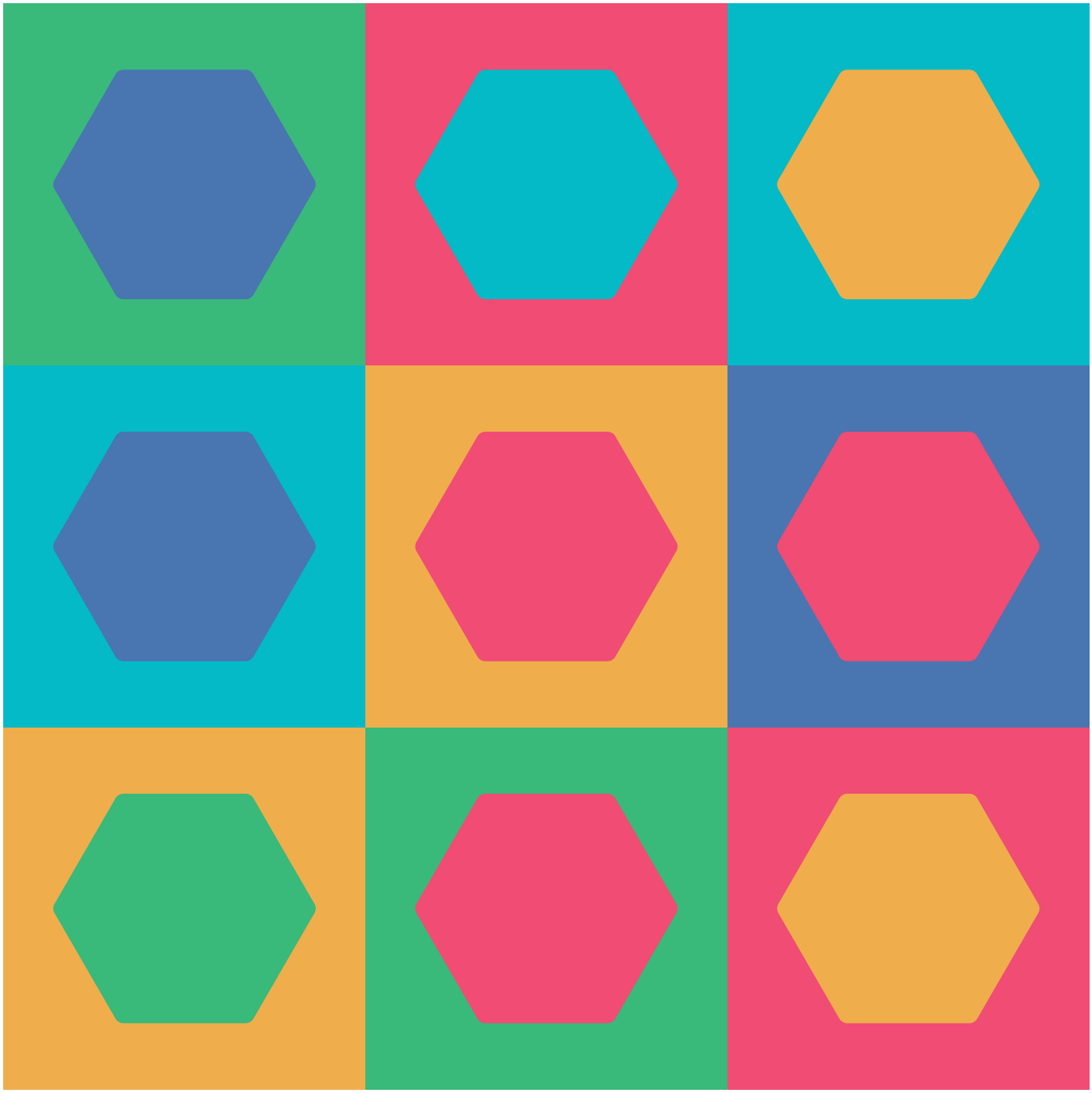
UNIVERSITY OF LEEDS

NHS
The Leeds Teaching Hospitals
NHS Trust

Shared research and innovation strategy: 2020 – 2030



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Foreword

Leeds Teaching Hospitals NHS Trust and the University of Leeds have a long history of collaboration in the pursuit of excellence for scientific research and its translation into education and healthcare practice. This ethos was enshrined in a formal research framework agreement in 2006, followed by the establishment of a Joint Partnership Board in 2009.

In 2011, the board approved a shared research and innovation strategy which endeavoured to increase research participation, capacity and capability, translate research and innovation into patient benefit, and become the partner of choice for industry. Whilst significant progress has been made towards these objectives, nearly a decade has passed and the world we live in has changed. It is time to refresh this strategy to better reflect the evolution of our organisations and the healthcare priorities of our communities, and to strengthen the recently published Leeds Teaching Hospitals NHS Trust Research and Innovation Strategy and the 2019 University of Leeds 'Medicine Redefined' strategy.

To put our approach into context, it is worth reflecting on the proud tradition of research and innovation in Leeds and the significant contributions we have made to the advancement of the biomedical sciences and healthcare. One thinks of Charles Turner Thackrah, the 'father of occupational medicine' and founder member of the Leeds School of Medicine in 1831[1]; Edith Pechey-Phipson, one of only seven women to be

registered as a doctor in the UK and a campaigner for women's rights[2]; Sir Berkeley Moynihan, who revolutionised sterile surgical practice[3]; Dame Kathleen Raven, who was instrumental in introducing Intensive Care Units to the UK[4]; and Leslie Pyrah and Frank Parsons, who established the Artificial Kidney Unit in Leeds, the first of its kind in the UK[5].

More recently one thinks of Monty Losowsky who was instrumental in the transformation of St James's University Hospital into a teaching hospital[6]; Tim de Dombal for his ground-breaking work in clinical information sciences[7]; and Anne Chamberlain, the first female Professor of Rheumatology in the UK, founder of the specialty of rehabilitation medicine and a pioneer in rehabilitation for people with conditions formerly considered untreatable[8]. There are many other examples, too numerous to mention here.

But times have changed since we first opened the doors of the Leeds General Infirmary in 1767. Against this impressive backdrop, our unique partnership between one of the UK's leading research-intensive universities[9] and one of Europe's largest teaching hospitals[10] is now planning for the future. We have developed this strategy to accelerate our efforts and generate even greater global impact by developing and embracing new technologies and starting the conversation about where and how healthcare research and innovation in Leeds can make a real difference, today and tomorrow.

