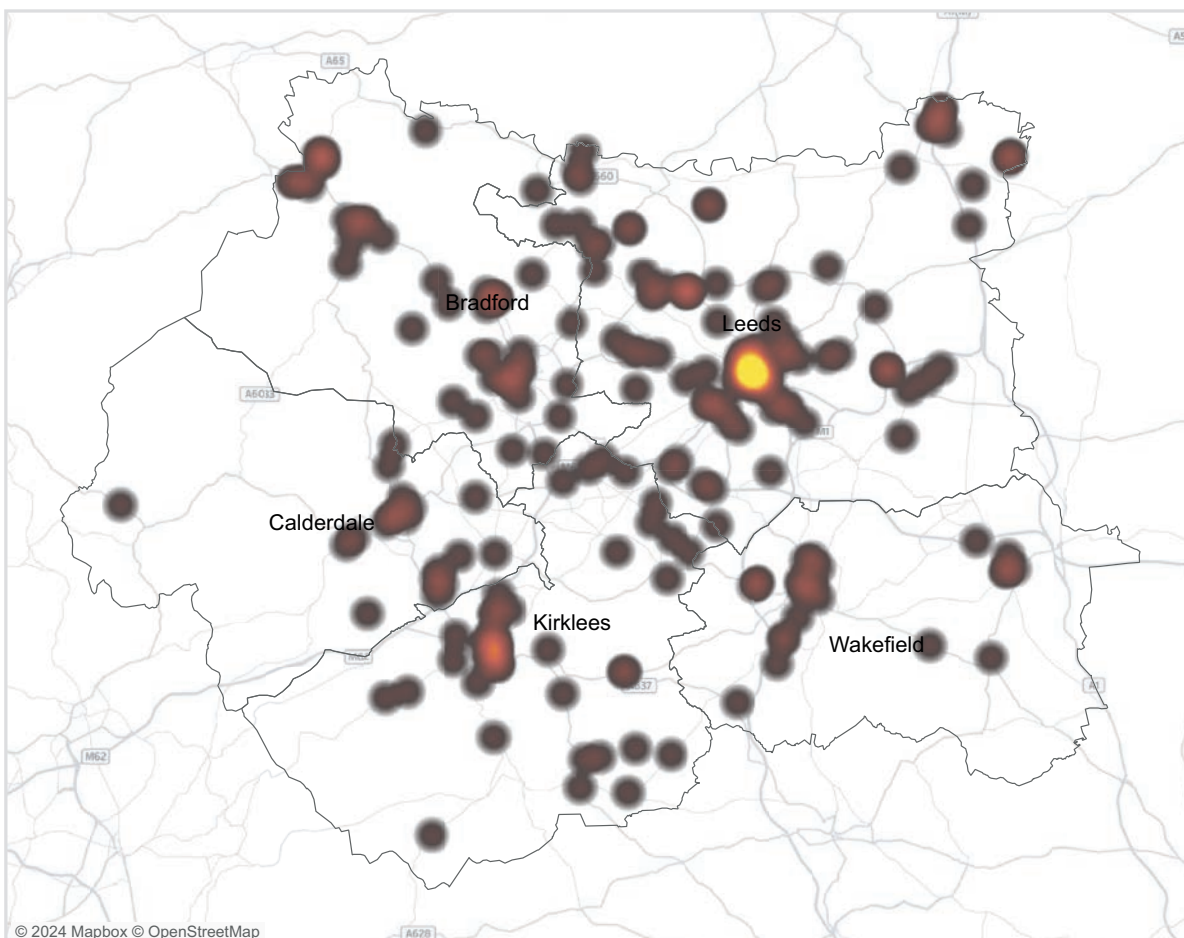


Source: Bureau van Dijk, Beahurst - figures are rounded

Leeds is a focal point for healthtech activity, as a regional home to:

- ◆ More than half of all healthtech businesses (57%, n=144).
- ◆ Almost three quarters of all 'dynamic' businesses^{xxiii} (74%, n=66).
- ◆ More than two thirds of total employment (69%, n=11,400).
- ◆ Most investment in R&D (95%, £245m) and external fundraising (99%, £114m).

Figure 4.1 – West Yorkshire Healthtech Industry Map



Source: Perspective Economics, Glass.ai

4.1.1. Dynamic Companies

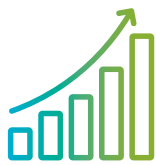
Of the 254 WYCA headquartered companies identified, 89 are 'dynamic' companies – defined as those that have grown revenue or employment, invested in R&D, or secured external grants or investment. Almost three quarters of these dynamic companies (n=66) are in Leeds. Leeds is also home to:



These dynamic companies are evidence of successful scale-up activity. Targeting structured scale-up support around these companies, and dynamic companies that emerge in future could deliver further economic benefit across West Yorkshire.

4.2. Private Investment

Access to private investment^{xxiv} in West Yorkshire has historically been seen as a barrier to start-up and scale-up activity. However, study interviewees suggested that the investment landscape in Leeds and West Yorkshire is changing. This positive sentiment is supported by analysis of investments made by regional investment companies – Northern Gritstone and NorthInvest – into Leeds-based companies.



Since 2016, there has been an **upward trend** in both the number and value of fundraisings secured by Leeds-based companies from these regional investment companies across all sectors (not just healthtech).

Good progress is being made on access to private investment. [Now] this needs to be increased to leverage the potential. A public sector organisation could consider setting up an evergreen seed fund ... to provide equity investment in early-stage businesses."

Health Sector Stakeholder

4.2.1. Regionally Backed Fundraising (All Sectors)

At the time of writing ten Leeds-based companies (across all sectors) had raised just under **£75m via 29 fundraisings** supported by Northern Gritstone and NorthInvest since 2016^{xxv}. This upward trend in investment by regional funds in Leeds-based companies is encouraging, but there is still scope to increase investment by those funds relative to their investments across the North. Raising awareness of investment opportunities in innovative local healthtech companies could help increase Leeds' share of investment.

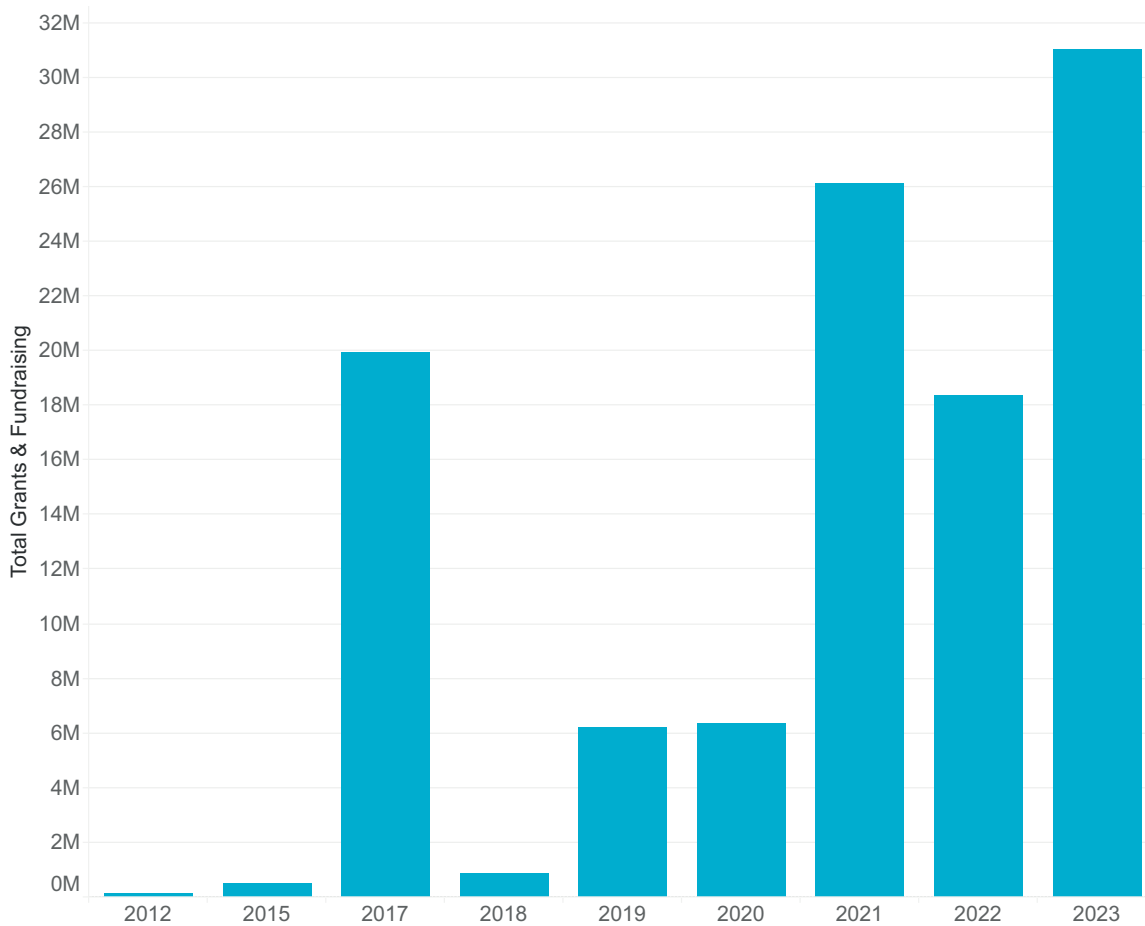
4.2.2. Wider Healthtech Fundraising

Beyond regionally backed fundraisings, healthtech businesses in West Yorkshire have successfully secured more than £115m in grants and fundraisings from a range of other sources since 2012^{xxvi} (Figure 4.2).



There has been a steep upward trend in investment in recent years,

from less than £2m in 2018 to more than £30m in 2023.

Figure 4.2 – Grants & Fundraising Secured by West Yorkshire Healthtech Companies

Source: Beauhurst

Top investors in health and medical technology companies include Apache Capital Partners, BGF Growth Capital and IP Group. Deepening relationships with these investors could represent another productive action for increasing private investment in Leeds and West Yorkshire.

4.3. Access to Networks & Markets

Access to health and care research and innovation networks was highlighted as a unique selling point for the ecosystem in Leeds. This was attributed to:



A collaborative and actively

networking innovation community

across Leeds and West Yorkshire.



