The value of industry clinical trials to the UK

Extended report

A report for the Association of the British Pharmaceutical Industry

December 2024

Contents

Industry clinical trials deliver significant value to the UK economy, the NHS, and the UK's research and development base

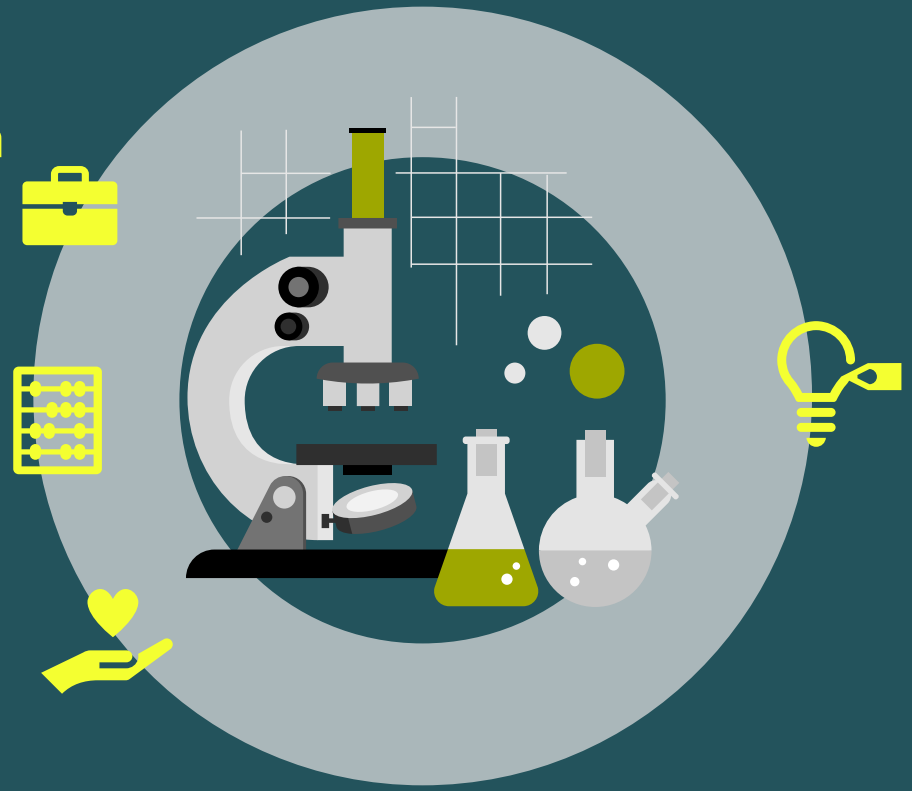
In 2022:

Industry clinical trials contributed **£7.4 billion** of gross value added (GVA) to the UK economy and supported a total of **65,000 jobs**.

Generated **£1.2 billion** of revenue for the NHS and supported **13,000 NHS jobs**.

£0.9 billion of GVA was generated by the contribution of industry clinical trials to improved patient outcomes in research-active hospitals compared to research-inactive hospitals.

These health improvements are estimated to prevent **3 million sick days**.



Over the past 5 years:

Industry contributed to almost **5,000** research papers between 2019 and 2023.

11% of these papers were highly cited, compared to an EU benchmark of 5.7%.

These papers supported **283** patent applications.