The following pages outline our collective commitment to a new vision and a new future. Working together, our strong and trusted partnership will meet our healthcare challenges head on, driving the best research, developing the best workforce and making Leeds the best place to live and work.

Dr Phil Wood
Chief Medical Officer,
Leeds Teaching Hospitals NHS Trust

Prof Paul Stewart
Executive Dean, Faculty of Medicine and Health,
University of Leeds

Executive summary

This strategy sets out our vision for how Leeds Teaching Hospitals NHS Trust and the University of Leeds will work in partnership to **transform health and wellbeing locally, nationally and internationally, through inclusive and collaborative research**.

It encompasses the future healthcare needs of our people and communities, seeks out opportunities for impactful research to reduce health inequalities and contribute to inclusive growth, and commits to supporting our well-trained, representative workforce to deliver high-quality care in a rapidly changing world. It also outlines how we will use our collective strength to narrow the gap in health research investment between the north and south of England[11].

Although the healthcare challenges we face are both substantial and exacerbated by increasingly limited resources, this strategy details how our organisations, in partnership with our communities, will address them in the coming decade. We will respond with agility and leverage technological advancements to develop innovative solutions that deliver equitable and sustainable, value-based healthcare.

But we cannot achieve this without the involvement and support of those around us. This strategy reflects our belief that research should be inclusive, collaborative and open to all; with those doing research reflective of the diversity of our population. To deliver our vision, we have made five commitments, each of which is underpinned by three strategic aims.

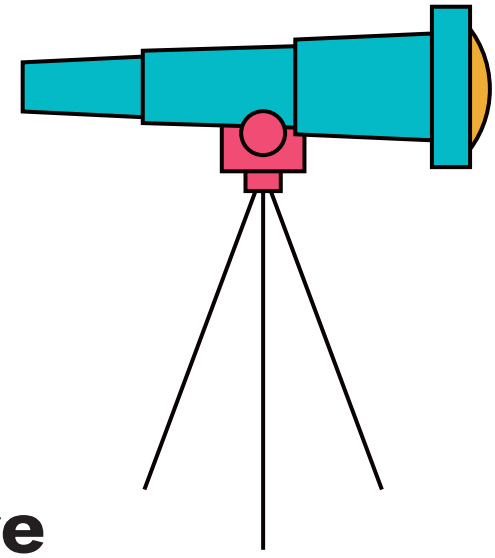
We will:

- **Champion research that closes the gap on health inequalities** by adopting a value-based healthcare approach, investing in impactful research which brings about transformative change, and securing research investment to support both local and national priorities.
- **Embed research into our local communities** by supporting greater opportunities for public involvement, pushing the boundaries of research, and forging closer links with voluntary and community organisations.
- **Support outstanding care through impactful research** by establishing shared functions and governance, embedding research excellence into routine clinical practice, and gaining recognition as an internationally leading research partnership.
- **Drive sustainable innovation for inclusive growth** by supporting our local healthtech economy, leveraging healthcare investment for our city, and growing opportunities and support for staff entrepreneurship.
- **Equip our people with the research skills for tomorrow** by building research capacity and capability across our organisations, providing integrated NHS-academic learning opportunities, and ensuring all our people can engage with research.

By meeting these commitments, our organisations will together ensure that the communities we serve have access to, and benefit from, the very latest research. Our staff will be equipped, enabled and supported to contribute to our research and position us as a leading international centre of healthcare innovation.

> "I chose to work at Leeds after visiting several other centres in the UK. If you have a big idea, Leeds is the right place to make it happen: a large teaching hospital with a very high level of subspecialisation, aligned to a big university doing high quality research across a wide variety of areas, and an atmosphere of willingness to co-operate. Very few places combine all those opportunities."
>
> **Darren Treanor, Consultant Pathologist and Honorary Clinical Associate Professor, Leeds Teaching Hospitals NHS Trust and University of Leeds**

Our partnership



The future of healthcare
The decade ahead

This is a challenging but exciting time to be involved in healthcare research and innovation. The coalescence of our growing and ageing populations, socio-economic and geographical inequalities, and the impact of the coronavirus pandemic mean that we must come together to find innovative solutions to some of our most complex problems.

Over the next 25 years the number of people living in Leeds is predicted to grow by over 15 per cent, with population growth anticipated to be fastest in the areas which experience the most disadvantage[12]. By 2030, more than 150,000 people aged over 65 will be living in the city[13]. However, differences in mortality rates in Yorkshire and the Humber mean that our under-75s are also more likely to suffer from preventable diseases such as heart disease and cancer, when compared with the national average[14].

These challenges are set against a background of increasingly limited resources, so we need a different way of thinking. To make real change, we must move away from a disease orientated approach to a more value-based philosophy that achieves equitable, sustainable, and transparent healthcare with better outcomes and experiences for everyone[15]. This means co-developing tailored solutions in a person-centred system that helps people to stay well, but treats them quickly when they become unwell.

Across the next decade, health and care will continue its evolution away from diagnosing and curing illness towards establishing and maintaining good health, preventing and predicting disease and intervening earlier. As we move from thinking about single diseases to addressing complex, multi-morbidity conditions, the role of multi-disciplinary and multi-professional teams from across health and care will become increasingly important.

And of course, technological and clinical developments will continue to drive improvements to health and care. Advances in robotics and automation, regenerative medicine, nanotechnology, genomics, advanced data analytics, artificial intelligence and immersive technologies will all play an increasing role. But it will be the convergence of these technologies, superimposed on a digital infrastructure, that will achieve the biggest gains, allowing us to better understand the uniqueness of each individual and deliver more efficient and tailored health and care.

Such technological developments mean that the skills of our workforce will also need to evolve. Within 20 years, 90 per cent of all jobs in the NHS are likely to require some digital skills[16]. Our clinical staff will need enhanced digital and genomics literacy and be able to effectively navigate the data-rich healthcare environment. This means investing in our workforce as well as technology.