Good and improving

infrastructure

for supporting health and care research and innovation



Strong connectivity

between senior leaders across health, academia and economic development.



Co-location of, and extensive collaboration

between academics, clinicians and private sector businesses.

“We have areas of excellence where we can really support early-stage innovators, we have really good links to clinical practice towards adoption ...”

Industry Stakeholder

Consultation with ecosystem stakeholders identified several active networks in Leeds, including but not limited to:

- ◆ **Propel@YH:** Propel@YH is Health Innovation Yorkshire and Humber's digital accelerator for innovative health and care start-ups. It offers support and guidance to fuel company growth and market expansion via a 6-month structured course delivered in collaboration with Nexus, Hill Dickinson (commercial law firm), Barclay's Eagle Labs, West Yorkshire Health and Care Partnership and Leeds City Council. In 2021/22, Propel provided 55 hours of high-quality support, facilitated 20 collaborations between start-up health and care companies and NHS stakeholders, generated three NHS trials and expanded market access across multiple UK regions. Several Propel-supported start-ups have since invested in Leeds.
- ◆ **Leeds Digital Health (LDH):** a private sector-led community initiative that brings together technical professionals working in digital health roles across West Yorkshire. LDH creates opportunities to share, learn and celebrate progress on digital health technologies via regular in-person and hybrid meet-ups. The initiative includes leading digital businesses operating within the health and care sector such as BJSS, 6B Digital, Aire Logic, Digibete and Doc Abode together with strategic partners from health, academia and economic development.
- ◆ **Leeds Digital Festival (LDF):** an open, collaborative programme showcasing, celebrating and catalysing digital culture in Leeds and beyond. Since it was established in 2016, the LDF has grown in both scale and visibility. It is now the largest festival of its kind in the UK, hosting hundreds of innovation events each year, of which dozens are specific to digital health.

"Propel was really good, a really structured week. We had everything from terminology to CE marking – all of the elements we needed to get started. We were also able to explore variations in the requirements between England and Canada, we could ask those silly questions and get the information we needed."

Industry Stakeholder

The study also conducted interviews with three internationally owned health and care start-ups introduced to the ecosystem in Leeds via the Propel programme, from Canada, Norway and the United States.

Senior representatives from each company highlighted the accelerated access that the Propel programme, with support from from Nexus and WYCA, provided to highly relevant health and care networks.

"The number of like-minded people working in the space is a real strength. Yes, advances in technology and video conferencing make it easier to connect, but nothing beats getting together. The sheer number of people working, and the links between people, and how it all flows and works together is fantastic, and it seems like we're just scratching the surface of that."

Industry Stakeholder



NEXUS

4.3.1. Enterprise & Innovation Support

Recent years have seen important additions to healthtech innovation support in Leeds. Study interviewees highlighted support from healthtech sector representatives at WYCA, and the impact that Nexus has had on enterprise and innovation support to healthtech businesses. Housed within a state-of-the-art, 6-floor 6,684m² building on the University of Leeds Campus, Nexus has quickly become a go-to location for enterprise and innovation support, including tailored support to healthtech start-ups and scale-ups.

A series of recent enterprise support investments will further bolster the health and care research and innovation business landscape in Leeds and West Yorkshire, including:

“We rapidly expanded our network, met really useful people, everything from accountants to health sector people. It felt really supportive and fruitful and wasn’t just a tick-box exercise – they followed up, set up meetings, connected us with clinicians, and checked-in with us again.”

Industry Stakeholder



- ◆ In October 2023, Innovate UK committed **up to £7.5m** for health technology innovation projects in West Yorkshire. Part of Innovate UK’s wider Launchpads programme, funding will support investment by local businesses in innovation projects regarding medical devices, in-vitro diagnostics, digital health, or other technology that can be shown to be within scope. Each project will contribute to one or more themes including overcoming health inequalities, global net zero challenges, major health conditions, disease prevention or earlier and better detection and diagnosis of disease.
- ◆ In November 2023, West Yorkshire became England’s third Investment Zone. Focused on Leeds, Bradford and Huddersfield, the new **£160m**, 10-year Investment Zone is targeting the life sciences sector and could unlock up to £220m of investment and create more than 2,500 new jobs across the region.

4.3.2. Wrap-Around Professional Advisory Support

Leeds is home to a network of businesses that can provide specialist health and medical technology related professional advice regarding finance, legal and regulatory compliance. Across every step of the health and medical technology commercialisation journey (Figure 4.3), the health and care research and innovation network in Leeds offers deep technical and advisory support (see Appendix 4 for examples of support available across the commercialisation journey)^{xxvii}.

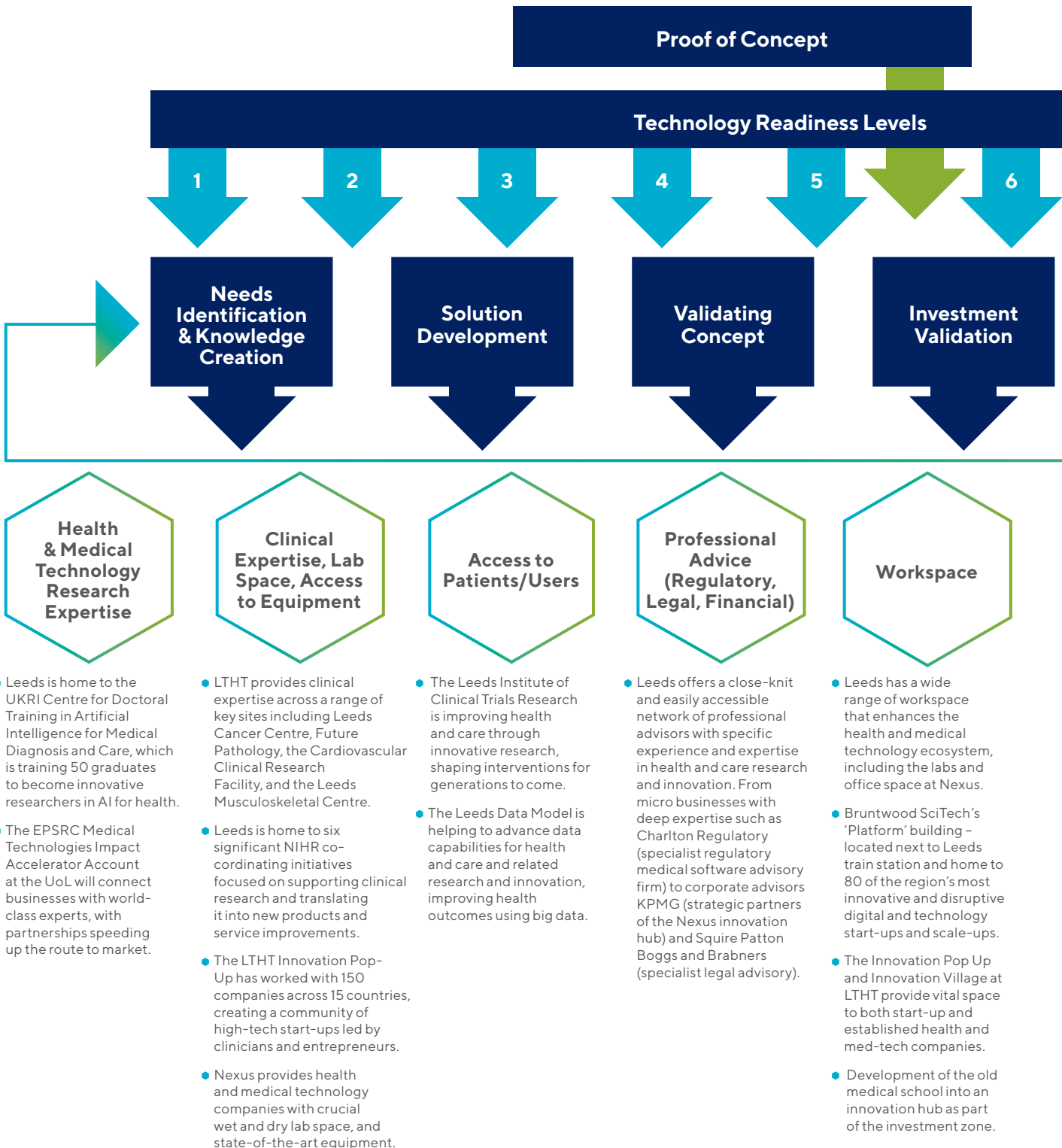
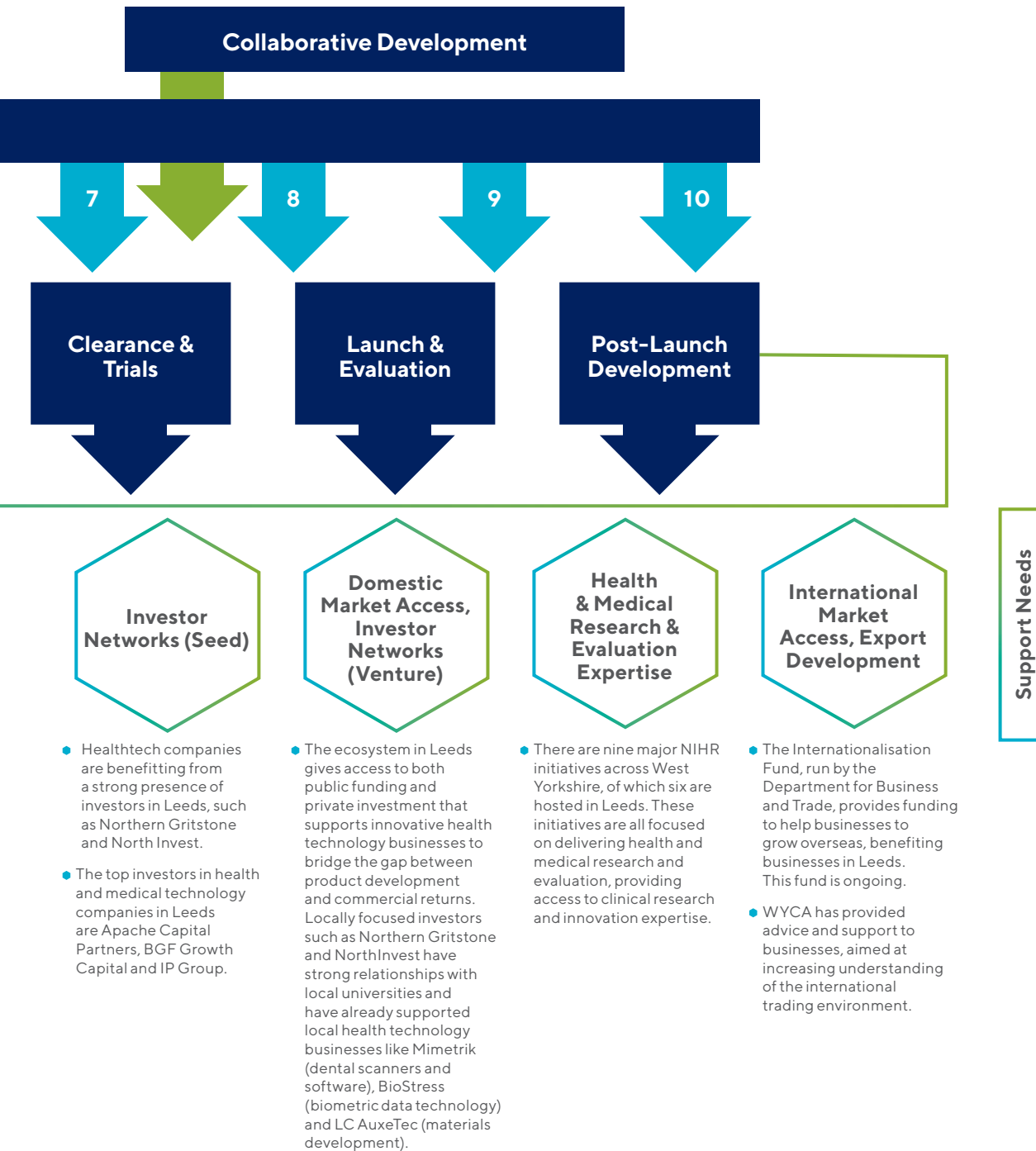


