



**The contribution of medical research  
funding by charities to the Northern  
Ireland economy**  
Fraser of Allander Institute



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## The Fraser of Allander Institute

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### **Disclaimer**

The analysis in this report has been conducted by the Fraser of Allander Institute (FAI) at the University of Strathclyde. The FAI is a leading academic research centre focused on the Scottish economy.

The report was commissioned in June 2021 by the British Heart Foundation.

The analysis was undertaken independently by the FAI. The FAI is committed to informing and encouraging public debate through the provision of the highest quality analytical advice and analysis. We are therefore happy to respond to requests for technical advice and analysis. Any technical errors or omissions are those of the FAI.

We are also thankful to the Association of Medical Charities (AMRC) and the UK Clinical Research Collaboration (UKCRC) for their help with this work.

# Executive Summary

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- Third sector medical research plays an important role both in the Northern Ireland economy and society.
- Medical research makes huge contributions to society through developing new treatments, improving existing ones and advancing technologies that can help save lives such as vaccinations that can help fight against infectious diseases such as Covid-19.
- Charities are major funders of medical research in Northern Ireland. Medical research funding by charities has been estimated to be 35% of all third sector and public funding of medical research, with active research funding of £9m in 2018.
- Without charity funding, the public sector would therefore need to increase their direct funding<sup>1</sup> of health-related research in Northern Ireland by an estimated 51% to cover the shortfall.
- Furthermore, whilst the primary aims of medical research funding by charities are the benefits provided to health, the funding also makes a significant contribution to Northern Ireland's economy:
  - Recipients of research funding purchase goods and services in order to undertake their research. This generates activity in their supply chains and across the whole of Northern Ireland's economy.
  - R&D can boost output and productivity in an economy with new technologies, medicines and processes.
  - As new methods and technologies are discovered, there are knowledge spill-overs into the public, private and third sectors which boost productivity and economic growth.
- This report examines the first of these contributions and estimates the economic impact of medical research funding by charities on Northern Ireland's economy in terms of jobs, output and Gross Value Added (GVA). This includes the direct impact of research on universities and medical organisations, as well as spill-over impacts on supply chains, job creation and wages.
- Our results estimate that, in 2019, medical research funding by charities supported 500 jobs, £39m in output and £26m in GVA in Northern Ireland.
- The pandemic had an impact on medical research funding by charities, placing jobs in research and the wider economy at risk. In 2020, the fall in medical research funding by charities put 50 jobs, and £3m output and £2m GVA at risk in Northern Ireland.
- We also estimate multipliers for medical research funding by charities and compare these to 62 other sectors of Northern Ireland's economy. Every £1 million spent on medical research funding in Northern Ireland by charities supports:
  - £2.44 million of output – 4th highest multiplier out of 63 sectors.
  - £1.63 million of GVA – 2nd highest multiplier out of 63 sectors.
  - 31 jobs – 7th highest multiplier out of 63 sectors.

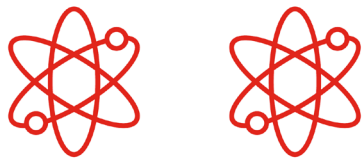
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<sup>1</sup> Direct funding as a small amount of charity funding is originally sourced from the public sector itself.

# NORTHERN IRELAND THIRD SECTOR MEDICAL RESEARCH

**£39m**

Total output supported in the Northern Ireland economy by third sector medical research expenditure



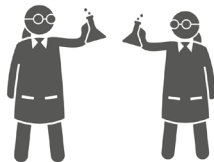
Third sector medical research supported a total of **500 FTE jobs** across the Northern Ireland economy in 2019



Charity medical research spend has the **4th highest** output multiplier out of 63 sectors in Northern Ireland



Medical research spend by charities in Northern Ireland was **£16m** in 2019



Charity medical research spend has the **7th highest** employment multiplier out of 63 sectors in Northern Ireland



Charity medical research spend has the **2nd highest** GVA multiplier out of 63 sectors in Northern Ireland



In 2018, health-related research accounted for **25%** of all UK research and development, or **£8.64 billion**



Third sector medical research supported **£26m** of GVA across the Northern Ireland economy in 2019



<sup>1</sup>Source: UKCRC

# 1. Introduction

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Medical research by charities is an important component of the Northern Ireland economy. In addition to the obvious socio-economic benefits of medical research such as improved health outcomes and better health technologies, medical research also contributes positively to the Northern Ireland economy.

The Covid-19 pandemic has also accelerated the role that R&D has to play in the Northern Ireland economy. Science and innovation have played a crucial role in attempts to curtail the virus and provide treatment which have allowed the loosening of restrictions and the re-opening of the economy.

The recent Northern Ireland Economic Recovery Plan<sup>1</sup> placed the life and health sciences sector, which employs over 8,500 people in Northern Ireland, at the forefront of the economic recovery. There is currently a focus on driving collaboration between researchers, industry, charities, health and government in the sector.

This report assesses the economic contribution and wider spill-over effects of medical research expenditure by charities to the Northern Ireland economy.

The analysis focuses only on the economic impact of research expenditure undertaken in Northern Ireland. It does not account for capital expenditure, non-medical research and research undertaken in other countries.

We also refer to 2019 figures throughout this report due to the unprecedented effects of the Covid-19 pandemic on third sector medical research. This provides a more accurate representation of the economic contribution of medical research activities in Northern Ireland.

This report is divided into the following sections:

- Section 1 provides an overview of medical research by charities in Northern Ireland;
- Section 2 evaluates some of the socio-economic benefits provided by R&D, and in particular, health R&D in Northern Ireland;
- Section 3 evaluates the economic contribution of third sector medical research expenditure in Northern Ireland in terms of economic output, Gross Value Added (GVA) and employment.

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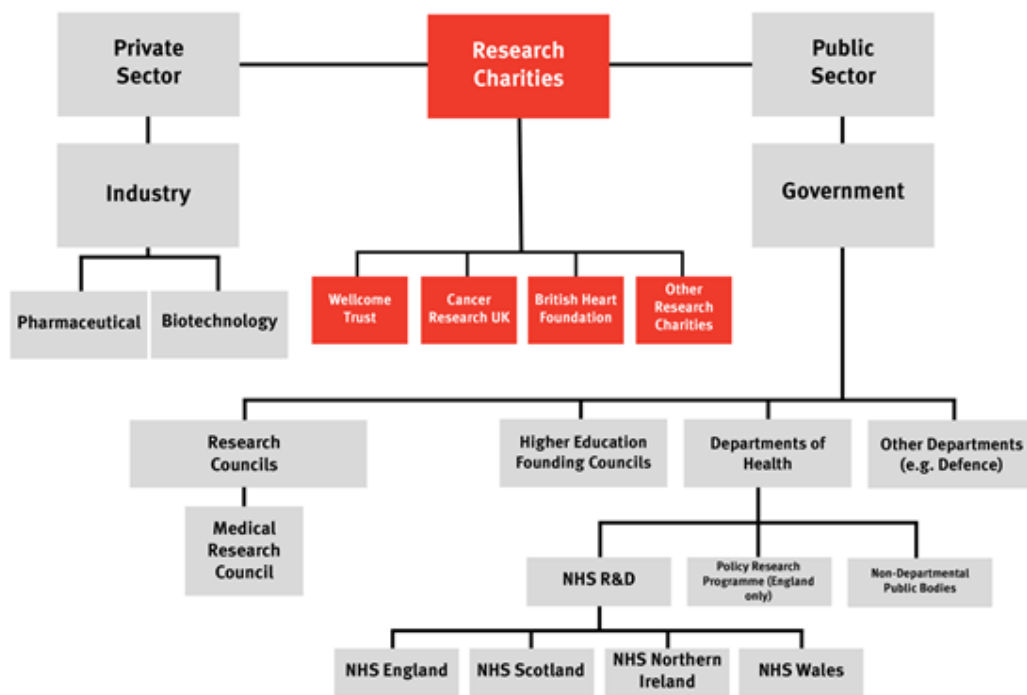
<sup>1</sup> See [NI Economic Recovery Plan](#)

# 2. Medical Research in Northern Ireland

## Who undertakes medical research in Northern Ireland?

Medical research and health research and development is an important part of the Northern Ireland economy. One reason for this is that the system benefits heavily from both the health and social care system and the many medical research charities operating and funding research in Northern Ireland.