Our methods of training will need to incorporate more flexibility, enabling staff to move beyond traditional role boundaries to become clinical scientists, educators, innovators or managers, with opportunities to move between roles throughout their careers. Our future education programmes must incorporate computing, engineering, molecular biology, data literacy, leadership and entrepreneurship, team building and communication, to produce multi-lingual 'healthcare technologists' capable of communicating across a diverse professional spectrum.

Crucially, we must not forget people in the midst of technological advancement. The active involvement of our population and communities is essential to ensure that research and innovation truly addresses their needs: just because we are able to do something, does not mean it is the right thing for us to do. This includes consideration of our most vulnerable and marginalised groups, and the diversity that exists across our city. We must form lasting partnerships with those who live in our city and beyond, so they can help us build a future healthcare system that recognises equally their physical, psychological, social and economic wellbeing.

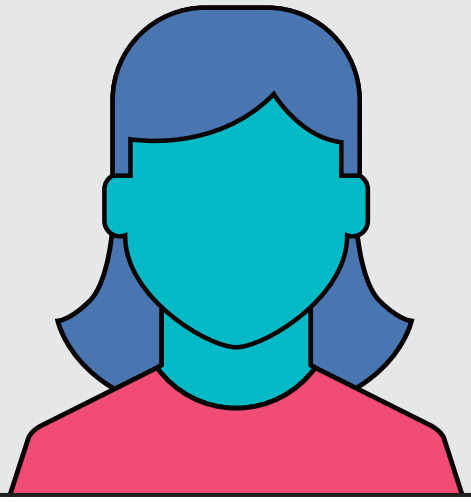
A future scenario
Alesha's story

Alesha, 28, lives with her partner Alex and their young daughter. She works part time at a local school and keeps fit and active. She has been suffering from abdominal pain and diarrhoea and books a video consultation with her GP. She is advised to go to Leeds Teaching Hospitals NHS Trust and as she walks into the A&E department, a ceiling-mounted CT scanner diagnoses small bowel Crohn's disease. She is admitted to the John Goligher Colorectal Unit and her immune profile is compared to similar patients held on the Leeds Care Record. She is advised that the best option is surgery.

To minimise scarring, Alesha chooses tele-robotic surgery. This is performed by a robotics surgical team, assisted by a bioengineer and computer scientist. Fluorescent biomarkers help to visualise the diseased bowel and CT images, overlaid onto the operative field, help to guide surgical resection. With her permission, the operation is relayed globally to a virtual audience of students and healthcare professionals. Her resected bowel is digitally stored in the Northern Pathology Imaging Cooperative to help future research.

Thanks to modern enhanced recovery practices, Alesha is discharged the following day, equipped with a wearable monitor to alert clinicians to possible complications. Within a short time, she is back at work and able to care for her daughter. Alesha remains well for the next 20 years. Her Crohn's disease is monitored by an implanted biosensor and kept in remission by a tailored regimen of nanomedicines.

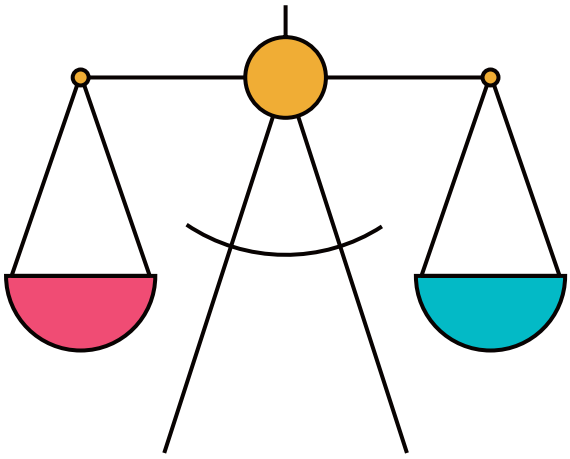
Aged 48, Alesha starts to experience pains in her joints. She is referred to the Leeds Musculoskeletal Clinic where advanced functional imaging diagnoses inflammatory polyarthropathy. Genomic analysis shows that she is suitable for the latest stem cell therapy. She is intrigued by this new treatment and works with the research team to design a clinical trial to determine the patient benefits and cost effectiveness of treatment. Stem cells are injected into her affected joints to quickly suppress inflammation, enabling her to resume her normal activities, and importantly, start planning for her daughter's forthcoming wedding.



Our vision

Working together, we have the ability to make a real difference, not just to our local communities, but to health and wellbeing across the globe. Our two institutions play a fundamental role in making our city the best place to live and work, but to do so effectively we must be representative of, driven by, and work for all of our communities.

Our vision is to **transform health and wellbeing through inclusive and collaborative world-class research**. To deliver this vision, we have made five joint commitments which will close the gap on health inequalities and equip our workforce and wider population with the opportunity, skills and knowledge to meet the challenges of today and tomorrow head on.



Commitment one

Champion research that closes the gap on health inequalities

It is essential that we accelerate our efforts and work together, both across organisations and with our communities

Inequalities in health and wealth mean that not everyone in our city has the same opportunity to live a healthy life. These inequalities exist both across Leeds and between our city and the rest of the country[17], creating considerable healthcare challenges which will be further exacerbated by the ongoing and long-term effects of the coronavirus pandemic[18].

Across Leeds, there is a ten-year difference in life expectancy between the north and south of the city[19]. Compared with the national average, life expectancy across the region is lower for both men and women, absence from work due to sickness is greater, and mortality rates are uniformly higher[14]. Levels of obesity and diabetes are rising[20] and so too is dementia; now the leading cause of death in the UK[21]. Improvements in mortality from cardiovascular and chronic respiratory disease are also slowing down[22] and the proportion of people living with disability is expected to climb to 2.8 million by 2025[23]. One in 17 people will suffer from a rare disease in their lifetime, with most having a genetic basis[51]. In short, whilst more people are going to be living longer, it's predicted that they will be doing so in poorer health.

Much of this is due to wider socio-economic inequalities. In Leeds, almost 20 per cent of children were estimated to live in poverty in 2015[24]. Of those aged over 16 in the city, nearly 18,000 people are unemployed but seeking work[25] and a further 24,000 are unable to work due to long-term sickness. Nearly a quarter of Leeds neighbourhoods are ranked among the most deprived 10 per cent nationally[26].