Figure 4.3 – Health & Medical Technology Commercialisation Journey





4.3.3. Access to Market

Interviewees suggested that embedding and scaling new health and care technology within the NHS is an ongoing challenge. However, procurement data shows that the knowledge and experience required to secure NHS contracts does exist within Leeds. This is particularly true for software and medical technology products and services. A search for contracts awarded to companies from Leeds identified 217 awards since 2018 to more than 60 companies. The value of these awards equates to almost £500m, with prominent suppliers including a combination of digital health, software development and medical technology companies^{xxviii}.

4.4. National Benchmarking

To help understand how Leeds compares as a UK location for healthtech innovation activity, the study team produced a series of study-specific national benchmarks that use consistent data from both web-based and proprietary sources.

4.4.1. Concentration of Healthtech People

Publicly available Office for Life Sciences (OLS) data shows that over the past decade (between 2011 and 2021) Yorkshire and the Humber has increased medtech and biopharma employment by 41% – more than any other comparator region^{xxix}. This includes a 49% increase in employment within medical technology service and supply businesses and a 27% increase in employment within core medical technology businesses.



Study-specific benchmarking data collated by Glass.ai shows that, among the five national comparator locations, **Leeds is home to almost one third of all healthtech employees.**



This is equivalent to around 2 in every 100 working age people in Leeds^{xxx}.

Table 4.4 – Concentration of Healthtech People

Region	Healthtech Employees	%	Employment (16+, '000s)	% of
Leeds	7,476	31	401	1.9
Birmingham	1,375	6	500	0.3
Bristol	1,643	7	258	0.6
Glasgow	9,557	39	317	3.5
Manchester	3,564	15	271	1.3
Newcastle	868	4	139	0.6
Total / Ave	24,483	100	1,886	1.4

Source: Glass.ai

4.4.2. Concentration of High-Growth and Investment-Raising Healthtech Businesses

Study-specific benchmarking data gathered from leading UK investment platform Beauhurst shows that of 316 in-scope healthtech companies in benchmark cities Leeds accounted for 20% of the companies identified (second only to Birmingham) and for:

- ◆ most companies that have featured on high-growth lists (29% of the total);
- ◆ most companies that have secured equity fundraising (21% of the total);
- ◆ second highest share of companies that have seen 20% growth (24% of the total);
- ◆ second highest share of companies that secured a substantive innovation grant (19%)^{xxxi}.



Leeds is also home to **16% of companies** that had attended an accelerator and **8% of companies** that had spun out from a university.

“We got to meet high-level people that would have taken us a couple of years to acquire for ourselves. There’s an ecosystem welcoming new tech in the healthcare sector that is different to other places in the world – Leeds seems like an open city welcoming new technology, and we want to be a part of that.”

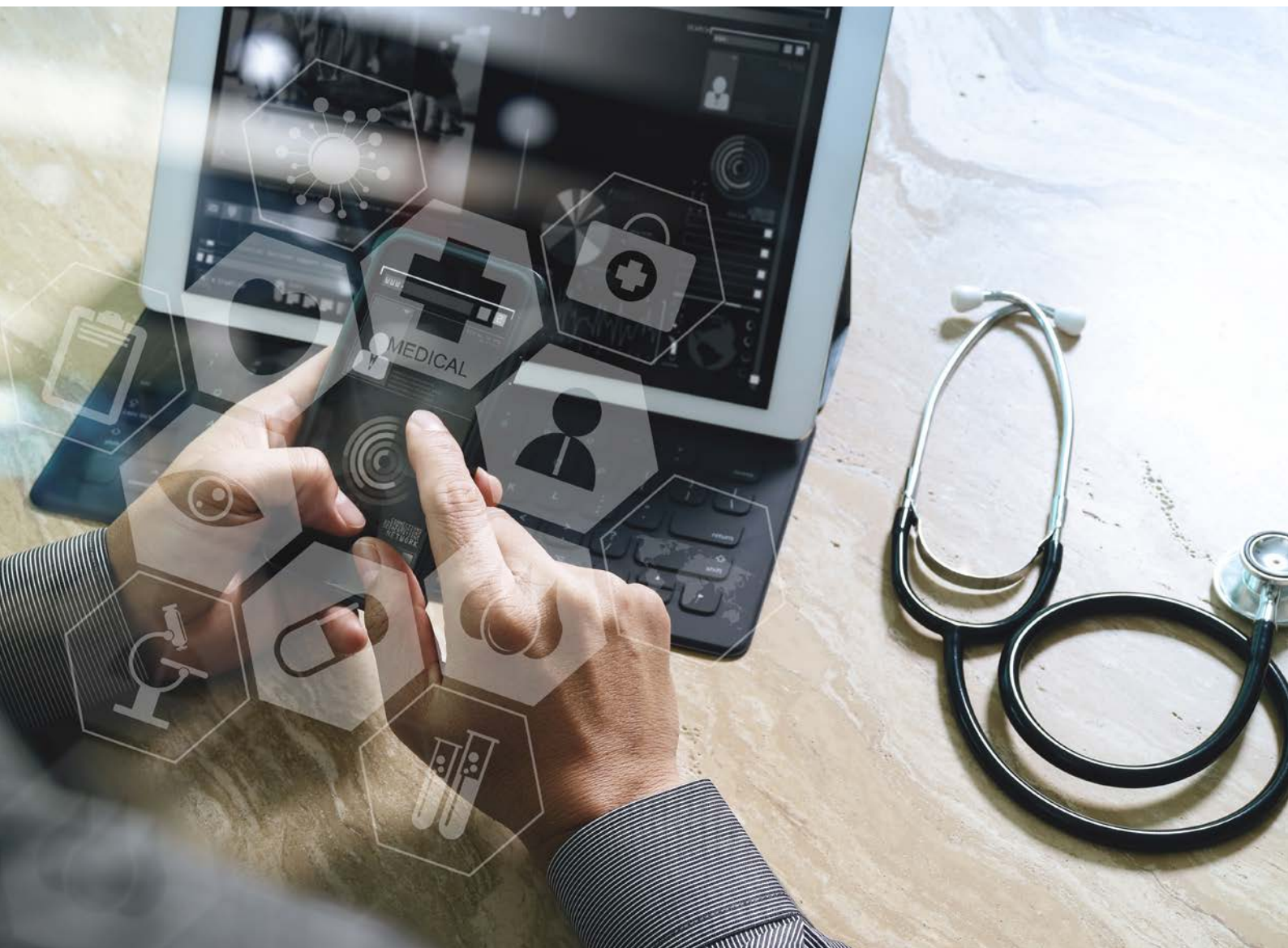
*International Industry
Stakeholder*

4.4.3. Inward Investment



Between 2018 and 2022 Leeds attracted approximately **£12m in Foreign Direct Investment (FDI)** for health and care related projects, resulting in **over 80 jobs**.

All health and care inward investment projects into Leeds have been software and IT related, including companies such as Serenus.AI which specialises in the development of advanced generative artificial intelligence, and global digital transformation business UST. This profile of inward investment supports the suggestion that Leeds is an attractive location for health-focused software, digital and artificial intelligence businesses^{xxii}.



4.5. International Benchmarking

Hands-on support provided through masterclasses, mentoring and access to co-working space have been recognised by international healthtech business owners as major factors in their decision to set up in Leeds.



Analysis of study-specific benchmarking data on investment-raising healthtech companies headquartered in nine international cities shows that **Leeds is already competing as an international healthtech cluster^{xxxiii}**.



Of the ~1,200 international companies identified, Leeds is **home to almost 8% of the total.**

This puts it either on a par with or ahead of other recognised healthtech innovation locations such as Basel, Eindhoven, Oulu, Mainz and Bergen. Removing Boston (considered to be an outlier due to scale) adjusts the Leeds share to almost 14% of the total **ranking it 3rd** behind just Dublin and Zurich.



Innovative **wellness** companies^{xxxiv}, many of which are digitally driven, are particularly prevalent within the Leeds cluster. Excluding Boston, Leeds ranks second for private investment raised by wellness companies, representing approximately **one third of total investment**, just behind Dublin.