**Diagram 1:** Health R&D system in the UK



Source: [UK Government](#)

Funding in medical research and health R&D is distributed through three main channels (Figure 1):

- Private sector;
- Public sector;
- Research charities.

Private sector medical research primarily includes firms in the human health and pharmaceutical sectors in the UK. According to analysis by the UK Clinical Research Collaboration<sup>2</sup>, the private sector is the largest performer of health-related research, undertaking half of all research.

This is followed by universities who undertake over a third of all research (36%).

<sup>2</sup> See [UKCRC](#)

However, these figures do not fully demonstrate the source of funding for research in the UK. While data is typically collected on who is undertaking the research, less is known about the size of the contribution from these different groups to health-related research funding.

## Who funds medical research in Northern Ireland and the UK?

The UK's Governments are not major undertakers of research but provide a significant amount of funding to those performing the research. This is funded primarily through taxation and includes funding by the Northern Ireland Executive, through the Health & Social Care (H&SC) R&D division and the Department of Education. It is also funded by the UK Government, through UK Research and Innovation and the National Institute for Health Research (NIHR).

Similarly, medical research charities provide significant funding for health-related research. A 2018 survey by the UK Clinical Research Collaboration (UKCRC) <sup>3</sup> has attempted to inform this discussion by speaking to 13 member organisations, 25 UK Government and other publicly funded organisations, 12 professional organisations, 87 medical research charities that are members of AMRC and 9 non-AMRC charities.

The survey found that in the UK in 2018:

- UK Research and Innovation funded £986 million of UK health research (39%);
- Other government and public bodies funded £460 million of UK health research (18%);
- Charities and not-for-profit organisations funded £1,115 million of UK health research (44%).

Although the response rate for member organisations was 100%, it's important to note that the response rates for UK Government and other publicly funded organisations, professional organisations, AMRC medical research charities and non-AMRC charities were only 63%, 39%, 62% and 16% respectively.

The UKCRC data does not cover all charity research funding. The survey finds that all charities and not-for-profits funded £1,115m of health-related research in 2018, of which AMRC charities made up £1,018m.

However, a small number of AMRC charities did not provide data in the UKCRC survey – their grants are estimated at £42m<sup>4</sup>. In addition, the UKCRC survey does not include a large amount of Cancer Research UK funding for 2018. Difficulties in comparing data provided by financial year and by calendar year make it difficult to precisely estimate this, but time-based estimates of grant funding by Cancer Research UK<sup>5</sup> suggest that the UKCRC figure may underestimate their funding by approximately £65m - £81m.

In total, we therefore estimate that total research funding by charities was £1,222m in 2018, or 46% of all public and third sector medical research funding. This is on a time-apportioned basis where funding is allocated to years based on active research time<sup>6</sup>.

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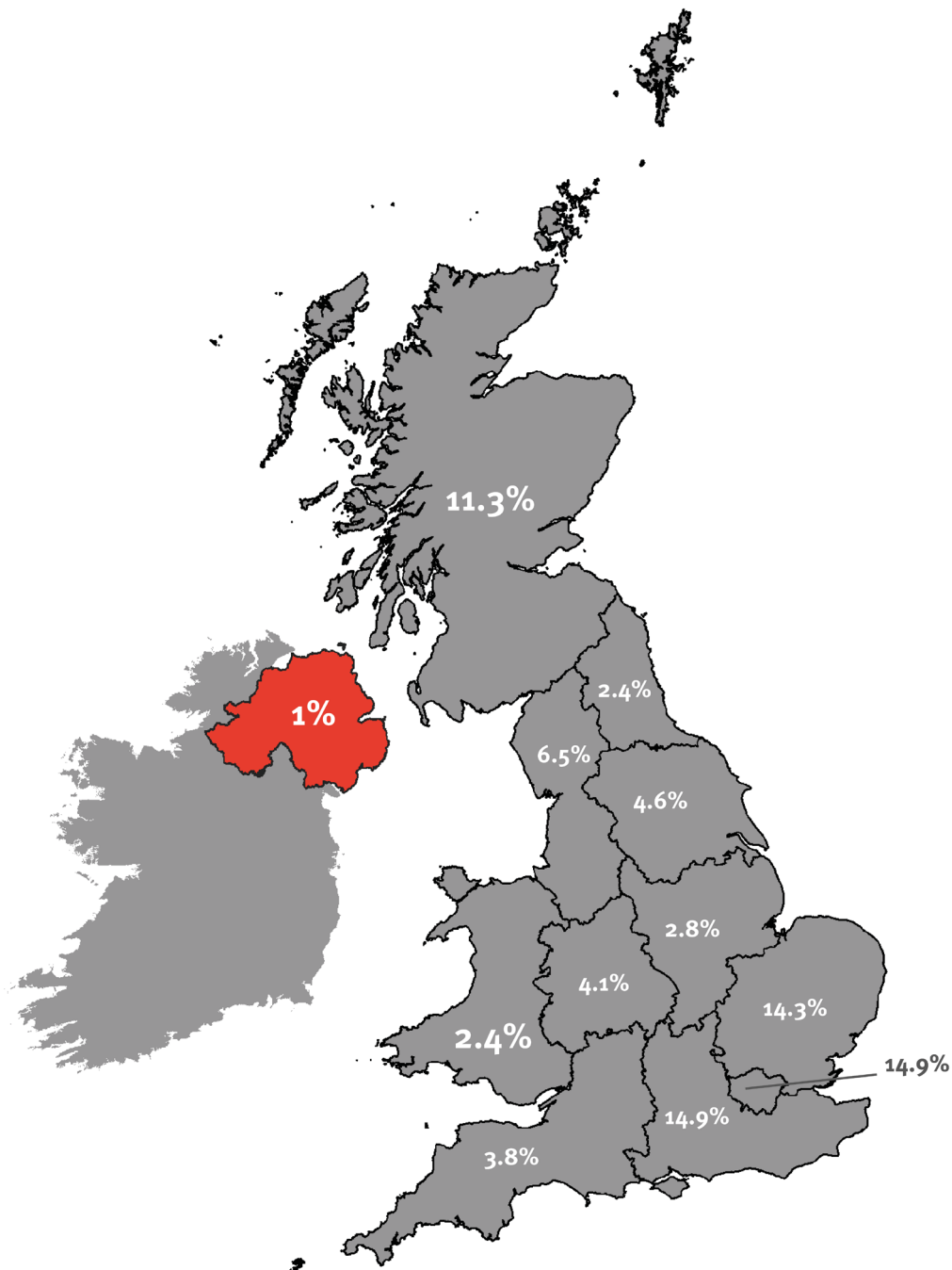
<sup>3</sup> See [UKCRC](#)

<sup>4</sup> These figures are sourced from the publicly available AMRC dashboard.