A lot has already been done to identify and prioritise healthcare research in our region. The NIHR Yorkshire and Humber Applied Research Collaboration is working to address healthy childhood, mental health and multimorbidity, older people and urgent care, but much more needs to be done. It is essential that we accelerate our efforts and work together, both across organisations and with our communities, to put in place solutions to our most pressing healthcare challenges.

Although the challenges facing us are immense and exacerbated by the large discrepancy in health research investment between the north and south of England[11], the opportunities to drive improvements through research and innovation are plentiful. Importantly, we are well placed to benefit from national priorities to invest in research capability and capacity where there is the greatest need. To influence regional investment opportunities, we need to be organised and agile, and more vocal in articulating our collective research strengths and the healthcare needs of our population.

Case Study:
The Yorkshire Lung Screening Trial

The £7million trial funded by Yorkshire Cancer Research investigates whether screening CT scans for those most at risk will reduce the incidence of incurable lung cancer by detecting the disease at an earlier stage. People living in deprived parts of the UK are twice as likely to die of lung cancer than those from more affluent areas. The screening scans are provided in mobile units in supermarkets and shopping centres to make them easily accessible. Of the 5,000 people recruited to date, over 100 were found to have a screen-detected cancer, and most at a potentially curable stage. Smokers are also offered help to quit, with over 1,000 completing a smoking cessation course. The five-year trial combines project management and data analysis by the University with clinical delivery through the Trust.

Leeds resident John, 71, visited a mobile unit at Costco, a five-minute drive from his home in Hunslet, after being invited by his GP. A former smoker, John worked in the printing industry until retirement and has Chronic Obstructive Pulmonary Disease (COPD). He was found to have an early-stage lung cancer which was successfully removed and remains all clear.

> "I just think how lucky I am. It could have been a very different story if it had been found two years down the line."
>
> **John, Leeds**

Strategic aims

Working together, we are already impacting on the lives of thousands of people in Leeds and beyond, but more needs to be done to address the unfair variance in health outcomes caused by systemic social and economic differences. To close the gap on health inequalities and bring about more equitable, sustainable and responsive healthcare for all, our organisations commit to work together to:

1. **Adopt a value-based healthcare approach**

   We will prioritise research and innovation that achieves the best health outcomes and experiences for every person. We will support multi-disciplinary and collaborative research which addresses the needs of our people.

2. **Support research which brings about transformative change and invest in research that has impact**

   We will support research which has the greatest ability to address both the causes and effects of health inequalities. We will invest in high-quality research, forge closer links with other UK and international universities to strengthen our global competitiveness and work across disciplines to find the best ways to deliver equitable care.

3. **Secure research investment that supports local and national priorities**

   We will more effectively communicate our joint research strengths, and the opportunities our communities offer for high quality research, to improve health and care locally and nationally. We will create processes across our organisations that enable us to respond cohesively and quickly to investment opportunities as they arise.

Case study:
Gender inequalities after heart attack

A national study led by Leeds researchers has identified that women are dying unnecessarily due to unequal care following a heart attack. The study, led by Professor of Cardiovascular Medicine and Honorary Consultant Cardiologist, Chris Gale, estimated that over 8,200 women in England and Wales could have survived their heart attack had they been given the same quality of treatment as men.

The research team used anonymised data from the national heart attack registry to analyse the treatment and outcomes of 691,290 people who were hospitalised for heart attack between 2003 and 2013. They found that women were less likely to receive the guideline recommended treatments such as coronary angiogram, reperfusion, statins or betablockers, resulting in women having a higher death rate within 30 days of a heart attack.

Commitment two

Embed research into our local communities

By collaborating with charity and third sector organisations, our research can provide the best outcomes for all people and make the best use of our resources

To have real impact, healthcare research should be responsive, informed by health priorities and sensitive to the challenges and needs of our people; but unfortunately, inequalities in health and wealth can be reinforced and reproduced in research[27]. In particular, marginalised communities who are disadvantaged, underserved and experience significantly poorer health and care outcomes, are the most likely to be excluded from research.

Groups such as migrants, homeless people, drug users, sex workers and those with rare diseases[28] are all vulnerable to exclusion, and evidence shows that Black, Asian and Minority Ethnic (BAME) people are consistently under-represented in medical research[29,30]. By not engaging these groups and individuals during the research process, scientific and clinical advances in healthcare become disproportionally distributed[31].

Whilst social, health and economic inequalities all fuel this disparity, so too do factors such as differences in digital access and capability. Of the 780,000 people who live in our city, approximately 90,000 adults are offline or lack basic digital skills[32], which impacts on their ability to engage with healthcare resources and research and puts them

at a disadvantage in living healthy lives[33]. In an increasingly digital world, these groups become even more hidden and left behind[34].

Our vibrant third sector, composed of over 1,500 registered charities in Leeds[35], provides a vital link between researchers and communities. By collaborating with charity and third sector organisations, our research can provide the best outcomes for all people and make the best use of our resources[36]. Through the Leeds Social Sciences Institute, we have the ability to build cross-faculty research that maximises impact, promotes knowledge exchange and ensures the best in public and policy engagement.

Whilst we are already excellent at involving people in our research – Leeds Teaching Hospitals NHS Trust recruited nearly 21,000 research participants across 453 studies in 2018/2019 alone[37] – we must do more to form active partnerships with our communities.

By encouraging and supporting wider and more diverse participation from marginalised and excluded groups, we will be better able to do research that reflects genuine needs and aspirations and ultimately provide better services and better care.

Case study: **The Leeds Vaccine Hub**

COVID-19 vaccine research trials will begin in late 2020. The Leeds Vaccine Hub, which includes Harrogate and York and is led by Leeds Teaching Hospitals NHS Trust, is looking to recruit thousands of volunteers to take part. Public opinion about COVID-19 vaccine research has been mixed, which could result in incomplete data on the vaccine's effectiveness across all communities.

A team from the NIHR Leeds Biomedical Research Centre and NIHR Leeds Clinical Research Facility – both collaborations between Leeds Teaching Hospitals and the University of Leeds – has been working with a number of community organisations from across the city including BAME, refugee and disability groups, running focus groups to understand their concerns around vaccine research. Communication about the trials and the plans for delivery have been developed and adapted as a result. Ongoing outreach is also planned to help to ensure that members of the public have the correct information to make an informed decision about their participation, supporting recruitment that is as fully representative of the city and region as possible.