5. Skills, Talent & Champions



The health and care research and innovation ecosystem in Leeds benefits from a strong pipeline of talent and skills. This includes graduates with relevant skills coming out of local universities, high graduate retention rates, and diverse routes into health and life sciences careers. The strong skills pipeline supports high demand from private sector healthtech companies in Leeds. For example, demand for medical research and innovation roles has grown by 50% over the last 5 years – higher than any other national comparator city.

5.1. Skills Pipeline

Further Education (FE) providers and Higher Education Institutions (HEIs) provide diverse pathways into the health and care research and innovation ecosystem in Leeds and West Yorkshire.

5.1.1. Further Education

Within the FE sector, Leeds City College was one of the first providers of ‘Technical’ or T-Level vocational qualifications. In 2022/23 providers in Yorkshire and the Humber enrolled almost 550 learners onto T-Level courses – placing it among the top English regions in terms of both overall numbers of T-Level learners, and for numbers enrolled in both digital and health pathways^{xxxv}.

FE providers in Yorkshire and the Humber also enrol among the highest apprenticeship numbers of any English region. In 2022/23 Yorkshire and Humber providers enrolled just under 40,000 people onto apprenticeship schemes. Approximately two fifths (38%) of those enrolled onto apprenticeship courses in Yorkshire and the Humber studied subjects relevant to health and care research and innovation. This includes health, public services and care, information and communication technology, and science and mathematics.

The Leeds Mathematics School, a partnership between the University of Leeds and GORSE Academies Trust, opened in 2023 to welcome its first cohort. This is a unique sixth form school for Leeds, providing a specialised curriculum for students who have a passion for maths. At its heart is a focus on raising the participation of under-represented groups – especially girls and the disadvantaged – in the study of maths and related subjects such as computer science to empower these individuals to make significant future contributions to the region and global society.

5.1.2. Higher Education

Universities in Leeds offer a complementary range of health and care related courses from health informatics and medical engineering, to mental health, nursing, nutrition and dietetics. For example, from January 2024, Leeds Trinity now offers three new nursing degrees in adult nursing, learning disability nursing and mental health nursing, complementing nursing courses offered at other universities.



According to the Higher Education Statistics Agency (HESA), in 2021/22 Leeds-based universities enrolled

more than 37,000

new undergraduate students in all disciplines, and

more than 11,000

students in courses that are relevant to health and care research and innovation.



Study-specific benchmarking data shows that Leeds-based universities accounted

for the **highest proportion**

of undergraduate students taking biosciences (Rank:1, 39%), and for just less than

one quarter of students enrolled

in artificial intelligence (Rank: 3, 23%).

Leeds universities rank third for enrolment in materials science and technology courses.



Leeds-based universities are also major contributors to the postgraduate skills pipeline. In 2021/22 there were more than 16,000 postgraduate students enrolled across the University of Leeds and Leeds Beckett University, with

almost a fifth

(n~3,000) enrolled in postgraduate courses related to the health and care research and innovation ecosystem and approximately

one quarter of postgraduate students studying artificial intelligence.

The University of Leeds delivers numerous health and care research and innovation-related doctoral training initiatives including:

- ◆ **UKRI Centres for Doctoral Training (CDTs) in New Forms of Data, Data Analytics and Society, and AI for Medical Diagnosis and Care.**
- ◆ **Yorkshire Cancer Research's Academic Fellowship Platform.**
- ◆ **The British Heart Foundation's 4-year PhD programme in Cardiovascular Disease & Diabetes.**
- ◆ **The Medical Research Council's Discovery Medicine North (DiMeN) Doctoral Training Partnership.**

- ◆ **The 4ward North Wellcome Trust Doctoral Training Platform.**
- ◆ **Cancer Research UK's Leeds-Manchester Academic Researcher Clinical Training Innovation in Training (ARCTIC) Doctoral Training Programme.**

Collectively these Centres have equipped hundreds of PhD students with the latest knowledge and techniques to make unique contributions in data science and artificial intelligence, clinical research, and across numerous disease areas.



There is close alignment between the local supply and demand for skills, with AI and materials science skills required by approximately **half of the healthtech companies** identified through this study (i.e., those involved in data, software development, information technology, healthtech manufacturing)^{xxxvi}.





5.2. Clinical Health & Care Talent

NHS Trusts headquartered in Leeds employ almost 23,500 people. This includes almost 12,300 professionally qualified clinical staff, of which more than 2,500 are doctors, more than 1,200 are specialty doctors and consultants, and more than 3,600 are Scientific, Therapeutic and Technical (STT) staff^{xxxvii}. Scientific staff in the NHS lead the creative use of science and technology advances for research and innovation^{xxxviii}. Further, the Leeds Health and Care Academy completed an unprecedented, citywide health and care workforce review at the end of 2023, revising the total workforce number from 57,000 to 60,000.

Leeds-based NHS Trust organisations also employ the lowest proportion of people in management and ‘central functions’ roles, representing just 9.7% of the total FTE count, compared to 11.6% in Manchester and 10.8% in Birmingham (equivalent to more than 2,000 additional management and central functions FTEs in both cases).



Among five comparator regions in England, Leeds-based NHS Trusts employ the **highest proportion** of people in STT roles (just less than 30% of all clinical staff) and offer the **strongest levels of support** to those staff (2.5 STT support staff to each STT staff member).



The **high efficiency** of health and care services in Leeds has been recognised in recent years, including by the Care Quality Commission (CQC)^{xxxix}. Embedding a culture of research and innovation is at the core of NHS plans in Leeds and is included as one of LHT's seven in-year commitments for 2023^{xl}.

5.2.1. Integrated Health & Care Training



The University of Leeds is working with LTHT, and the Leeds and York Partnership NHS Foundation Trust (LYPFT) to deliver **nationally leading Integrated Academic Training (IAT)** via the NIHR pathway for both medically qualified professionals and allied health professionals. IAT supports individuals to gain research experience as part of their clinical training, and therefore helps to increase research capacity and capability within the health and care workforce.

Since 2007, the University has secured **48 personal** fellowships, including 10 pre-doctoral, 25 doctoral and 19 post-doctoral awards. The University's conversion rate is recognised as 'outstanding' with three quarters of those involved progressing to another funded fellowship or into an academic or clinical academic post.



The city is also home to unique, forward thinking **talent development initiatives**, like the pioneering Leeds Health and Care Academy (LHCA). LHCA creates better integration of the health and care workforce in Leeds via a diverse range of educational programmes

The Leeds Health and Care Academy (LHCA) offers skill enhancement workshops for practitioners and specialised courses for researchers and students, equipping individuals with the knowledge and tools necessary to excel in a range of roles. In 2022/23 LHCA supported **1,344 unique learners**, helped **211 people into employment** through their programmes and **facilitated access to health and wellbeing training or support for a further 750 people**^{xli}. The number of people accessing LHCA programmes has increased by 22% between 2021/22 and 2022/23, highlighting latent demand for LHCA's learning and development offer.

5.3. Skills Demand

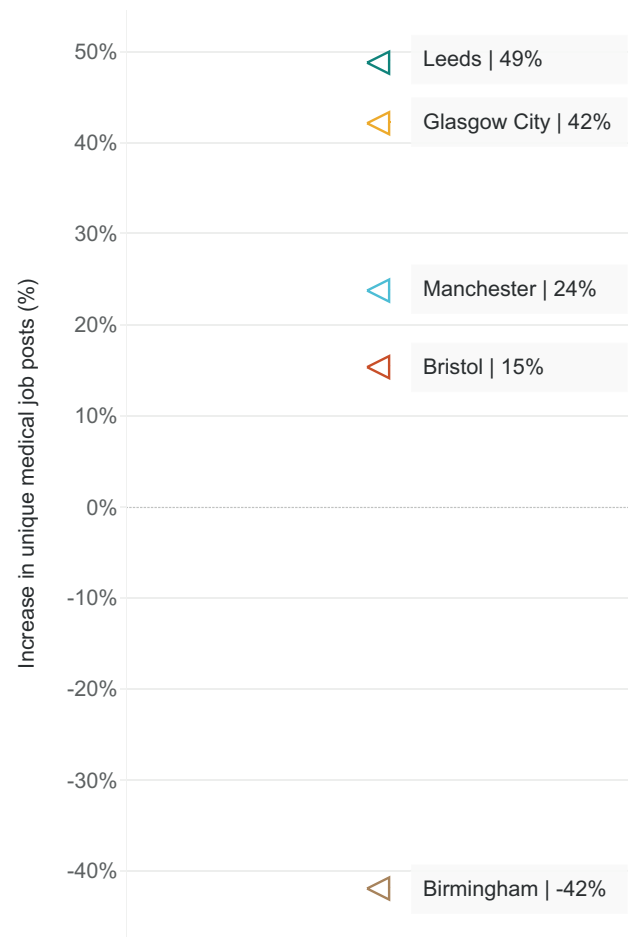


Analysis of unique job posting data provided by labour market analytics platform Lightcast shows that between 2018 and 2022 Leeds saw almost **50% growth in job posts relevant to medical research and innovation** - higher than any other comparator location. (Figure 5.1)^{xliii}.



Over the same period, Lightcast data shows that Leeds has also seen **41% growth in unique job postings for ICT roles** (joint 4th with Glasgow) and a total of **21,116 unique software-related job postings** (4th). The comparatively high demand in Leeds for people in medical, ICT and software development roles over the past five years is indicative of a vibrant health and care research and innovation ecosystem.

Medtech Jobs Demand Across Comparator Locations





6. Conclusions, Opportunities & Recommendations

6.1. Conclusions



This independent report shows that Leeds is **among the foremost UK locations** for health and care research and innovation.

It benefits from strong and well-co-ordinated leadership and a long-term policy focus that has led to major new strategic initiatives in recent years.

Fifty-nine ecosystem assets support research and innovation in Leeds, including anchor organisations such as LHTT and Leeds City Council, co-coordinating partnerships such as the LAHP, and six NIHR supported translational research and innovation assets.



Within the past five years, academic institutions in the city have secured **over £200m** in funding for health and care research and innovation from across UKRI research councils – ranking Leeds third for research and innovation funding among UK benchmark cities. This funding is being used to create new knowledge and research impact from across academic disciplines, including notable impact from engineering-related health and care research.