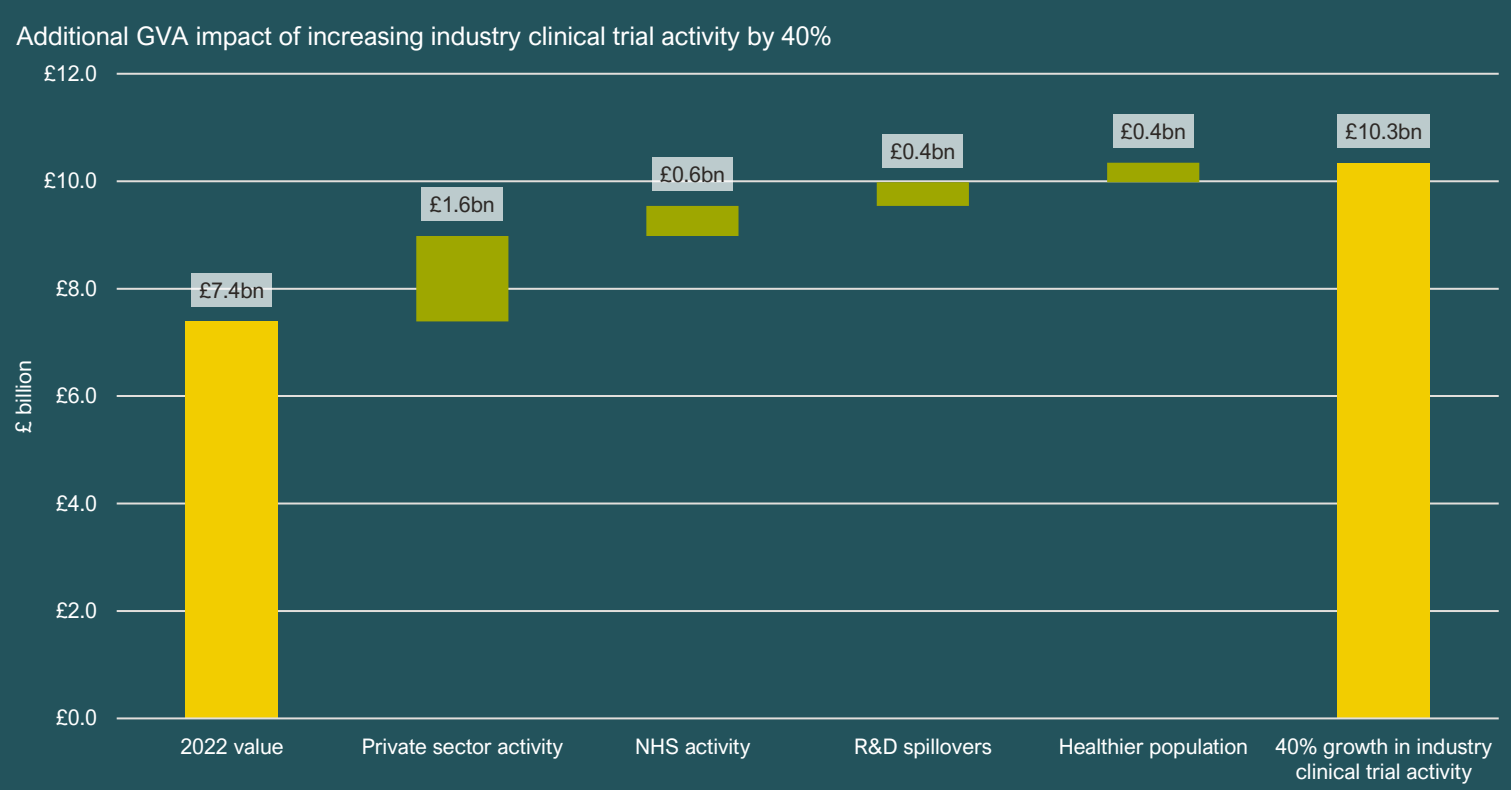
Restoring the UK's capacity to deliver industry clinical trials would significantly advance the government's NHS and economic growth missions

Increasing UK industry clinical trial activity by 40% (comparable to 2017 levels) would generate:

£3 billion of additional GVA for the UK economy.

26,000 additional jobs, **5,000** of which are in the NHS.

1.1 million additional avoided sick days from improved quality of care, leading to a healthier population.



1. Introduction

"Rebuilding and innovating within the UK's clinical trials sector is an essential part of the UK's wider health, scientific, and economic strategy."

Lord O'Shaughnessy review (2023)

Clinical trials are an essential part of the research and development (R&D) of new healthcare innovations including medicines and vaccines. These innovations help to improve patient outcomes, which in turn enable people to lead healthy and fulfilling lives. Not only do these health benefits have a profound impact on individual patients and their loved ones, but they are also a key part of supporting a healthy population enabling UK productivity and wellbeing.

Industry clinical trials are a key contributor to the UK's economic growth. They support jobs and skills development across the supply chain and contribute to the attractiveness of the UK for global R&D investment. For the NHS, they are a valuable source of revenue as well as a source of industry-funded treatment.

However, there has been a recent decline in the number of industry clinical trials initiated in the UK, which fell from a peak of 690 in 2015 to 394 in 2021. While there are some signs of recent recovery, with 411 trials initiated in the UK in 2022, this is still far below the 2015 peak.[1] Investing in capacity today to accelerate this recovery will generate significant long-term financial and patient benefits, helping to advance the government's missions for health and economic growth.

Frontier Economics was commissioned by the Association of the British Pharmaceutical Industry (ABPI) to explore the value of commercial clinical trials to the UK. This work explored benefits to UK patient outcomes, R&D, the NHS, and the UK economy.