Strategic aims

We need to bridge the gap between research endeavour and community need, embedding research into the very communities we wish to impact so that our work can better represent our people and be informed by their needs and priorities. We commit to work together to:

1. **Expand, formalise and support greater opportunities for public involvement**

   We will establish and grow a patient and public involvement community that supports and mobilises people from across our region. We will provide diverse opportunities for participation, involvement and engagement at all levels throughout the research process.

2. **Push the boundaries of research by taking it into the community**

   We will promote engagement in research by showcasing and sharing our research opportunities and outcomes through innovative, community-focused methods and improved used of communications channels.

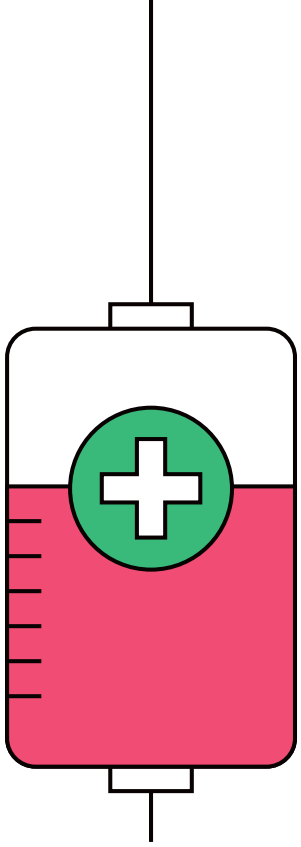
3. **Forge closer links with voluntary and community organisations**

   We will establish cross-sector partnerships with our local voluntary and community organisations to co-produce research, exchange knowledge, and open the door to research for people who would otherwise be excluded.

Case study:
St Gemma's Academic Unit of Palliative Care

The Academic Unit of Palliative Care (AUPC) is a partnership between the Leeds-based charity St Gemma's Hospice and the University, which carries out research and trains health professionals from across the city. Since it was set up in 2012, the AUPC has secured £12.5m research income.

The Unit's evidence-based care group bridges the gap between the latest research findings and clinical practice in palliative and end of life care. The group reviews clinical guidelines to ensure they are in line with the evidence and puts in place clinical outcome measures to support the clinical teams in delivering evidence-based care. Research within the AUPC has contributed to changes worldwide on how cancer-related pain is managed. Through the AUPC, in 2017 St Gemma's became the first and only UK hospice to have University teaching status.



Commitment three

Support outstanding care through impactful research

We are helping new treatments and diagnostics reach patients faster than ever before

Together, the University of Leeds and Leeds Teaching Hospitals NHS Trust benefit from first-class infrastructure, the latest technology and a wealth of expertise that enables them to take healthcare research from idea to implementation. From the discovery of data-driven drugs in the Astbury Centre, to research focused on engineering and physical sciences at the Bragg Centre for Materials Research and Henry Royce Institute, Leeds has a proud history of research excellence in the basic and discovery sciences.

The close proximity of our two organisations provides us with a geographical advantage. Our scientists developing novel treatments and innovations can easily interact with our clinicians working at the frontline of patient care, with unparalleled access to research material in one of the busiest UK hospitals.

We are strong in translational research across our organisations, including in cardiometabolic medicine, cancer, and musculoskeletal disease, underpinned by methodological expertise in genomics and informatics. We are international leaders in clinical trials research, epidemiology, and pathology. Our expertise in patient focused

research into common clinical problems gives us a strategic advantage in finding solutions to complex healthcare problems. This includes internationally leading research into ageing, frailty, and stroke; and the Electronic Frailty Index (eFI), developed in Leeds, is used routinely in GP practices to identify and tailor treatments for those at risk of frailty[38].

We are leading the research agenda in many areas of national importance, such as anti-microbial resistance, and influencing policy at home and abroad. We are also supporting care through the incorporation of digital research into routine practice. The Northern Pathology Imaging Cooperative provides a unique digital pathology resource linking to regional hospitals and the Leeds Care Record. It provides access to 4.3 million patient records across primary, secondary, and social care. The Leeds Institute for Data Analytics also provides expertise in data analysis, alongside computer science and artificial intelligence applied to medicine.

With a National Institute for Health Research (NIHR) Biomedical Research Centre, two NIHR Medtech and In Vitro Diagnostics Co-operatives, three rare disease European Reference Networks, as well as a new £3.5million Clinical Research Facility undertaking early phase clinical trials and a Centre for Personalised Medicine and Health, we are helping new treatments and diagnostics reach patients faster than ever before. The new £3million Leeds Teaching Hospitals Research and Innovation Centre also supports clinical trials delivery with staff training opportunities through the Leeds NIHR Academy.

Case Study:
Oral and gut microbiome in at-risk individuals: new insights for the prevention of rheumatoid arthritis

Collaborative research in Leeds between rheumatology, dentistry and microbiology has revealed increased levels of gum disease and an altered microbiome in the oral cavity and gut in individuals at risk of rheumatoid arthritis. These changes are present before joint disease develops, suggesting that bacteria and inflammation in the mouth and gut have a role in triggering the autoimmune processes that lead to rheumatoid arthritis

Leeds is leading the way in developing new strategies for the prevention of rheumatoid arthritis. Professor Paul Emery and Dr Kulveer Mankia are co-convening a European League against Rheumatism (EULAR) expert taskforce on conducting clinical trials in at-risk individuals. The first trial investigating periodontal intervention for rheumatoid arthritis prevention in at-risk individuals is now being planned.

> "Really interesting... I love the idea of not initially giving drugs and addressing other risk factors"
>
> **PPI group member**

Strategic aims

With such a wealth of infrastructure and expertise, it is essential we work together to ensure that research can make a positive difference at the frontline of healthcare, as fast and as widely as possible. By working closely across and between organisations, pooling our talents and resources and simplifying ways of working, we can grow our capabilities and accelerate innovation from discovery to implementation, adoption and spread. We commit to:

1. **Establish shared functions and governance to drive convergent research**

   We will create simplified, shared infrastructure to better integrate our joint research and innovation, create opportunities for collaboration and the cross-pollination of ideas, promote interdisciplinary, challenge-led research, and drive international collaboration.