<sup>5</sup> [Analysis of Grant Costs and Time-Appportioned Spend by Host Institution](#), Cancer Research UK

<sup>6</sup> This is different to the transaction based estimates used in the modelling which allocates funding to years based on financial transactions. AMRC transaction based estimates for 2018 financial years stood at £1,303m.

**Diagram 2:** Public and charity health related R&D by devolved nation and parts of the UK, 2018



Source: UKCRC



Using the UKCRC dataset, we find that the third sector supports £9 million of medical research expenditure in Northern Ireland and the public sector supports £17 million.

Without charity funding, the public sector would therefore need to increase their direct funding<sup>7</sup> of health-related research in Northern Ireland by an estimated 51% to cover the shortfall.

### **Growth of medical research funding by charities over time in Northern Ireland**

Charity-funded medical research plays a crucial role in the research environment. Due to the unique purpose of charities and their strong relationships with patients and insights into patient priorities, the research they fund is inherently patient-centric.

The research funded by charities is also crucial to building the wider research base through developing the skills of the workforce, investing in infrastructure and funding high-risk, high-reward research that de-risks discovery for industry. This investment helps to leverage investment from industry.

Charities are therefore key to the foundation of the research environment that allows for the creation of economic benefit.

Medical research expenditure<sup>8</sup> has increased since 2014, with an estimated £15 million in funding by AMRC charities in Northern Ireland in 2019, (Chart 1).

In 2020, Northern Ireland experienced a drop in medical research expenditure by charities. Reported expenditure in Northern Ireland in 2020 was around £1.1 million lower than in 2019 – a fall of around 8%. This can be attributed to the pandemic, with in-person charity retail operations having to close and household finances at risk.

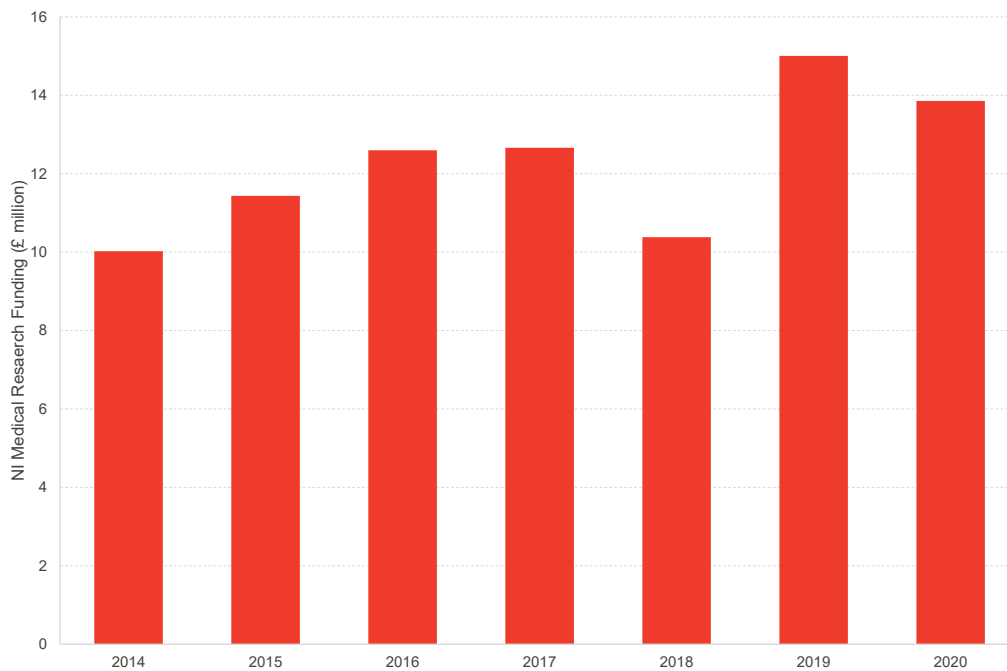
2018 was a comparatively weak year for charity funding of medical research in Northern Ireland with a fall of around £2.3 million from 2017. This was due to lower funding of UK research by Wellcome.

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<sup>7</sup> Direct funding as a small amount of charity funding is originally sourced from the public sector itself.

<sup>8</sup> This is expenditure by 154 member charities of the Association of Medical Research Charities.

**Chart 1:** Total AMRC medical research expenditure in Northern Ireland, £ million, annualised value, 2014 – 2020



Source: UKCRC, AMRC, FAI Calculations

### *The Covid-19 pandemic impact on charity-funded medical research*

The ongoing Covid-19 pandemic has significantly affected medical research in Northern Ireland and the UK.

A survey by The Charity Commission for Northern Ireland<sup>9</sup> found that 98% of their responding members felt the pandemic had negatively affected their operations, with 45% reporting that they had stopped services and activities. Across the UK, funding from AMRC charities, excluding Wellcome, fell from £917 million in 2019 to £776 million in 2020, a drop of 15%. This trend is expected to continue with a survey of member charities estimating that funding will fall to £653 million during 2021.

As well as this, the AMRC<sup>10</sup> highlights the potential long-term implications of the pandemic on medical researchers. They estimate that in 2020 there were 1,750 early career medical researchers or PhD students, of which two thirds relied solely on medical research funding to support their salaries.

The cuts in charitable funding during the pandemic meant around 60% of charities had to reduce or cancel support for early career and skilled researchers.

The direct consequences of these cuts are evident, with 40% of early career researchers admitting to having considered leaving medical research, and 82% of researchers feeling less secure in the profession.

<sup>9</sup> See [NICVA](#)

<sup>10</sup> See [AMRC](#)

The resulting uncertainty in the sector, caused by the pandemic, means that not only might the sector lose good talent but could also lead to long-term shortages in highly skilled medical researchers. Additionally, in May 2020, the AMRC forecasted that the sector may not return to pre-pandemic levels for 4-5 years, leading to potential implications for the further advancement of medical treatments in the UK and Northern Ireland.

### **Which charities fund medical research?**

In Northern Ireland, there are currently more than 7,000 charities operating for a wide variety of causes across society<sup>11</sup>.

A study by the Charities Aid Foundation in the UK<sup>12</sup> found that in 2018, 64% of people had donated to a charity with the most donated to causes related to animal welfare and young people (26%); and a quarter of respondents reported having donated to medical charities.

Data provided by the Association of Medical Research Charities, a membership organisation with more than 150 registered charity members, shows that some of the largest members in Northern Ireland by funding are:

- The Wellcome Trust
- Leukaemia & Lymphoma NI
- Prostate Cancer UK
- Macular Society

The member charities of the AMRC distribute medical research funding across Northern Ireland via several organisations and institutions. The largest type of recipient is universities, which received 99% of the total value of research grants in 2019, with the remaining 1% going to hospitals and other recipients.

### **The role of universities in Northern Ireland**

Universities not only have commitments to provide high quality education, but also conduct a significant amount of research. In particular, medical schools and other relevant bodies within universities have core aims to provide ground-breaking research and technologies.