Leeds is at the heart of the regional healthtech industry sector. It is home to more than half of all businesses, almost three quarters of all ‘dynamic’ businesses, and more than two thirds of total employment. Study-specific benchmarking data collated by Glass.ai shows that, among the five benchmark cities, Leeds is home to almost one third of all healthtech employees – equivalent to almost two in every hundred working age people in Leeds. The healthtech industry sector in Leeds is particularly strong in digital, data science, software development and medical technology.

Study-specific benchmarking data on investment raising healthtech companies internationally shows that Leeds is also already competing as an international healthtech location. As home to almost 14% of companies identified, Leeds ranks it 3rd behind just Dublin and Zurich.

The health and care ecosystem in Leeds provides good access to research and innovation networks, offers tailored enterprise and innovation support and wrap-around professional services with specific health and care expertise.


Further and higher education providers offer both diverse and specialised routes that support health and care research and innovation at all levels, from T-Levels and apprenticeships to undergraduate and postgraduate courses and doctoral training.


Stakeholders from across the health and care research and innovation ecosystem in Leeds continue working towards a shared vision – one in which Leeds is recognised as a leading city, nationally and internationally, for health and care research and innovation.

6.2. Opportunities & Recommendations

In support of this vision five high-potential opportunities and corresponding recommendations have been identified.

1. Maintain a collaborative focus on health and care research and innovation particularly across care pathways and organisational boundaries.

	Opportunity:
<p>Strong leadership and effective co-ordination were highlighted as key foundations of the health and care research and innovation ecosystem in Leeds. At a time when so many strategic initiatives are being delivered, stakeholders should be supported to maintain a unified and collaborative strategic focus.</p>	

	Action:
<p>Agree clear mandates for ecosystem co-ordination, back the organisations chosen to deliver, and expand programmes that connect ecosystem stakeholders.</p>	

2. Extend start-up and acceleration support to help scale dynamic, high-potential companies.

	Opportunity:
<p>Local and international healthtech companies highlighted the quality and effectiveness of start-up support delivered across the ecosystem. Extending this support to help high-potential scale-up companies can deliver further economic growth and capitalise on recent investment trends.</p>	

	Action:
<p>Design and deliver a comprehensive, targeted programme of scale-up support that builds on the success of existing acceleration support. Raising awareness of investment opportunities in innovative local healthtech companies could help increase Leeds' share of investment.</p>	


3. Further leverage healthtech industry sector specialisms.


	Opportunity:
<p>Leeds has sectoral strengths in medical technology, digital health, software development, data analytics and artificial intelligence. Involving private sector networks in start-up and scale-up activities can help future entrepreneurs benefit from existing sectoral knowledge.</p>	


	Action:
<p>Involve existing private sector collaborations such as the Healthtech Cluster and Leeds Digital Health in the design and delivery of start-up and scale-up support.</p>	

4. Continue building capacity across the ecosystem to support research and innovation activity.


	Opportunity:
<p>Effective access to clinical networks was highlighted as an ecosystem strength. There must be sufficient capacity to facilitate research and innovation across the ecosystem in future – from clinical environments to local communities.</p>	


	Action:
<p>Ensure that provision is made to enable research and innovation across organisational boundaries. This should include adequate clinical time to support research and innovation.</p>	

	Opportunity:
<p>Leeds is well placed to use data to better understand, plan and deliver care-related research and innovation particularly across care pathways and organisational boundaries.</p>	

	Action:
<p>Explore opportunities to raise awareness and use of key datasets, such as the Leeds Data Model, for understanding, planning and delivering care-related research and innovation.</p>	

5. Heighten the scale of ambition within research and innovation funding applications, ensuring that research aspirations are informed and guided by the city’s highest health needs.

	Opportunity:
<p>Research organisations in Leeds already secure significant levels of funding for health and care research and innovation, but there is some scope to increase the scale of research funding awards.</p>	

	Action:
<p>Support research organisations to identify and scope a small number of larger scale strategic health and care research and innovation funding opportunities that clearly address the city’s most pronounced health and care needs.</p>	



Appendices

The background features a dark blue field with a grid of light blue nodes connected by thin lines. Overlaid on this grid are several large, wavy, flowing lines in a lighter blue and teal color, creating a sense of movement and depth. The overall aesthetic is clean, modern, and technical.

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Appendix 1 – Benchmarking Data

National benchmarking comparator locations (Leeds, Manchester, Bristol, Birmingham, Glasgow and Newcastle Upon Tyne) were selected based on consultation with the study Steering Group as locations with recognised health and care research and innovation activity outside of London and the South East of England.

International benchmarking locations include Boston, Dublin, Zurich, Leeds, Basel, Eindhoven, Oulu, Mainz and Bergen. Locations were selected based on desk-based review of independent studies into prominent healthtech innovation cities, most of which (except Boston) are comparable to Leeds in terms of area and population size.






Table A.1 – National and International Benchmarking Data

Analysis	Metrics (Source)	Focus (Geography)	Year, Notes (Source)
Industry Strength	Number of Health and Care Research Organisations	Research Organisations (UK)	2022, web-based identification of Research Organisations (https://www.glass.ai/)
	Number of Health and Care Employees	People Employed in Health & Care Research Organisations (UK)	2022, web-based identification of people employed within health and care Research Organisations (https://www.glass.ai/)
	Number & Profile of High Growth Health & Care Businesses	High Growth Businesses (UK)	2022, high growth companies in comparator geographies (https://www.beauhurst.com/)
	Number & Profile of Investment Raising Companies	Investment Raising Companies (International)	2022, investment raising companies in comparator international geographies (https://www.crunchbase.com)
Availability of Talent	NHS Trust Staffing	Health Trusts (England)	2022, equivalent Scottish data not available (https://digital.nhs.uk/data-and-information/publications/statistical/nhs-workforce-statistics/january-2022)
	Student Enrolment (Graduate & Postgraduate)	Universities (UK)	2021/22, universities in comparator geographies (https://www.hesa.ac.uk/data-and-analysis/students)
	Skills Demand	Occupations (UK)	2018 – 2022, unique job adverts posted within comparator geographies (https://lightcast.io/uk)
Research & Innovation Strength	Research Funding	Universities (UK)	2018 – 2022, funding awards and award values by Research Council (https://gtr.ukri.org/ , https://fundingawards.nihr.ac.uk/ , https://www.ukri.org/publications/innovate-uk-funded-projects-since-2004/)
	Research Power	Universities (UK)	2021, results based on submissions made between 2014 and 2020 (https://www.ref.ac.uk/)
	Research Impact		
	Patents	Research Organisations (UK)	2018 – 2022, using selected IPCR Classification Codes (https://www.lens.org/)

Appendix 2 – LTHT | University of Leeds Strategy

The joint strategy on health and care research and innovation developed by LTHT and the University of Leeds sets out five commitments and 15 strategic aims as summarised in the Table below.

Table A.2 - Joint LTHT University of Leeds Commitments

Commitment	Strategic Aim
 Championing research that reduces health inequality	1. Adopt a value-based healthcare approach
	2. Invest in research that has impact
	3. Secure research investment aligned to local and national priorities
 Embed research into local communities	1. Support greater opportunity for public involvement
	2. Push the boundaries of research by taking it to communities
	3. Forge closer links with voluntary and community organisations
 Support outstanding care through impactful research	1. Establish shared research functions and governance
	2. Embed research excellence within routine clinical practice
	3. Be recognised as an internationally leading research partnership
 Drive sustainable innovation for inclusive growth	1. Support the local health technology economy
	2. Act as anchor institutions to leverage investment for Leeds
	3. Grow opportunities and support for staff entrepreneurship
 Equip our people with research skills for tomorrow	1. Build research capacity and capability across academia & NHS
	2. Provide integrated NHS-academic learning opportunities
	3. Ensure all our people can engage with research

Appendix 3 – Case Studies

This appendix includes eight case studies developed to highlight salient ecosystem strengths. Each case study is based on a combination of in-depth interviews, desk research and data analysis.



Case Study: Hyivy: An International Perspective on Access to Networks

Hyivy is a pioneering health start-up that seeks to elevate the standard of pelvic health and care for both patients and clinicians. It provides holistic, patient-centric pelvic health rehabilitation solutions including development of a novel holistic pelvic rehabilitation device designed to treat, monitor, track, and prevent pelvic symptoms that one in three women will experience in their lifetime. Hyivy is at the forefront of revolutionising pelvic health care, fostering a community of support, and driving the necessary change to enhance the quality of life for women dealing with pelvic health issues.

At the time of writing Hyivy has joined the Nexus community, is obtaining Class 2 regulatory approval in the United States and Canada and is establishing clinical trials in the UK.

Commenting on the company's early experience in the UK, senior representatives explained the value they derived from support they received to access relevant health and care research and innovation networks:

“Propel was really good, a really structured week. We had everything from terminology to CE marking – all of the elements we needed to get started. We were also able to explore variations in the requirements between England and Canada, we could ask those silly questions and get the information we needed.”

“We rapidly expanded our network, met really useful people, everything from accountants to health sector people. It felt really supportive and fruitful and wasn't just a tick-box exercise – they followed up, set up meetings, connected us with clinicians, and checked-in with us again.”



Case Study: Nexus: State-of-the-Art Specialist Enterprise Support

Officially launched in May 2019 and housed within a state-of-the-art, 6-floor 6,684m² building on the University of Leeds Campus, Nexus sits at the heart of the research, innovation and economic development ecosystem in Leeds. Nexus has quickly become a go-to location for support with enterprise, innovation, knowledge transfer and commercialisation activities, acting as a key asset to the research, development and innovation ecosystem in Leeds and West Yorkshire.

Healthtech at Nexus

By providing an environment that encourages cross-sector collaboration, knowledge exchange, and access to cutting-edge resources, Nexus empowers startups and scale-ups to develop ground-breaking solutions to real-world challenges. Its proximity to nationally unique health research and innovation assets such as the Innovation Pop-Up at Leeds General Infirmary, the Leeds Academic Health Partnership and the NIHR Clinical Research Network – make it a particularly attractive place for health technology businesses. Nexus is a key asset in the health and care ecosystem, providing a physical space for these innovative businesses to come together and has become a popular venue for hosting collaborative health and care events.