2. **Embed research excellence into routine clinical practice**

   We will identify and prioritise the areas where our research can have the most impact on the health and wellbeing of patients locally and beyond, and ensure that everyone can be enrolled in research studies and benefit from the latest diagnostics and treatments.

3. **Gain recognition as an internationally leading research partnership**

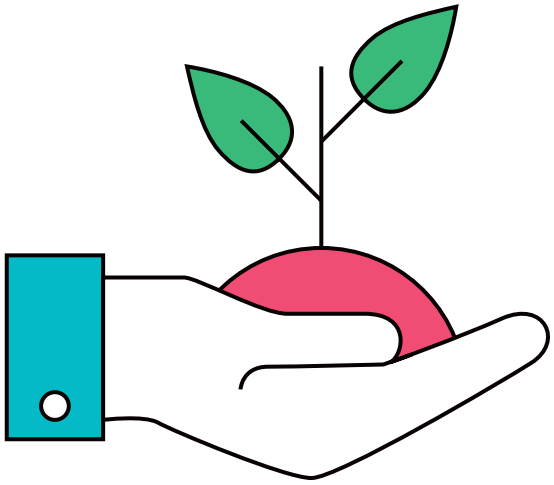
   We will translate our research into clinical practice, integrate our discoveries into all local health and care settings, including mental health and primary care, and showcase our achievements in producing world-class research and innovation to address and prevent health inequalities and deliver excellent clinical care.

Case study:
Using scans to better detect signs of significant coronary heart disease

Leeds research has shown that a cardiac magnetic resonance scan (CMR) is a more reliable and cost-effective way of detecting signs of significant coronary heart disease than the commonly used non-invasive imaging test (SPECT).

The trial was led by Professor of Cardiology and Consultant Cardiologist John Greenwood and involved 750 UK patients.

It also confirmed that CMR was better at ruling out those who did not have the condition and identifying which patients would go on to have future heart complications. A follow-on trial using CMR to investigate patients with suspected cardiac chest pain resulted in fewer unnecessary invasive angiogram procedures. The trials have resulted in CMR being recommended in 2019 European Society of Cardiology guidelines for the diagnosis and management of chronic coronary syndromes.



Commitment four

Drive sustainable innovation for inclusive growth

It is essential that growth is inclusive to ensure the benefits are fairly distributed and experienced

Health, wellbeing and wealth are inextricably linked. Where investment in health and care improves the economic output of a region, so too does economic investment improve the health of populations[39]. By playing an active role in growing our city's economy we can begin to address some of the causes of health inequalities, but it is essential that growth is inclusive to ensure the benefits are fairly distributed and experienced.

As anchor institutions – that is, large organisations that have a significant stake in the city – both the University of Leeds and Leeds Teaching Hospitals NHS Trust are integral to supporting the health of our communities[14]. We do this through research and development, working with industry, buying goods and services, and through our employment of over 21,500 staff.

We also sit at the centre of a vibrant economic landscape. Our city is part of the largest city region outside of London, forms the main economic hub for Yorkshire and is at the centre of the Northern Powerhouse[40]. With over three million residents, the Leeds City Region has an economic output of £65 billion per year and over 121,000

businesses are based here[40]. We are home to 250 health technology (healthtech) companies[41], with 22 per cent of all digital health jobs in the UK based in the region[14], as well as the headquarters of NHS Digital.

Recent investments in healthtech infrastructure – including NEXUS, a £40m innovation hub based at the University of Leeds, the Centre for Responsive Healthtech Innovation, and a Healthtech Innovation Hub – will make Leeds a connected, innovation-driven ecosystem and a preferred destination for entrepreneurs, innovators and industry. Our £650m Hospital of the Future opens up further opportunities as the first UK 'digital hospital by design'.

This is reinforced by our strong, cross-sector partnerships. Through the Leeds Academic Health Partnership we have close, collaborative relationships spanning NHS, academia and the Yorkshire and Humber Academic Health Science Network, underpinned by the innovative methodologies developed through our participation in the MIT Regional Entrepreneurship Acceleration Program.

There is also close collaboration with West Yorkshire and Harrogate Health and Care Partnership, the Leeds City Region Local Enterprise Partnership, Medilink North of England, and the Association of British Healthtech Industries. Further, our organisations are working closely with the Northern Health Sciences Alliance as part of the Northern Powerhouse to lobby government for additional funding under the 'levelling up' agenda.

Case study:
NEXUS: supporting academic-industry collaboration

Research and innovation at the University of Leeds focuses on some of the most pressing challenges facing healthcare. Through Nexus, businesses are able to partner with the University to enable scientific discoveries to be translated into real-life healthcare solutions quickly and effectively.

The University and Nexus are leading collaborations in a well-developed health innovation ecosystem, central to which is the partnership with Leeds Teaching Hospitals NHS Trust. Nexus provides businesses with access to facilities, a vibrant talent pool, equipment, and specialist clinical, scientific and technical expertise to develop ground-breaking healthcare innovations. Nexus also helps businesses to leverage value from its networks across the health innovation ecosystem including various NIHR supporting infrastructures and strategic partnerships, such as the National Measurement Laboratory.

Through close partnerships and collaboration between the University, Leeds Teaching Hospitals NHS Trust and industry, Nexus ensures new technologies can be brought to market quickly to deliver better diagnosis and targeted treatments, helping people to live longer, healthier, more independent lives.

Strategic aims

Despite our city-based and regional strengths, we can do more to level up Leeds, attract greater regional investment and support the growth of local, sustainable healthtech businesses. Working together, we can harness the strengths of our organisations, assets and population to position Leeds at the forefront of the Northern Powerhouse. It is time to transition from strategy to delivery, to demonstrate the value of our partnership and establish it as a major force linking health and wellbeing to economic growth. We commit to:

1. **Support the local healthtech economy**

   We will drive regional investment by working with businesses and innovators to embed healthtech innovation into the NHS. We will prioritise investment in sustainable and green initiatives and those that contribute to addressing health inequalities.

2. **Use our position as anchor institutions to leverage investment for the city**

   We will use our shared organisational and regional strengths to work with local, regional and national partners to lobby and represent our city effectively, so that we can close the gap on investment between the north and south of England.