Industry clinical trials

The Department for Health and Social Care (DHSC) defines three broad categories of clinical trials:[2]

- Industry clinical trials (also known as commercial contract studies) are sponsored and fully funded by the life sciences industry.
- Commercial collaborative studies are typically funded, either wholly or in part, by the life sciences industry and sponsored by a combination of industry and non-commercial organisations.
- Non-commercial studies are sponsored and wholly funded by one or more non-commercial organisations, including medical research charities, universities, and public funders.

In 2022, 411 industry clinical trials were initiated in the UK, and 42,088 participants were recruited into industry clinical trials in 2022/23. While this is an increase compared to 2021, it is still well below 2017/18 levels when 58,048 participants were recruited into industry clinical trials in the UK.[1] Looking at the UK's attractiveness as a destination for industry clinical research, in 2021 the UK ranked 4th, 6th, and 10th for the global share of phase 1, phase 2, and phase 3 trials respectively.

The ABPI commissioned Frontier Economics to assess the value of industry clinical trials to UK society. This paper explores two questions:

1. What is the current value of industry clinical trials to UK society?
2. What are the potential future impacts of growth in UK clinical trial activity?

This study built on existing work that highlights the importance of industry clinical trials to the UK and the benefits associated with strengthening the UK's global position including:

- The impact and value assessment of the National Institute for Health and Care Research (NIHR).[3]
- The recent assessment of benefits associated with investment into access and uptake of innovative medicines as part of the Government's Life Sciences Vision.[4]
- The Lord O'Shaughnessy Review which set out recommendations on how industry clinical trials can support UK health, growth, and investment opportunities.[5]

This study focused on phase 1, 2, and 3 industry clinical trials, which are described in the figure below. Phase 4 trials, which study the effects of new treatments in the wider population after approval, are out of scope.

Acknowledgements

We thank the NIHR for its input and support with this analysis.

If you use this document in your own research and/or writing, it should be cited as: Frontier Economics (2024). 'The value of industry clinical trials, extended report' commissioned by The Association of the British Pharmaceutical Industry.

Impact framework and approach

A logic model was developed to support the identification of the benefits of delivering industry clinical trials in the UK. This identified four key benefits:

Benefits to the economy

The overall economic contribution of industry clinical trials, measured in GVA and full-time equivalent (FTE) employment. Wider productivity benefits from a healthier population arising from improved patient care in research-active hospitals compared to research-inactive hospitals were also considered.

Benefits to the NHS

Revenue from commercial income payments for the delivery of trials.

Benefits to the R&D base

Enabling UK-led clinical research publications, strengthening the UK's global scientific leadership and attractiveness as a destination for R&D and investment.

Benefits to patients

Potential health improvements for patients participating in clinical trials.

This extended report builds on the previous report published in September 2024, which focused on the benefits to the UK economy, the NHS, and UK R&D, by extending the analysis to the benefits to patients.

This study used a mixed-methods approach, bringing together evidence generated through several methods to conduct a quantitative and qualitative assessment of impacts. It has drawn on publicly available data as well as data provided by the NIHR.

This study has some limitations:

- Some assumptions have been drawn from previous work carried out for the NIHR.[3] These include assumptions on payroll as a share of expenditure in NHS Trusts, which is used to estimate the number of NHS clinical research jobs enabled by industry clinical trials. Data sources have been specified in the technical appendix.
- Data on average per-patient payments in 2022/23 has been provided by the NIHR. This value represents the average across all industry clinical trials (commercial studies) supported by the NIHR Clinical Research Network. However, per-patient payments will vary significantly across individual studies to reflect factors such as specialty, trial, duration, study type, and product type.

It is also important to recognise that realisation of some benefits will rely on activities of several other organisations, for example the NHS, the Medicines and Healthcare products Regulation Agency (MHRA), and the National Institute for Health and Care Excellence (NICE) and may be impacted by external factors. It has not been possible to carry out detailed attribution of impacts.

Full details on the data and approach can be found in the technical appendix.

2. Benefits to the UK economy

Despite the decline in recent years, industry clinical trials contributed £7.4 billion of GVA in 2022

While the UK remains a strong player in the global clinical trial market, the number of trials initiated in the UK and the number of patients recruited have been declining since 2015. In 2022, 411 industry clinical trials were initiated in the UK, compared to the peak of 690 in 2015. Nonetheless, these industry clinical trials continue to bring numerous benefits, including creation of high-quality jobs, knowledge and skills spillovers and better healthcare outcomes.

Industry clinical trials supported **65,000 jobs** in 2022. This is made up of **21,000** clinical research jobs in the private sector, **13,000** clinical research jobs in the NHS, and **31,000** jobs associated with indirect and induced impacts of this clinical research activity.