Nexus has embraced this cluster-based strategy to proactively connect its member community with academic expertise. Focus on healthtech directly leverages the strengths of both the University of Leeds and the West Yorkshire region. Nexus has harnessed the regional strengths in digital technology and attracted pre-existing and start-up healthtech companies to Leeds, through the connections available and informative events such as the **Leadership for Digital Innovation in MedTech** event in May 2023.

Leeds Digital Specialists accelerate 'Virtual Clinic' Platform

Digital healthcare experts at Nexus developed a 'virtual clinic' platform amid the Covid-19 pandemic. This digital platform is aimed at overseeing persistent health issues and decreasing the requirement for in-person appointments. Trainee doctors from the University of Leeds participated in crafting the platform alongside Nexus member Itecho Health. Collaborating with LTHT, London's King's College and St Thomas's Hospitals, the team refined the platform for application across 22 chronic health conditions, including blood cancers, lung and prostate cancer, renal and liver dysfunction, and rheumatoid arthritis.

National Measurement Laboratory

Nexus is also home to scientific research and innovation assets such as the National Measurement Laboratory. The Laboratory's Northern Cell Metrology Hub is a novel epicentre of innovation in clinical diagnostics and medical technology to which Nexus members have access.





Case Study: PinPoint Data Science: An AI Revolution in Cancer Diagnostics

A surge in urgent cancer referrals is placing immense strain on NHS resources. Of the 2.8 million patients referred each year, 93% will not actually have cancer. Yet every referral triggers a battery of expensive, time-consuming tests, while patients face agonising waits for diagnoses.

Leeds-based PinPoint Data Science has pioneered an AI-powered blood test – ‘The PinPoint Test’ that could help to transform cancer diagnostics. The PinPoint Test analyses routine blood results using machine learning algorithms, and within seconds calculates a patient's probability of having cancer.

This simple test acts as a compass for clinicians. High-risk patients are flagged for rapid investigation, while low risk patients can avoid unnecessary testing. PinPoint has modelled a scenario where 20% of referrals could potentially be ruled out, saving 560,000 patients per year from anxiety-inducing limbo. Compliance with two-week referral targets could increase from 66% to 98%, leading to real and substantive capacity savings.

Benefits of more efficient and effective urgent care pathways should cascade through the system: patients receive quicker answers; doctors regain precious time to focus on care; NHS resources will better align with need; and crucially, survival rates should improve as more treatable cancers are caught early.

Thanks to significant investment of time, intellect and resources from across the health system, academia and the private sector, the PinPoint Test is a ‘plug-and-play’ solution that slots seamlessly into existing NHS infrastructure, without costly equipment or disruption. Consultation with senior company representatives to inform this study highlighted the significant role that the close network of clinical and academic leaders in Leeds has had to play.

“[We made] a very conscious decision to choose Leeds as a place’... Being [based] in Leeds was all about the network of people who knew how to get things done. The ecosystem itself is not a one-way channel that takes you from A – B, it’s a network that interacts with each other – [you] need to find the one person who understands the value you’re proposing and can help you to navigate that network – taking you to places that you didn’t even know existed.”

As cancer referral rates continue to trend upwards, PinPoint's test couldn't arrive at a more crucial juncture. By distilling medical complexity into binary risk profiles, the company's technology promises to revolutionize diagnostics, offering one of few real-world illustrations of how AI can deliver societal, and economic benefit.

Since their incorporation in 2016, PinPoint Data Science have secured £1.36m in private investment, more than £2.4m in grant funding, and are continuing to grow their headcount. Nevertheless, despite the companies highly innovative product, successful product development, employment growth, fundraising and ongoing trials, even after eight years of operation the path to sustainable commercial returns is still dependent upon adoption at scale across the NHS.



Case Study: Singfit: An International Perspective on Access to Market

Founded in Los Angeles in 2017, Musical Health Technologies (SingFit) has created a technology platform that dramatically expands the ability of people to access proven benefits of therapeutic music to improve their health. First made aware of potential UK opportunities at a US health and care conference, SingFit took up a place on the Propel programme in 2022 and is currently actively pursuing UK market entry options.

“For as much as people in the UK complain about fragmentation in the NHS, compared to the US system, at least [the NHS does] have national priorities, you know what is important to them. The NHS has clear identification of what is important and where additional funding for those things is available.”

Talking about their experience of Propel, senior SingFit representatives reiterated very positive sentiment, particularly regarding the relevance of expertise offered via the Propel Bootcamp.

“The [contributors] they chose were so well curated. For each part of the process that you needed to go through there was someone there who really knew the ins and outs of it.”

Yet it was the supportive approach of the health and care research and innovation ecosystem that made the most striking impression.

“You’re so low on resources as a start-up that having someone else do something for you is so refreshing!”

Propel@YH

Case Study: Propel@YH: Attracting International Healthtech Startups to Leeds

Propel, run by Health Innovation Yorkshire and Humber and hosted by Nexus, is a digital health accelerator that is attracting international healthtech companies to establish operations in Leeds and the surrounding region. By hosting targeted bootcamps for healthtech startups from innovation hubs in the Nordics, the USA and Canada, Propel creates a pipeline of high-potential companies entering the local ecosystem. Not all applications can be taken forward, suggesting that the programme has occupied a demonstrable niche and is meeting latent demand for the type of support that the programme provides among international healthtech start-ups.

Hands-on support provided through masterclasses, mentoring and access to co-working space have been recognised by international healthtech business owners as a major factor in their decisions to build a presence in Leeds. Propel is accelerating the growth of the healthtech cluster in Leeds and the wider West Yorkshire region, acting as a further catalyst for high-value job creation, international investment and, most importantly, the development of innovative health and medical technologies that can benefit the local health and care system, and the local population that it exists to serve. It is also, therefore, effectively positioning the region as an attractive destination for healthtech companies looking to access the UK market, boosting dynamism, competitiveness and innovation capacity within the healthtech cluster in Leeds.

“We got to meet high-level people that would have taken us a couple of years to acquire for ourselves. There’s an ecosystem welcoming new tech in the healthcare sector that is different to other places in the world – Leeds seems like an open city welcoming new technology, and we want to be a part of that.”

SmartCrowding (Norway), Propel Bootcamp Participant



Case Study: Using AI to Increase Fertility Treatment Success Rates

Leeds-based fertility treatment company Care Fertility is a world-renowned pioneering fertility group. In the 25 years since the company began it has helped thousands of people to become parents and, thanks to collaboration with local software development company BJSS and access to data science talent from the University of Leeds, the company is now using artificial intelligence to help its embryologists give would-be parents an even better chance of success. Care Fertility's unique 'Caremaps-AI' technology, developed by the company's in-house scientists and trained on almost half a billion images from 63,000 embryos, allows the company to record and analyse thousands of images of an embryo as it develops. In its latest stage of development, the technology uses machine learning to analyse embryo development from fertilisation right up to the point of transfer to the patient. Care Fertility's application of AI is just one of a series of examples of where Leeds-based companies operating within spheres of local clinical excellence are developing genuinely world-leading AI technologies. PinPoint Data Science (included in a previous case study) has brought together clinical expertise in cancer diagnostics with machine learning capability to produce an AI-driven blood test that could transform cancer diagnosis and treatment pathways. The success of these collaborations hinges on the ability to connect clinicians, academics and entrepreneurs across the health and care research and innovation ecosystem, which, as numerous business interviewees affirmed, is one of the unique strengths of the ecosystem in Leeds^{xliii}.

“They have a very good [NIHR Co-operative] in Leeds [which] knew a lot about in-vitro devices, which is what we are – [they] understood why so many devices didn't make it to market.”



Case Study: Leeds Health & Care Academy (LHCA)

The Leeds Health & Care Academy is a pioneering learning and development initiative for health and care employees. The first of its kind in the UK, LHCA creates better integration of the health and care workforce in Leeds, helping to realise the potential of its 'One Workforce' through planning, delivering and learning together. By extension, the LHCA also serves as a hub for integrating research, education, and innovation within the health and care sector in Leeds, encouraging collaboration, knowledge exchange and advancing health and care practices.

LHCA offers a diverse range of educational programmes, offering skill enhancement workshops for practitioners and specialised courses for researchers and students, equipping individuals with the knowledge and tools necessary to excel in varying roles. In 2022/23 the Academy supported 1,344 unique learners, helped 211 people into employment through their programmes and facilitated access to health and wellbeing training or support for a further 750 people^{xiv}. The number of people accessing LHCA learning and development programmes has increased by 22% between 2021/22 and 2022/23, pointing to latent demand for the Academy's learning and development offer.

The LHCA is also a vital part of the research and innovation ecosystem, supporting cutting-edge research projects and through collaborative efforts to address pressing healthcare challenges. This collaborative approach helped the Academy to secure just under £1m in external funding in 2022/23. Through its interdisciplinary research and practice-based development, the LHCA looks to pioneer breakthroughs in cross-sector workforce development and adoption of health technologies, treatment methodologies, and care delivery models, all with the aim of improving health outcomes.

LHCA is a catalyst for diversity and inclusion within the local health and care research and innovation ecosystem. For example, over the last three years, its Springboard Women's Development Programme has supported 213 women in non-managerial roles with their personal and professional development, 50% of whom were from black or minority ethnic groups.



Leeds Healthtech Cluster Company Profile

Founded in late 2020, BIOStress is at the forefront of managing workplace stress using innovative biometric data. BIOStress measure stress accurately, objectively and scientifically in real-time, helping to understand its impact on well-being and productivity. The company offers personalised stress management programs, transforming how organisations approach workplace wellness. Collaboration with leading universities enabled a world-first study among Bupa contact centre employees that yielded a 22% reduction in perceived stress and a 30-minute average improvement in sleep. 100% of those involved in the study recommended it to their colleagues.

When asked why BIOStress chose Leeds as its preferred location, co-founder Tim Wade explained that

“Leeds is a big city region, but it still has a strong community and a good healthtech scene – so you have the benefit of both scale and community. North-South connectivity is also good; it only takes a couple of hours to get to London from Leeds [and] the local universities are great [they’ve been] very pro-active when it comes to AI and data science internships.”