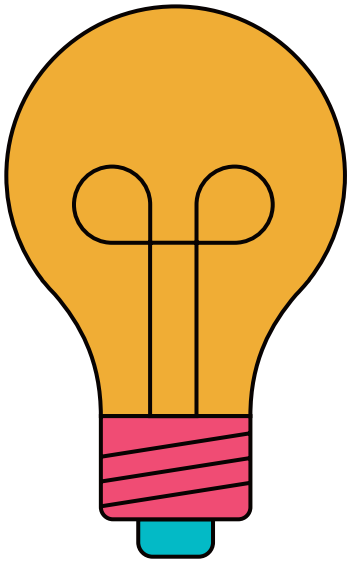
3. **Grow opportunities and support for staff entrepreneurship**

   We will create a clear pathway and support mechanisms for all staff across the two organisations who have an idea or innovation that can improve care.

Case study:
Hospitals of the Future and the Innovation District

Plans to transform two of Leeds Teaching Hospital NHS Trust's seven hospitals – Leeds General Infirmary (LGI) and Leeds Children's Hospital – are central to a new innovation district in the city. The ambitious £650m hospital project will see the LGI site completely redesigned and the Children's Hospital extensively redeveloped. The aim is to enable outstanding care tailored to the needs of patients to be delivered in the most innovative surroundings.

The hospitals will act as a cornerstone to the innovation district, a partnership between the Trust, the University, Leeds Beckett University and the City Council to redevelop the northern area of the city centre. The organisations will build on their strong relationships by forging closer links through physical spaces and buildings, making it easier to work together. This will draw businesses and investment to the area and create jobs and wealth for the city.



Commitment five

Equip our people with the research skills for tomorrow

We need to support all staff at all levels to undertake and be involved in research, and equip them with the knowledge and skills to prepare them for the research needs of tomorrow

The University of Leeds has a proud history of providing world-class, research-led education with more than 1,200 medical, nursing, dental and allied health professional undergraduates completing their degrees every year.

Our teaching excellence has been recognised by achieving a Gold rating in the Teaching Excellence Framework – the highest award possible[42] – and we have also made significant investments into biomedical research training, contributing £50million for 200 University Academic Fellows over five years and £30million for new cross-faculty leadership chairs. Postgraduate research opportunities include the new UKRI Centre for Doctoral Training (CDT) in Artificial Intelligence, the EPSRC CDT in Soft Matter for Formulation and Industrial Innovation and British Heart Foundation four-year cardiovascular PhD programmes.

Together with Leeds Teaching Hospitals NHS Trust, we are ranked in the top five across England for NIHR funded posts. The Leeds NIHR Integrated Clinical Academic programme provides junior clinical academics protected time for research, with opportunities for further development including NIHR Fellowship Awards, Cancer Research UK

Clinical Trials Fellowships and the Medical Research Council Clinical Academic Research Partnerships. We also helped to secure funding from the Wellcome Trust to establish the 4Ward North Clinical PhD Academy to raise the quality of clinical academic research training in northern England.

The University of Leeds and Leeds Teaching Hospitals NHS Trust are also founding partners of the Leeds Health and Care Academy, a project of the Leeds Academic Health Partnership, which creates a single, joined up approach for innovative learning and development for all 57,000 health and care staff in Leeds – learning and working together as one citywide team.

Central to our approach is equality. The University of Leeds is the only UK medical school to hold an Athena SWAN Equality Charter Gold Award for our significant and sustained progression and achievement in promoting gender equality[43]. For graduates who move on to work at Leeds Teaching Hospitals NHS Trust, they are supported by the values of 'The Leeds Way' which empowers them to develop to their full potential[44].

However, there is still a vast underrepresentation of women and BAME people in research careers. Of the nearly 20,000 PhD studentships awarded by UK Research and Innovation between 2016 and 2019, only 1.2 per cent were awarded to Black or Black Mixed students[45] and although women are equally represented in medicine, they are consistently under-represented in academic medicine[46].

The ability of all staff nationally to engage with research is also in decline[47]. The number of academics working at the interface between academia and the NHS represents only 4.2 per cent of NHS medical consultants, 0.4 per cent of general practitioners, and less than 0.1 per cent of nurses, midwives and allied health professionals[48]. We need to support all staff at all levels to undertake and be involved in research, and equip them with the knowledge and skills to prepare them for the research needs of tomorrow.

Case study: **Medicine+ Enterprise**

In 2018, a new programme was launched to introduce all medical students to the concept of enterprise. Five medical students were appointed to the new MSc Enterprise and Entrepreneurship programme in partnership with Leeds University Business School.

One of the students, Edward Mbanasor, says: "This exciting programme has provided an incredible opportunity to pursue a key passion of mine. I've received valuable expert mentoring and opportunities which have helped me gain the confidence to launch a business to promote student health and wellbeing."

Working closely with the Yorkshire Deanery, the medical school and Leeds Teaching Hospitals NHS Trust are developing an innovation and enterprise Academic Foundation programme that will allow clinical trainees to develop smarter and more creative solutions to increase productivity and improve patient outcomes.

Strategic aims

Technological and social developments will change the way we work and improve the care we provide to patients. We need to ensure our workforce is equipped with the necessary skills to use these advances for maximum benefit. We know that research-active hospitals deliver better care and so to support making research an 'always event'[49], we commit to:

1. **Build research capacity and capability across academia and the NHS**

   We will create more opportunities for staff at all career stages and in all professions to develop the skills to engage in research. Research opportunities will be made more visible and staff supported to secure research funding and develop academic careers.

2. **Provide integrated NHS-academic learning opportunities**

   We will build a culture and infrastructure that promotes cross-institutional and inter-disciplinary learning. We will incorporate the latest advances in research methodology, technology and entrepreneurship to ensure our staff are well trained and fully supported to deliver tomorrow's healthcare research.

3. **Ensure all our people can engage with research**

   Through enhanced support, mentoring and opportunities, we will ensure that anyone who wants to engage in research can do so. We will ensure that our researchers reflect the diversity of our population.

Case study:
Training the Allied Health Professionals of tomorrow

Leeds is leading the way in supporting research pathways for Allied Health Professionals (AHPs). The University and Trust are the first in the UK to include nurses, midwives and AHPs in their agreement to honour terms and conditions for clinical academics. A 2017 Medical Research Council report found that Leeds has the third highest number of fellowships in the UK, after London and Manchester, for AHPs, nurses, midwives, dentists, and other healthcare professionals. The organisations host four AHP NIHR Senior Investigators and 21 Integrated Academic Fellowships – including the largest number at Clinical Lecturer level of any Higher Education Institution.