This activity is associated with **£6.5 billion of GVA**, **£4.0 billion** of which arises from private-sector activity and **£1.4 billion** of which is from NHS activity to deliver industry clinical trials.

R&D spillover benefits from private-sector clinical research activity generated an additional **£1.1 billion of GVA**.

Contributed to improved patient outcomes in research-active hospitals, compared with research-inactive hospitals. These health improvements were estimated to prevent **3 million sick days**, worth **£0.9 billion of GVA.**

Contribution to UK productivity and employment

This report looks at three ways industry clinical trials contribute to UK GVA:

- **Direct, indirect, and induced effects** measure the impact of industry investment into the UK to carry out clinical trial activity. Direct effects measure the impact of higher final demand for clinical research. This will also lead to an increase in demand on their suppliers (indirect impact). Direct and indirect impacts lead to an increase in the level of household income, some of which will be re-spent on goods and services (induced impact).
- **Spillover effects of R&D**. R&D is well known for generating 'spillover effects' where knowledge, products, and processes created during research activity can be used by other companies. This helps to spread the benefits of innovation beyond the organisation originally carrying out the research, and further contributes to the growth of the wider economy.
- **Impacts of a healthier population**. Evidence shows that NHS Trusts that are engaged in research activities have better patient outcomes,[9] which has productivity impacts such as reduced absenteeism.

The remainder of this section looks at each of these in turn.

Direct, indirect, and induced effects of clinical research activity

The life sciences industry plays a key role in the UK economy. Based on Office for National Statistics (ONS) payroll data for 2022 (the most recent year available), industry clinical trial activity generated **an estimated £5.4 billion GVA through direct, indirect, and induced benefits and supported 65,000 jobs**. This does not include the GVA impact of spillover benefits or contribution to a healthier population.

The industry directly employed an estimated 21,000 people in the UK to deliver clinical trials in 2022, contributing £1.9 billion to the UK economy (direct impact).

This increases to £3.2 billion and 36,000 jobs once additional activity across the supply chain to deliver this research activity (indirect impact) is accounted for. Finally, including the impacts of spending by employees (induced impact) increase this to reach a total of £4.0 billion of GVA and 42,000 jobs from private-sector activity.

In addition to the contribution of private-sector activity set out above, industry contracts NHS providers to deliver clinical trials, paying them a per-patient payment for doing so. This supports around 13,000 jobs in the NHS. There is a greater range of uncertainty around this estimate as it uses historical data on wage costs, which may have changed in relation to per-patient payments. When indirect and induced effects are included, revenue generated by industry clinical trials supported 23,000 jobs and £1.4 billion of GVA.*

Spillover effects

Evidence suggests the spillover benefits of R&D could be in the range of 20% to 37% of private returns (benefits that accrue to the business making R&D investments).[6-8] A conservative estimate of 20% has been applied on private-sector industry clinical trial expenditure, which was reported to be £5.5 billion in the ONS Business enterprise research and development dataset (BERD) resulting in **£1.1 billion of spillover benefits** (see page 31, technical appendix for further detail) in addition to the £5.4 billion of private returns (direct, indirect, and induced effects).

* NHS employment impacts presented here are the same as those discussed on page 16 and should therefore not be aggregated, as this would lead to double-counting.

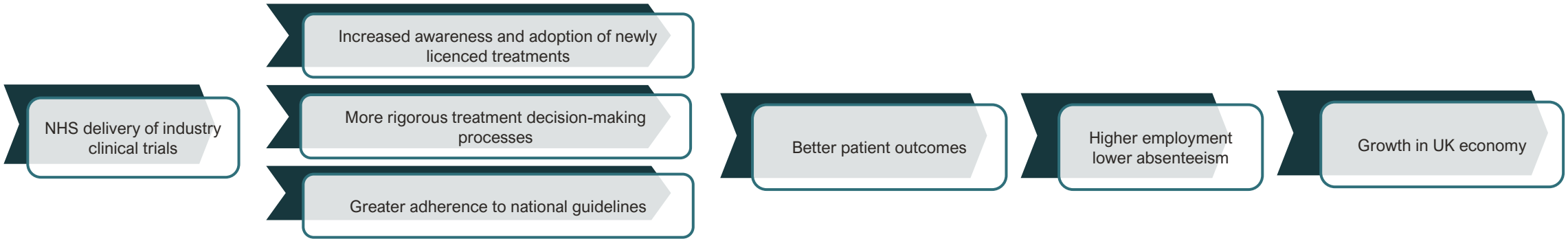
Impact of a healthier population

Evidence shows that NHS Trusts that are engaged in research activities have better patient outcomes.[9] This includes lower mortality rates,[10] shorter hospital stays,[11] and improved patient-care experiences.[12] These benefits are not confined to large hospitals but are evident across all NHS hospitals engaged in research[13]. This is a key beneficial side-effect of clinical research, with industry clinical trials making up 44% of all interventional studies in 2022/23.[14]