Northern Ireland has a strong reputation for its medical schools, which helps to create a large base of potential clinical researchers. In recent years, examples of charity-funded medical research conducted by universities in Northern Ireland and funded by charities include:

- The Northern Ireland Clinical Research Facility. A joint venture between Queen's University, Ulster University, Public Health Agency and the Belfast Health and Social Care Trust. The facility, funded by the Wellcome Trust and Wolfson Foundation aims to provide world class clinical research in Northern Ireland.
- A number of research projects taking place at Queen's University, funded by The British Heart Foundation. The projects are researching abnormal heart rhythms known as atrial fibrillation; developing treatments for people who have suffered from heart attacks; and researching preventative measures for heart disease.

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<sup>11</sup> See [Thomson Reuters](#)

<sup>12</sup> See [Charities Aid Foundation](#)

- The creation of the Northern Ireland Network Centre between Queen's University and Ulster University. The centre, funded by Alzheimer's Research UK, aims to better connect researchers between the two biggest universities in Northern Ireland in order to enhance the quality of research.

## Life Sciences in Northern Ireland

Northern Ireland also has a strong health and life sciences sector. Our research in 2020<sup>13</sup> suggested that the health and life sciences sector in Northern Ireland was an integral part of the economy, with employment in both component sectors, pharmaceuticals and medicines, increasing by 6% between 2015 and 2020. As well as this, employment in the wider life sciences sector increased 12% over the same period.

The work of home-grown life sciences businesses such as Almac have supported a strong sector which was estimated to generate £1.1 billion in GVA (an estimate of economic growth).

Northern Ireland is also a popular destination for biomedical firms, with research into areas such as cancer, cardiovascular disease and cystic fibrosis.

A sign of the growth of this sector is also seen in the recent establishment of Health Innovation Research Alliance Northern Ireland (HIRANI), an organisation established to act as the voice of the life sciences sector in Northern Ireland and strengthen the capabilities of the sector. HIRANI is supported by the Department of Health and the Department for the Economy.

HIRANI aim to increase commercial and innovative research in the UK by removing the barriers between research and translation into treatments for patients to unlock NI's life sciences potential further.

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<sup>13</sup> See [Fraser of Allander Institute](#)

This is not the only example of where the public sector is working to promote life sciences research. Other examples include:

- The identification of the Health and Life Sciences sector as a key sector within the economic recovery plan to aid Northern Ireland in recovering from the effects of the Covid-19 pandemic.
- The development of The Institute for Research Excellence in Advanced Clinical Healthcare (i-REACH) is an exciting new project for healthcare in Northern Ireland that will be funded through the Belfast Region City Deal.

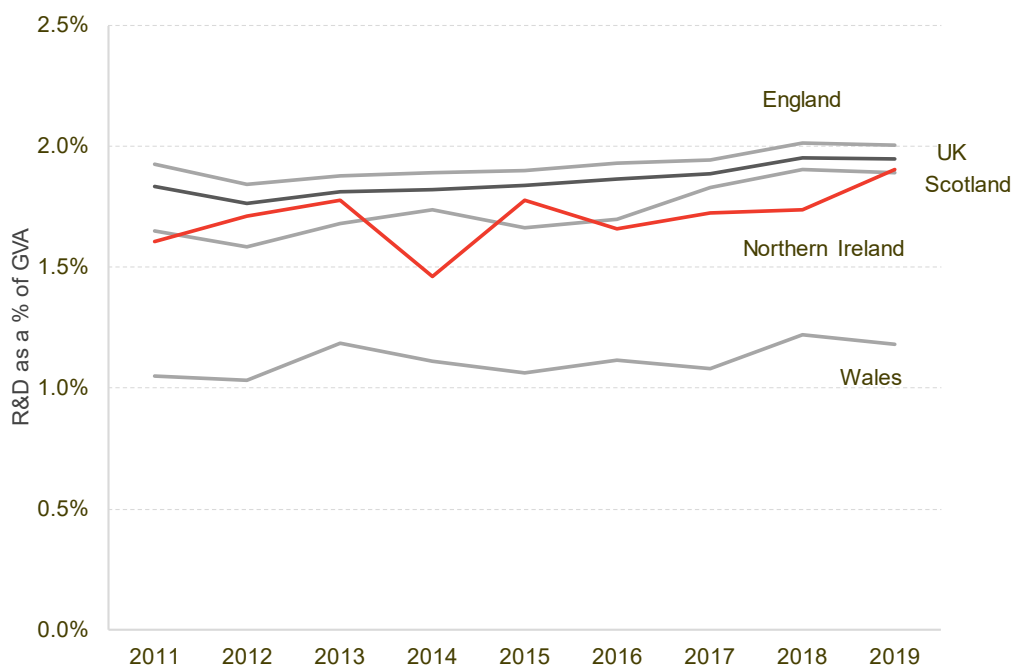
## The benefits of medical research and development

### How much R&D does Northern Ireland perform?

In 2019, total expenditure on R&D in Northern Ireland was £881 million, or 1.9% of GVA, Chart 2.

Of the three devolved nations, Northern Ireland experienced the highest growth in R&D between 2018 and 2019 as a proportion of GVA, bringing the nations R&D spend in line with the UK average.

**Chart 2:** R&D as a percentage of GVA<sup>14</sup>



Source: ONS

### The benefits of health R&D

R&D has the ability to boost output and productivity in an economy. As technology advances, we can produce more with the same amount of resources and so productivity improves. And as new methods and technologies are discovered, there are knowledge spill-overs onto the public, private and third sectors. Productivity is a key long-term driver of economic and wage growth.

<sup>14</sup> Note that we have used GVA rather than GDP to calculate this chart. This has allowed for a full time series back to 2011, although the numbers are higher than those seen using GDP as the denominator.

There are many socio-economic benefits resulting from increased R&D, particularly in the case of health-related research. R&D has the ability to improve lives through improved health care; develop skills through new processes and ideas; and improve overall quality of life with advancements in medical technologies and treatments.

Northern Ireland's strong commitment to Health and Life Sciences highlights the role that research and development has to play in the economy of Northern Ireland, however health related R&D also has its own specific benefits to the economy and society.

Health research and development has been a huge contributor to improvements in health outcomes and technologies.

In general, health research can diagnose diseases and health problems; help to discover new drugs and treatments; and as previously mentioned, create vaccinations against contagious viruses, like Covid-19.

Clinical research is also crucial in providing the best standard of care to patients and there is a need to develop better, kinder treatments and to improve patient care and this relies on scientific progress.

Medical research not only helps to improve overall health outcomes for society but can improve quality of life for individuals.

Some examples of successful medical related R&D projects funded by charities in Northern Ireland include:

- The Experimental Cancer Medicine Centre (ECMC) operated by Cancer Research UK aims to bring lab scientists and cancer doctors from universities and health and social care trusts to improve communication between labs and clinics.
- The Northern Ireland Network Centre, in partnership with Alzheimer's Research UK, is a facility aimed at increasing collaboration between Queen's University and Ulster University to increase the quality and amount of research into Alzheimer's produced in Northern Ireland.

Whilst these are only a few examples of ongoing and successful medical research projects funded by charities in Northern Ireland, medical research ranges across all health conditions, from the rarest diseases to the most common illnesses.

As well as benefiting society, charity-funded medical research has wider benefits to the medical research environment as a whole.

For example, research by Burrige et. al (2016)<sup>15</sup> found that increases in government and third sector funded research can increase private sector funding. They find that increasing expenditure in the public sector and third sector by 1% creates nearly the same increase in private sector expenditure within a year.