Laurie Cave, Specialist Children's Cystic Fibrosis Dietician, is now a Health Education England/NIHR Clinical Doctoral Research Fellow. She says: "This NIHR Fellowship really is the complete package. I'm developing my research skills and experience, clinical and professional skills, alongside continuing clinical practice."

Acknowledgements

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This document was produced in collaboration with Campus PR, a specialist agency providing expert communications and public relations services to higher education and research organisations.

Useful links

4Ward North Clinical PhD Academy
https://www.4wardnorth.org.uk

Advance HE Athena SWAN Charter
https://www.ecu.ac.uk/equality-charters/athena-swan

Association of British Healthtech Industries
https://www.abhi.org.uk

Astbury Centre
http://www.astbury.leeds.ac.uk

Bragg Centre for Materials Research
https://www.leeds.ac.uk/info/130565/bragg_centre_for_materials_research

Henry Royce Institute
https://www.royce.ac.uk

Leeds Academic Health Partnership
https://www.leedsacademichealthpartnership.org

Leeds Cares
https://leeds-cares.org

Leeds City Region Local Enterprise Partnership
www.the-lep.com

Leeds Health and Care Academy
https://leedshealthandcareacademy.org/

Leeds In Vitro Diagnostics MIC
https://www.leedsmic.nihr.ac.uk

Leeds Institute for Data Analytics
https://lida.leeds.ac.uk

Leeds MIC in Surgical Technologies
https://surgicalmic.nihr.ac.uk

Leeds NIHR Biomedical Research Centre
https://leedsbrc.nihr.ac.uk

Leeds NIHR Clinical Research Facility
http://leedscrf.nihr.ac.uk

Leeds Teaching Hospitals NHS Trust Research Academy
https://www.leedsth.nhs.uk/research/research-academy

Leeds Teaching Hospitals NHS Trust
https://www.leedsth.nhs.uk

Leeds Teaching Hospitals NHS Trust: research training opportunities
www.leedsth.nhs.uk/research

Medilink North of England
http://www.medilink.co.uk

MIT Regional Entrepreneurship Acceleration Program (MIT REAP)
https://reap.mit.edu/cohort/leeds-city-united-kingdom

NEXUS Leeds
https://nexusleeds.co.uk

NIHR Yorkshire and Humber Applied Research Collaboration
https://www.arc-yh.nihr.ac.uk/home

Northern Health Sciences Alliance
https://www.thenhsa.co.uk

Northern Pathology Imaging Cooperative
https://www.virtualpathology.leeds.ac.uk/npic

Northern Powerhouse
https://northernpowerhouse.gov.uk

St Gemma's Hospice Academic Unit of Palliative Care
www.st-gemma.co.uk/AcademicUnit

Third Sector Leeds
https://doinggoodleeds.org.uk/third-sector-leeds

UK Government Life Sciences Industrial Strategy
https://www.gov.uk/government/publications/life-sciences-industrial-strategy

UKRI Centre for Doctoral Training in Artificial Intelligence for Medical Diagnosis and Care
https://ai-medical.leeds.ac.uk

University of Leeds
www.leeds.ac.uk

University of Leeds: Academic Unit for Ageing and Stroke Research
www.medicinehealth.leeds.ac.uk

University of Leeds: Centre for Computational Imaging and Simulation Technologies in Biomedicine
http://www.cistib.org

University of Leeds: Clinical Trials Research Unit
https://ctru.leeds.ac.uk

University of Leeds: Leeds Institute of Cardiovascular and Metabolic Medicine
https://medicinehealth.leeds.ac.uk

University of Leeds: Leeds Social Sciences Institute
https://lssi.leeds.ac.uk

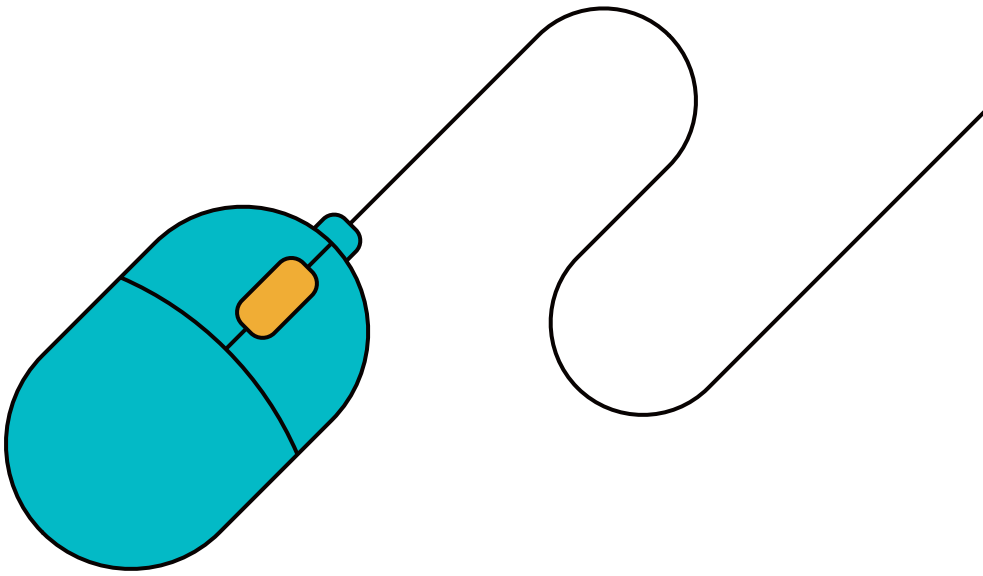
University of Leeds: Faculty of Medicine and Health
https://medicinehealth.leeds.ac.uk/medicine

West Yorkshire and Harrogate Health and Care Partnership
https://www.wyhpartnership.co.uk/about

Wolfson Centre for Applied Health Research
https://wolfsoncahr.uk

Yorkshire and Humber Academic Health Science Network
https://www.yhahsn.org.uk

Yorkshire Cancer Research
https://yorkshirecancerresearch.org.uk



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