Appendix 4 – Wrap Around Support

The Table below provides just a snapshot of the extensive technical and professional network of support and collaboration available to health and medical technology businesses in Leeds and the wider West Yorkshire region.

Table A.3 – Assets that support Health & Medical Technology Commercialisation

Support Needs	Example
<p>Health & Medical Technology Research Expertise</p>	<ul style="list-style-type: none"> • Leeds is home to the UKRI Centre for Doctoral Training in Artificial Intelligence for Medical Diagnosis and Care, which is training 50 graduates to become innovative researchers in AI for health. • The EPSRC Medical Technologies Impact Accelerator Account at the UoL will connect businesses with world-class experts, with partnerships speeding up the route to market.
<p>Clinical Expertise, Lab Space, Access to Equipment</p>	<ul style="list-style-type: none"> • The LTHT provides clinical expertise across a range of key sites including Leeds Cancer Centre, Future Pathology, the Cardiovascular Clinical Research Facility, and the Leeds Musculoskeletal Centre. • Leeds is home to six significant NIHR co-coordinating initiatives focused on supporting clinical research and translating it into new products and service improvements. • The Innovation Pop Up has worked with 150 companies across 15 countries, creating a community of high-tech start-ups led by clinicians and entrepreneurs. • Nexus provides health and medical technology companies with crucial wet and dry lab space, and state-of-the-art equipment.
<p>Access to Patients/ Users/ Population Health Data</p>	<ul style="list-style-type: none"> • The Leeds Institute of Clinical Trials Research is improving health and care through innovative research, shaping interventions for generations to come. • The Leeds Data Model is helping to advance data capabilities for health and care and related research and innovation, improving health outcomes using big data.
<p>Professional Advice (Regulatory, Legal, Financial)</p>	<ul style="list-style-type: none"> • Leeds offers a close-knit and easily accessible network of professional advisors with specific experience and expertise in health and care research and innovation. From micro businesses with deep expertise such as Charlton Regulatory (specialist regulatory medical software advisory firm) to corporate advisors KPMG (strategic partners of the Nexus innovation hub) and Squire Patton Boggs and Brabners (specialist legal advisory).

Support Needs	Example
<p>Workspace</p>	<ul style="list-style-type: none"> • Labs and office space at Nexus. • Bruntwood SciTech’s ‘Platform’ building – located next to Leeds train station and home to 80 of the region’s most innovative and disruptive digital and technology start-ups and scale-ups. • The Innovation Pop Up and Innovation Village at LTHT provide vital space to both start-up and established health and med-tech companies. • Development of the Old Medical School into an innovation hub as part of the Investment Zone.
<p>Investor Networks (Seed)</p>	<ul style="list-style-type: none"> • Healthtech companies have benefited from a strong presence of investors in Leeds, such as Northern Gritstone and North Invest. • The top investors in health and medical technology companies in Leeds are Apache Capital Partners, BGF Growth Capital and IP Group.
<p>Access to Health Systems</p>	<ul style="list-style-type: none"> • In addition to the NIHR assets and networks referenced previously, HIYaH works with health and care providers, commissioners, academia and industry to build a pipeline of solutions for the NHS – from research and product development through to implementation and commercialisation.
<p>Domestic Market Access, Investor Networks (Venture)</p>	<ul style="list-style-type: none"> • The ecosystem in Leeds gives access to both public funding and private investment that supports innovative health technology businesses to bridge the gap between product development and commercial returns. Locally focused investors such as Northern Gritstone and NorthInvest have strong relationships with local universities and have already supported local health technology businesses like Mimetrik (dental scanners and software), BioStress (biometric data technology) and LC AuxeTec (materials development).
<p>Health & Medical Research & Evaluation Expertise</p>	<ul style="list-style-type: none"> • There are nine major NIHR initiatives across West Yorkshire, of which six are hosted in Leeds. These initiatives are all focused on delivering health and medical research and evaluation, providing access to clinical research and innovation expertise. • The Clinical Trials Research Unit at the University of Leeds.
<p>International Market Access, Export Development</p>	<ul style="list-style-type: none"> • The Internationalisation Fund, run by the Department for Business and Trade, provides funding to help businesses to grow overseas, benefiting businesses in Leeds. This fund is ongoing. • WYCA has provided advice and support to businesses, aimed at increasing understanding of the international trading environment.

Appendix 5 – Skills Benchmarking Data

The Table below provides just a snapshot of the technical and professional network of support available to health and medical technology businesses in Leeds and the wider West Yorkshire region (except Boston) are comparable to Leeds in terms of area and population size.

Table A.4 – T-Level Starts by Region (2022/23)

Region	T-level Pathways		
	All	Digital	Health
South East	823	262	123
North West	820	182	205
South West	757	218	135
Yorkshire and The Humber	548	155	98
West Midlands	377	112	46
East of England	318	70	25
East Midlands	301	71	30
London	271	103	6
North East	224	66	39

Source: Department for Education

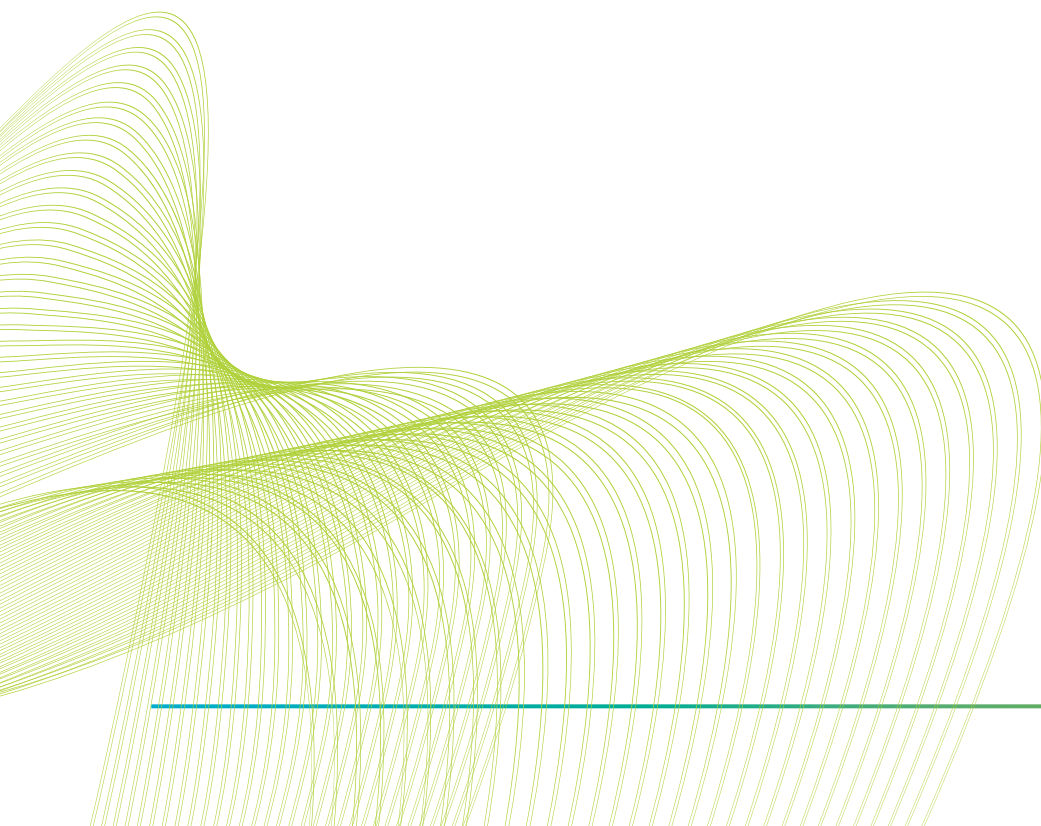


Table A.5 – Apprenticeship Starts by Region (2022/23)

Region	Health, Public Services and Care	Information and Communication Technology	Science and Mathematics	Total
South East	15030	4120	40	19190
North West	14290	3280	40	17610
Yorkshire and The Humber	12890	2150	40	15080
West Midlands	11600	2800	20	14420
South West	11600	2520	40	14160
London	8800	4820	40	13660
East of England	9980	2190	50	12220
East Midlands	8690	1790	40	10520
North East	5180	1070	10	6260

Source: Department for Education

Table A.6 – Percentage of People in STT Roles (Rank)

Location	STT (% of Clinical) Rank	STT Support Rate Rank
Leeds	1	1
Manchester	2	4
Birmingham	3	3
Bristol	4	5
Newcastle	5	2