However, whilst the primary intention of medical research is to improve our health, medical research spending by charities also provides a significant contribution to the economy.

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<sup>15</sup> See [Burrige et. Al \(2016\)](#)

# 3. Modelling the contribution of medical research expenditure

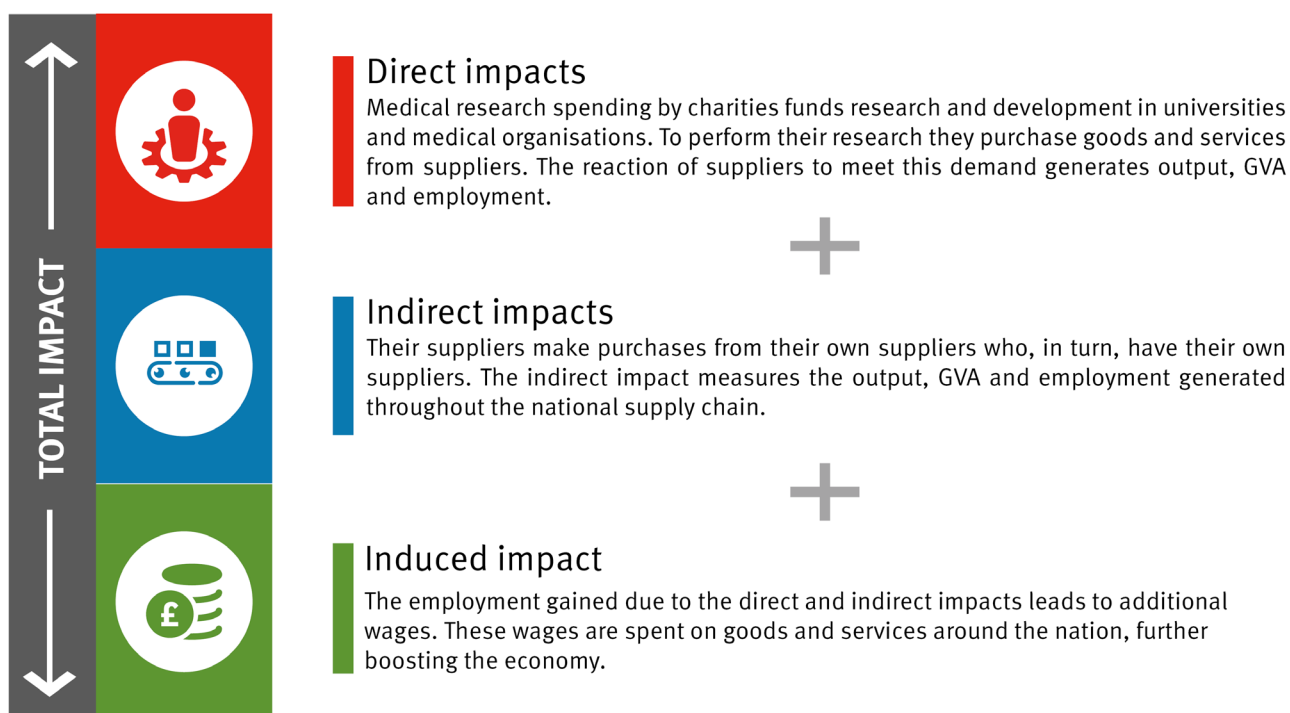
Improving treatments and outcomes for the people of Northern Ireland is the priority for medical research. However, medical research expenditure funded by charities also makes a substantial contribution to the economy, supporting economic growth and jobs across the whole of Northern Ireland.

In this section, we use our detailed model of Northern Ireland’s economy to estimate the economic impact of medical research expenditure funded by charities. We focus on the impacts of spending on supply chains and wages in Northern Ireland. Notably, our estimates do not include the significant beneficial impacts of:

- Improved levels of health in Northern Ireland which help unlock the potential of the workforce, reduce health service costs and improve quality of life.
- The impact of positive knowledge and innovation spill-overs of medical research on knowledge within the private, public and third sectors, which drives economic growth over the long term.
- The value of drugs, patents and technologies that are created as a result of the research.

## Interpreting our results

The results highlight the direct, indirect and induced impacts of medical research expenditure in Northern Ireland. The diagram below explains each of these impacts.



Our estimates are presented using output, GVA and FTE jobs.

- Output is the value of all goods and services produced.
- Gross value added (GVA) is a measure of the contribution to an economy and is similar to GDP (gross domestic product). Put simply, it is the output minus the cost of goods and services used in production.
- Full-time Equivalent (FTE) Jobs is a measure of jobs that accounts for the spread of part-time and full-time work across sectors of the economy. One FTE is equal to one job working full-time hours, or two part-time jobs.

## Total Impact

In 2019, medical research funding by charities supported around £39 million output, £26 million GVA and 500 employment in Northern Ireland.

Of these jobs, 275 jobs are supported directly in the universities, research and development organisations and medical organisations receiving funding, while a further 225 jobs are supported across Northern Ireland as a result of spill-over effects.

The pandemic has had a large impact on funding. Medical research funding in Northern Ireland provided by charities fell from £16.1 million in 2019 to £14.8 million in 2020. As a result, output, GVA and jobs that were supported by medical research funding by charities were placed at risk.

As a result of this fall in funding, as many as 50 jobs across all sectors of Northern Ireland's economy were at risk of being lost. The true impact on job losses is likely smaller than this figure due to significant government interventions such as the Job Retention Scheme.

Table 1 to Table 3 highlight the direct, indirect (supply chain spill-overs) and induced (wage spending spill-overs) impact of medical research expenditure by charities in Northern Ireland.

**Table 1:** Economic impact of medical research funding by charities on Northern Ireland's output, £ million, 2019-2020\*

|              | 2019        | 2020        |
|--------------|-------------|-------------|
| Direct       | 16.1        | 14.8        |
| Indirect     | 4.1         | 3.8         |
| Induced      | 19.2        | 17.7        |
| <b>Total</b> | <b>39.4</b> | <b>36.4</b> |

\*Rounded to the nearest 10. Columns may not sum as a result.

Source: FAI Calculations



**Table 2:** Economic impact of medical research funding by charities on Northern Ireland's full-time equivalent jobs, 2019-2020\*

|              | <b>2019</b> | <b>2020</b> |
|--------------|-------------|-------------|
| Direct       | 275         | 250         |
| Indirect     | 50          | 50          |
| Induced      | 175         | 175         |
| <b>Total</b> | <b>500</b>  | <b>450</b>  |

\*Rounded to the nearest 25. Columns may not sum as a result.

Source: FAI Calculations

**Table 3:** Economic impact of medical research funding by charities on Northern Ireland's GVA, £ million, 2019-2020\*

|              | <b>2019</b> | <b>2020</b> |
|--------------|-------------|-------------|
| Direct       | 12.3        | 11.3        |
| Indirect     | 2.4         | 2.2         |
| Induced      | 11.7        | 10.8        |
| <b>Total</b> | <b>26.3</b> | <b>24.3</b> |

\*Rounded to the nearest 10. Columns may not sum as a result.

Source: FAI Calculations

## Economic multipliers

While large industries often have significant impacts, economic multipliers can be used to understand the value for money that an industry supports in the economy.

Economic multipliers tell us the amount of output, GVA and jobs supported by a £1 million expenditure on final demand (for example: government spending, exporting, research and development). High multipliers typically describe industries that are strongly integrated with Northern Ireland's supply chains and spend significant amounts on wages.

We find that a pound spent by medical research funding by charities has a significantly larger impact on output, GVA and employment than the average pound spent in Northern Ireland.

Every £1 spent on medical research funding by charities in Northern Ireland supports:

- £2.44 of output,
- £1.63 of GVA, and
- 31 employment.

How does this compare? On average across the whole economy, every £1 spent in Northern Ireland supports:

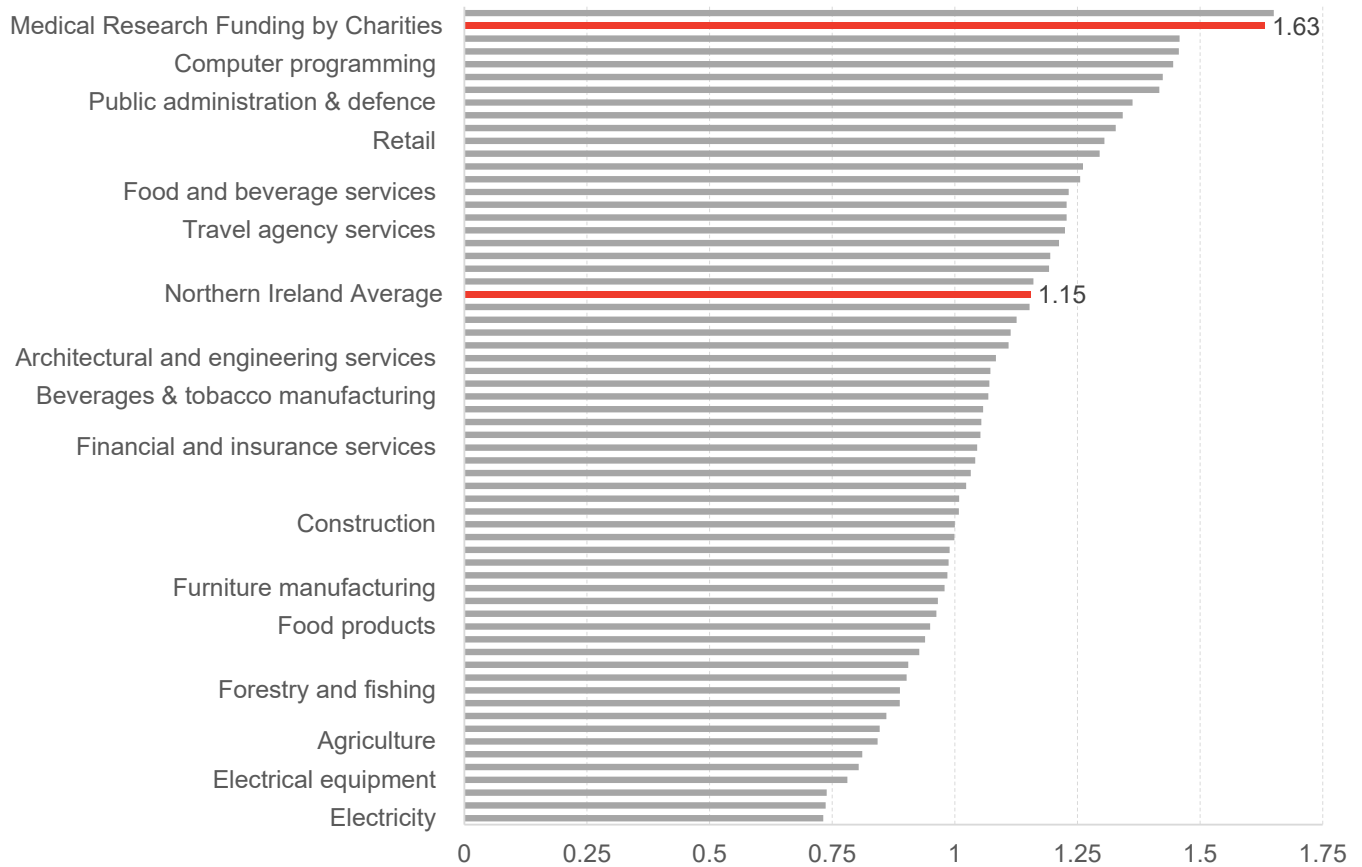
- £2.18 of output,
- £1.15 of GVA, and
- 19 employment.

Chart 3 and 4 show the GVA-output multipliers and FTE employment-output multipliers for medical research funding by charities compared to 62 sectors<sup>16</sup> of Northern Ireland's economy. Medical research funding by charities places 2nd for GVA-output multipliers and 7th for employment-output multipliers.

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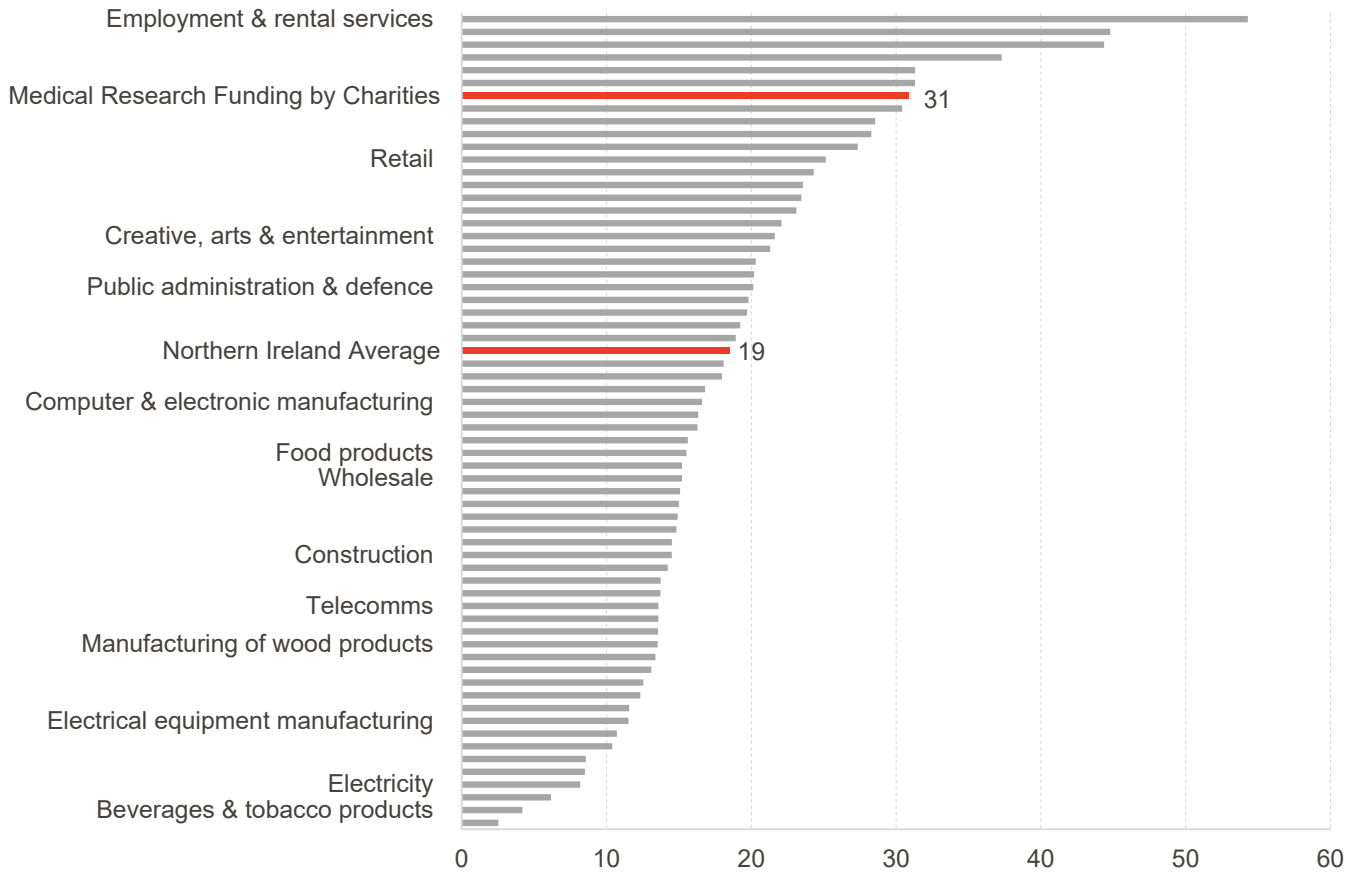
<sup>16</sup> The 'Services of households as employers of domestic personnel' sector has been excluded as it is not a conventional industry.