Source: NHS Workforce Statistics, June 2023

References

- ⁱ University of Leeds, 2017 "Opportunities and Growth: Medical Technologies in the Leeds City Region", Department for Business, Energy & Industrial Strategy, 2017
- ⁱⁱ Since 2017 administrative boundaries have changed – the focus of this report is on Leeds within the context of what is now referred to as West Yorkshire.
- ⁱⁱⁱ Interview questionnaires were designed to elicit information across a series of 8 ecosystem components in line with a recognised 'ecosystem assessment canvas' first developed by ITU Innovation. Ecosystem components include; 1. Vision & Strategy, 2. Talent & Champions, 3. Infrastructure & Programmes, 4. Capital & Resources, 5. Markets & Networks, 6. Culture & Community, 7. Policy & Regulation and 8. Co-ordinating Mechanisms.
- ^{iv} NHS Workforce Data is the exception, where comparable records are available for Health Trusts in England only.
- ^v A summary of the shared goals and strategic aims set out by LHTT and the University of Leeds is available at Appendix 2.
- ^{vi} <https://www.wypartnership.co.uk/publications/west-yorkshire-integrated-care-strategy>
- ^{vii} Including but not limited to Leeds' 'Best City Ambition'; the Marmot Review; Leeds Innovation Prospectus, the Leeds Innovation Vision and Arc; the West Yorkshire Investment Strategy; the West Yorkshire Strategic Economic Framework; the West Yorkshire Innovation Framework. A separate review of strategic alignment between ecosystem activity and local / national priorities is available as a stand-alone document.
- ^{viii} <https://www.westyorks-ca.gov.uk/media/10073/healthtech-strategy-action-plan-v03.pdf>
- ^{ix} An ecosystem asset is as a non-private-sector entity (health, academic or civic organisation, research centre, institute, long-term funding initiative etc.) that contributes to health and care research and innovation.
- ^x Recent research has focused on cancer and palliative care, elderly care and frailty, mental health in primary care, earlier diagnosis of cancer and improving prescribing.
- ^{xi} https://www.leedsth.nhs.uk/assets/70e3bc7c61/Transformational-Strategy_09.pdf
- ^{xii} Note that NIHR infrastructure awards are not included in the same database as funding for individual research projects and therefore further funding for translational research infrastructure is additional.
- ^{xiii} Active Bradford Limited; Age UK Bradford and District; Airedale NHS Foundation Trust; Barnsley Hospital NHS Foundation Trust; Bradford District Care NHS Foundation Trust; Bradford Metropolitan District Council; Bradford Teaching Hospitals NHS Foundation Trust; Calderdale and Huddersfield NHS Foundation Trust; Doncaster and Bassetlaw Hospitals NHS Foundation Trust; Doncaster Council; Health Education England; Hull York Medical School; Leeds and York Partnership NHS Foundation Trust; Leeds City Council; Leeds Teaching Hospitals NHS Trust; Mid Yorkshire Hospitals NHS Trust; NHS Bradford District and Craven CCG; NHS Improvement; NHS Sheffield CCG; NIHR Devices for Dignity MedTech Co-operative (MIC); Public Health England; Rotherham Doncaster and South Humber NHS Foundation Trust; Sheffield Children's NHS Foundation Trust; Sheffield City Council; Sheffield Hallam University; Sheffield Health and Social Care NHS Foundation Trust; Sheffield Teaching Hospitals NHS Foundation Trust; South West Yorkshire Partnership NHS Foundation Trust; St Luke's Hospice; Tees, Esk and Wear Valleys NHS Foundation Trust; University of Bradford; University of Huddersfield; University of Leeds; University of Sheffield; University of York; York Teaching Hospital NHS Foundation Trust; Yorkshire & Humber Academic Health Sciences Network (YHAHSN); Yorkshire Ambulance Service NHS Trust;
- ^{xiv} Research Power = Grade Point Average (GPA) x Number of Submitting Academic FTEs. GPA = % of submissions ranked 1–4* x 1–4. Biological Science research comparators: University of Manchester (4th), universities of Bristol, Birmingham and Newcastle (ranked 10th, 16th and 17th respectively). Engineering research comparators: University of Manchester (2nd), Newcastle University (12th), University of Bristol (13th), University of Birmingham (16th).
- ^{xv} Percentage of health-related engineering UoA submissions by other universities: University of Manchester (8%), University of Bristol (11%), University of Glasgow (38%), University of Strathclyde (40%), Newcastle University (20%).
- ^{xvi} Analysis is based on AI-driven classification of REF Impact Case Studies for in-scope universities using descriptive information, and the formal Unit of Assessment under which the Impact Case Study was submitted.
- ^{xvii} Health and care related patents are defined using International Patent Classification Reform (IPCRR) Classification codes. Specifically, the Boolean search included: Classification Code: A61B* OR (IPCR Classification Code: A61C* OR (IPCR Classification Code: A61F* OR (IPCR Classification Code: A61G* OR (IPCR Classification Code: A61H* OR (IPCR Classification Code: A61J* OR (IPCR Classification Code: A61K* OR (IPCR Classification Code: A61L* OR (IPCR Classification Code: A61M* OR (IPCR Classification Code: A61N* OR (IPCR Classification Code: A61P* OR (IPCR Classification Code: G16B* OR (IPCR Classification Code: G16C* OR (IPCR Classification Code: G16H* OR (IPCR Classification Code: G16Y* OR IPCR Classification Code: G16Z*)
- ^{xviii} <https://www.health.org.uk/funding-and-partnerships/our-partnerships/the-networked-data-lab>
- ^{xix} <https://lida.leeds.ac.uk/>
- ^{xx} <https://lida.leeds.ac.uk/news/leeds-defibrillator-research-used-in-parliamentary-bill/>
- ^{xxi} <https://observatory.leeds.gov.uk/>
- ^{xxii} <https://news.leeds.gov.uk/news/councils-switched-on-digital-programme-wins-national-recognition>

- ^{xxiii} Companies that increased employment or turnover by more than 10% between 2018 and 2021 and / or that have invested in R&D or secured external grants or fundraising have been flagged as 'dynamic' companies.
- ^{xxiv} <https://committees.parliament.uk/writtenevidence/103124/html/>
- ^{xxv} Note that the fundraising value stated here reflects total fundraising and not necessarily the amounts invested by Northern Gritstone and NorthInvest.
- ^{xxvi} Timing of grants and fundraising data uses date of the companies latest fundraising.
- ^{xxvii} <https://medical-technologies.co.uk/innovation/approach-to-innovation/>
- ^{xxviii} Software and digital companies such as BJSS, Aire Logic, Answer Digital, Hippo Digital, Pinnacle Systems Management, MediSoft, X-Lab and Dedalus. Medical technology companies such as Erbe (surgical systems), Hugh Steeper (prosthetics, orthotics and assistive technology) and TobyJen (hospital water systems). Consultation with international health and care companies also painted a positive picture of access to UK markets.
- ^{xxix} Comparator regions include the North East, the North West, the West Midlands, Scotland and the South West (increases of 34%, 13%, 8%, 7% and 23% respectively). Source: <https://www.gov.uk/government/statistics/bioscience-and-health-technology-sector-statistics-2021>
- ^{xxx} Note that the figures presented in Table 4.4 below differ from those presented in Section 4.1 because they reflect web-based people data rather than officially reported employment figures.
- ^{xxxi} Search for companies that had secured equity fundraising; received a substantive innovation grant; attended an accelerator; significantly scaled their operations; featured on a high-growth list; or was spun out of an academic institution.
- ^{xxxii} Benchmarking data suggests further scope to increase the level of inward investment into Leeds vis-à-vis national comparator locations where, for example, Glasgow and Birmingham saw inward investment of c. £30m over the same period.
- ^{xxxiii} International benchmarking locations include Boston, Dublin, Zurich, Leeds, Basel, Eindhoven, Oulu, Mainz and Bergen. Locations were selected based on desk-based review of independent studies into prominent healthtech innovation cities, most of which (with the exception of Boston) are comparable to Leeds in terms of area and population size. Sub-sectors used in the search included Assistive Technology, Assisted Living, Clinical Trials, Dental, Diagnostics, Electronic Health Records, Fertility, mHealth, Medical Devices, Personal Health, Therapeutics and Wellness.
- ^{xxxiv} Analysis based on Crunchbase algorithm that tags companies operating within the 'wellness industry'. The wellness industry falls within a broader healthcare 'industry group'.
- ^{xxxv} Data only available for England.
- ^{xxxvi} Digital / Data defined by SIC codes: 62012 Business and domestic software development, 62090 Other information technology and computer service activities, 62020 Computer consultancy activities, 58290 Other software publishing, 72200 Research and experimental development on social sciences and humanities (PinPoint), 63990 Other information service activities n.e.c., 63110 Data processing, hosting and related activities, 78300 Other human resource provision (BioStress). Manufacturing companies defined by manufacturing SIC codes: 32500 Manufacture of medical and dental instruments and supplies, 32990 Other manufacturing n.e.c., 27900 Manufacture of other electrical equipment, 26600 Manufacture of irradiation, electromedical and electrotherapeutic equipment, 26511 Manufacture of electronic instruments and appliances for measuring, testing, and navigation, except industrial process control equipment, 26400 Manufacture of consumer electronics, 26120 Manufacture of loaded electronic boards, 22290 Manufacture of other plastic products, 22220 Manufacture of plastic packing goods, 13990 Manufacture of other textiles n.e.c., 13960 Manufacture of other technical and industrial textiles, 13950 Manufacture of non-wovens and articles made from non-wovens, except apparel.
- ^{xxxvii} NHS Workforce Statistics, June 2023. Comparator Trusts include those headquartered in comparator local authority areas namely: North Bristol NHS Trust, University Hospitals Bristol and Weston NHS Foundation Trust, Birmingham and Solihull Mental Health NHS Foundation Trust, Birmingham Women's and Children's NHS Foundation Trust, Royal Orthopaedic Hospital NHS Foundation Trust, Sandwell and West Birmingham Hospitals NHS Trust, University Hospitals Birmingham NHS Foundation Trust, Christie NHS Foundation Trust, Greater Manchester Mental Health NHS Foundation Trust, Manchester University NHS Foundation Trust, Northern Care Alliance NHS Foundation Trust, Cumbria, Northumberland, Tyne and Wear NHS Foundation Trust, Leeds and York Partnership NHS Foundation Trust, Leeds Community Healthcare NHS Trust, Leeds Teaching Hospitals NHS Trust, Newcastle Upon Tyne Hospitals NHS Foundation Trust, North East Ambulance Service NHS Foundation Trust
- ^{xxxviii} <https://www.england.nhs.uk/wp-content/uploads/2019/08/Paper-1-Draft-HC-Workforce-Strategy-for-England-to-2027.pdf>
- ^{xxxix} CQC (2019) Leeds Teaching Hospitals NHS Trust Evidence Appendix, accessed 31st October 2023, available at [https://www.cqc.org.uk/_dp/files/1ec948af-8486-6cc2-bbe4-8dedcb0ea1bd]
- ^{xl} <https://www.leedsth.nhs.uk/assets/Publications/9d9cac0cec/Bulletin-Summer-2023-web.pdf>
- ^{xli} <https://leedshealthandcareacademy.org/about-us/>
- ^{xlii} Generalist medical practitioners, specialist medical practitioners, technical and medical sales professionals, medical imaging and therapeutic equipment technicians, medical and pathology laboratory technicians, medical and dental prosthetic technicians, medical records and health information technicians, medical assistants and secretaries.
- ^{xliii} <https://www.carefertility.com/about-us/scientific-clinical-expertise/embryo-time-lapse-imaging>
- ^{xliv} <https://leedshealthandcareacademy.org/about-us/>