**Chart 3:** Comparison of Type II GVA-output multipliers across 62 sectors of the Northern Ireland's economy & medical research funding by charities. Selected sectors labelled.



Source: FAI Calculations

**Chart 4:** Comparison of Type II FTE employment-output multipliers across 62 sectors of the Northern Ireland’s economy & medical research funding by charities. Selected sectors labelled.



Source: FAI Calculations

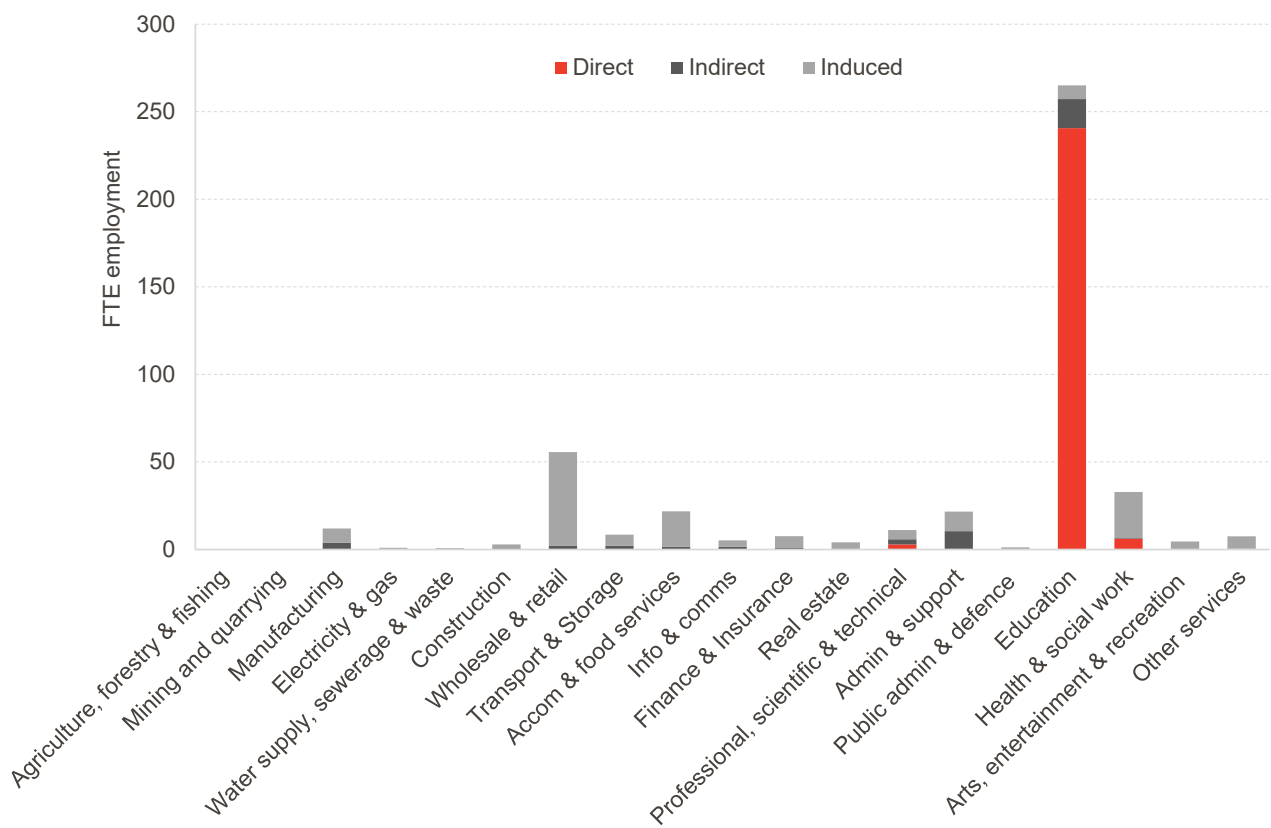
### Impact by sector of Northern Ireland’s economy

Chart 5 shows the spread of the FTE employment supported by medical research across Northern Ireland’s industries.

Unsurprisingly, the direct employment as a result of medical research funding by charities lies in the education and health sectors. However, the spill-over impacts extend into many other sectors.

For example, medical research funding supports around 100 employment in wholesale and retail, 40 in accommodation & food services and another 40 in administration and support services.

**Chart 5:** Direct, Indirect and induced contributions of medical research spending, 2019



Source: FAI Calculations

## Data and methodology

### *Data on medical research funding*

Data on medical research by charities was provided by two sources.

The first source is the UK Health Research Analysis in 2018. This is a survey of the main funders of clinical research in the UK and is undertaken by the UK Clinical Research Collaboration (UKCRC). This survey covers 22,500 projects from 146 organisations and provides a highly detailed view of medical research funding by organisation in 2018.

The second data source is the Association of Medical Research Charities (AMRC), a membership organisation that supports medical research charities. The AMRC collects data on UK medical research expenditure annually from its 150+ members.

There are several differences between the AMRC and UKCRC datasets.

The AMRC surveys almost all UK charities funding medical research and has values for each year since 2014, while the latest UKCRC dataset represents 2018 only. Only 62% of AMRC membership responded to the UKCRC survey, however the respondents accounted for around 97.5% of total UK expenditure.

The AMRC data is a sum of research expenditure reported by the annual accounts of charities. As different organisations have different financial year start and end dates, the figures can therefore differ from calendar year values. These data also report the amount of grant provided that year, but this does not necessarily reflect the year that the research is undertaken.

Comparatively, the UKCRC dataset aggregates values of grants based on the years the research was undertaken. For example, a three year grant which finishes on the 31st December 2018 would have one third of the grant value assigned to 2018.

Other differences between the figures and the datasets can also exist. After discussion with the UKCRC, some potential differences exist due to the difficulty of allocating funding shared between charities to the individual charities.

But most critically, while the AMRC data is an excellent source of annual research data, it only provides the total value of UK medical research expenditure by year or by organisation. It does not provide a breakdown of research funding by nation or by type of recipient. We have therefore used AMRC data to inform the annual totals, while using detailed UKCRC data to apportion these totals into regions and recipient types.

While we believe that combining the data gives the most accurate representation of medical funding in the UK, this does come with assumptions and drawbacks. For example, proportions for the four nations by funding recipient type are fixed. Therefore, if one nation or recipient type was impacted more significantly than others (e.g. during the pandemic), then this data will not reflect the extent of this change.

### *Data for constructing the model*

Our economic models use Input-Output tables from the nations of the UK. These include the ONS UK Input-Output table, the Scottish Government's Input-Output table and NISRA's Input-Output table.

Input-Output tables describe the flow of goods and services around the economy. They show how

industries buy and sell from each other, compensate labour, and sell to sources of final demand such as Government, households and exports. Input-Output tables are a simple transformation of Supply and Use tables.

While individual data sources can suffer heavily from inaccurate measurement, bias, definitions and other issues, Supply and Use tables are constructed from many government datasets. The inclusion of many datasets allows for (a) each dataset to act as a check for other datasets and (b) to place heavier weight on more reliable datasets. As a result, Supply and Use tables are considered the cornerstone of National Accounts. These, along with input-output tables, are produced by many advanced economies and are used to create significant economic statistics, such as GDP.

We have also introduced employment data to produce estimates of employment impacts. These data sources include the ONS Workforce Jobs dataset and the ONS Business Register and Employment Survey.

### *Modelling methodology*

We use input-output modelling to generate the estimates. This modelling methodology is well established and dates back to 1951 and resulted in the creator, Wassily Leontief, receiving the Nobel Memorial Prize in Economics.

It has widespread use in Government and academia. For example:

- UK Government Department for International Trade: [Evaluating the impact of exports on UK jobs and incomes](#)
- Scottish Government: [Scottish Budget 2020-2021: carbon assessment](#)
- OECD [Trade in Value Added statistics](#)

In National Accounts, charities can be found within both “industries” and “non-profit institutes serving households” (NPISH). This presents a difficulty from the perspective of modelling typical expenditures. Instead, our modelling focuses on the economic benefits associated with an uplift in research and development. This interpretation allows us to use economic multipliers – which model the economy-wide impacts of a change in final demand (e.g. research and development).

Once the model was created, data on UK medical research funding by charities is then used to map funding recipients (i.e. those with boosted R&D) to sectors of the economy. By sector, the major recipients of UK medical research funding by charities are:

- SIC 72: Scientific Research and Development
- SIC 85: Education
- SIC 86: Human health activities

In this report, three separate models have been developed to each cover a country – the UK, Scotland and Northern Ireland. Unfortunately, it is not possible to create a high-quality model for Wales as the Welsh Government currently does not publish the required data. Instead, we have used Welsh data to regionalise the UK model.

Our estimates model the impact of an uplift in research and development expenditure in education, research and development organisations and medical organisations.

The impact of an increase in research and development in these sectors results in the sectors increasing their output (i.e. to create R&D they must perform R&D). This is known as the direct impact.

These industries purchase goods and services in order to undertake their activities (e.g. electricity to power buildings, glass vials for experiments or research time from other organisations). These suppliers, in turn, purchase goods and services from their own suppliers and so on, down the supply chain. This is known as the indirect impact.

Employees are required to produce the additional output associated with both the direct and indirect impacts. These employees are paid wages, which are spent on goods and services around the UK. This results in additional output and employment, particularly in industries such as retail and food & accommodation services (i.e. bars, restaurants, hotels). This is known as the induced impact.

The total uplift in output in the economy resulting from an increase of £1m of final demand (e.g. research and development) is known as the output multiplier. Similarly, we can produce employment-output multipliers and GVA-output multipliers which represent the increase in employment or GVA from an increase of £1m of final demand.

The size of the multiplier is primarily affected by the proportion of (a) purchases from other industries [mainly affecting the direct and indirect effect], (b) leakages from the economy in the form of profits and imports [which reduces the multiplier at each stage], and (c) employee compensation such as wages [proportionately high wages increase the induced impact].

Estimates of multipliers for total business R&D expenditure were produced by mapping business R&D data, sourced from the ONS Business Enterprise Research and Development dataset, to sectors.

### *What are output, GVA and FTE jobs?*

Our estimates are presented using output, GVA and FTE jobs.

**Output:** The value of all goods and services produced. This is most easily thought of as the turnover of firms. However, output is selected over turnover because a large amount of activity is not undertaken by firms (e.g. by government and third sector which can have no turnover but produce a large amount of goods and services).

**GVA:** Gross value added is a measure of the contribution to an economy and is very similar to GDP (gross domestic product).

It is a preferred measure than output as a firm could buy £1m of goods and sell these on for a further £1m – clearly no value has been created here despite output counting this as a £1m contribution.

GVA can be described simply as subtracting costs of goods and services inputs from the sales. This is not the same as ‘profits’ since GVA also includes taxes on production, compensation of employees (e.g. wages, pensions), and gross operating surplus (e.g. company or self-employed profits). And an organisation can have no profit but can contribute to the economy by paying salaries.



Full-time Equivalent (FTE) Jobs: Full-time equivalent simply tries to account for the fact that supporting a part-time job does not have the same impact as supporting a full-time job. For calculating FTE, a full-time job equals one FTE while a part-time job equals half an FTE. In particular this avoids large overestimation in industries such as retail.

It should be noted that, while we have used the terms interchangeably in this report, there is a difference between “employees”, “employment” and “jobs”. For example, employment includes self-employment, while employees does not. And one employee can have multiple jobs.

### *Modelling assumptions and limitations*

The choice of model can influence the resulting estimates. Input-output modelling is the correct choice for the research question as it can capture the economy-wide impacts of spending at a fairly granular level.

However, input-output modelling requires assumptions. Some of the key assumptions include:

- There is no restraint on the supply side – this becomes problematic with extremely large additional expenditures (e.g. a £400 billion construction project would result in a shortage of construction workers).
- Price impacts are not considered. Again, this is problematic for very large demand side shocks. In the above example, the cost of construction materials would increase, resulting in less output.
- There is no substitution between technologies.
- Unless otherwise specified, inputs are treated as sector averages.

The final assumption is important as medical researchers within a sector could have different expenditures to the sector as a whole. Without a survey of the expenditures of all medical researchers, it is difficult to say how this could affect the results. However, such a survey would likely be cost prohibitive and researchers may be unaware of all the costs associated with their organisation (e.g. such as building maintenance and electricity).

These assumptions also apply to the multiplier results for total business R&D expenditure.

# Glossary

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**Output:** The value of all goods and services produced.

**GVA:** A measure of contribution to an economy equal to output less intermediate consumption (i.e. purchases of goods and services as inputs).

**GDP:** A measure of economic growth, equal to GVA plus taxes less subsidies on products.

**Employment:** A measure of people that includes employees and self-employed. This differs from jobs, for example one employee can have multiple jobs.

**Full-time equivalent:** Using FTE measures of jobs and employment attempts to account for the difference in economic impact between part-time and full-time work. One full-time equivalent employee is equal to one person working full-time, or two people working part-time.

**Direct impact:** An increase in the final use of a sector results in organisations in the sector reacting by increasing their output. This is called the direct impact.

**Indirect impact:** Firms that increase their output as part of the direct impact must purchase goods and services from their suppliers in order to produce this output. In turn, their suppliers must increase purchases from their suppliers and so on. The sum of the impacts down the supply chain is called the indirect impact.

**Induced impact:** Employment is generated as a result of the direct and indirect impacts. Employees are paid wages which are then spent on goods and services. This household spending impact is called the induced impact.

**Spill-overs:** For input-output modelling results, spill-overs typically refer to the indirect and induced impacts.

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