Consultants who participate in clinical research have a greater awareness and adoption of new treatments once they have been licenced[15] and the influence of research-active consultants often extends to their peers, promoting a culture of innovation.[16] This means that hospitals active in research are often quicker to adopt newly licenced and approved treatments.[17-18]

Clinical research participation also fosters collaboration between hospital staff and national experts, leading to dissemination of information that enhances medical care quality. It encourages adherence to clinical guidelines[12, 16, 19] and can lead to more rigorous treatment decision-making processes.[13] These impacts result in improved outcomes for patients treated in NHS Trusts that participate in clinical research. Not only does this benefit individual patient wellbeing, but it also supports a healthier population and UK productivity (see figure below).

> "Hospital consultants who take part in research studies are more likely to promote the uptake of innovative therapies or devices once they have been licenced, improving access for all patients. NHS bodies that carry out research tend, on average, to provide better health outcomes for their patients. Encouraging more research must be a priority for those bodies charged with improving the nation's health."
>
> Lord O'Shaughnessy Review



Health has a major effect on a person's ability to work. Generally, people in good health require fewer absences from work and have higher productivity per hour worked. Ill health can also indirectly affect a person's employment, as they may have to take absences to care for others.

New treatments can also improve quality of life for patients undergoing treatment, increasing their ability to stay in employment and reducing absenteeism. Previous work carried out for the ABPI estimates that increasing uptake of just four innovative medicine classes would lead to an estimated £17.9 billion productivity gain for the UK.[4]

Research participation is one way to increase uptake of innovative medicines. Chen and Goldman examined the relationship between new treatments and gains in labour productivity across multiple conditions.[20] They found that, on average, new treatments led to a 30% increase in work productivity. In the absence of new treatments, hours worked per person would have fallen by 7 hours a week.

The same approach was used to estimate population-wide productivity impacts. This was combined with findings on the proportion of NHS Trusts that are research-active* and the increased likelihood of consultants who participate in research to prescribe new treatments once they were licenced (see technical appendix for detailed approach).[18]

Faster uptake of new treatments in research-active hospitals was estimated to enable 6.3 million avoided sick days in 2022. Attributing 44% to industry clinical trials based on their share of interventional clinical trials leads to an **estimated 3 million avoided sick days in 2022, equivalent to £0.9 billion of GVA.**

Case study: Improved colorectal cancer outcomes in research-active NHS Trusts

Oncology is a major area of clinical research and accounted for almost half of industry clinical trials initiated in the UK in 2022.[31] It is also a major cost to the UK economy. Previous estimates suggest that preventable cancers cost the UK £40 billion a year in lost productivity.[21]

Downing et al (2016)[13] compares 5-year survival rates for colorectal cancer patients treated in research-active (those that had ≥16% of patients enrolled in interventional trials for at least 1 of the 8-year study period) and research-inactive NHS Trusts (those that did not have ≥16% of patients enrolled in interventional trials in any of the 8 years observed).

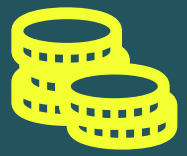
It found that 5-year survival rates were around 5% higher in NHS Trusts that met the criteria to be research-active in at least 1 year, and around 10% higher in those that met the criteria for at least 4 of the 8 years observed.

2,181 colorectal cancer patients diagnosed in 2022 were estimated to have benefited from improved care in research-active hospitals, leading to £1.2 million of productivity benefits per year for that patient cohort.

Without industry clinical trials, which made up 44% of all interventional trials in 2022/23,[14] the number of opportunities for NHS Trusts to participate in clinical research would be lower, potentially reducing the proportion of patients treated in research-active NHS Trusts. Attributing 44% of the £1.2 million of productivity benefits from improved patient care in research-active hospitals would lead to **a GVA benefit of £0.5 million attributed to industry clinical trials.**

* The term research-active corresponds with those classified as ‘high participation’ in Downing et al (2016),[13] defined as NHS Trusts where at least 16% new colorectal cancer patients were entered into research studies.

2. Benefits to the NHS



In 2022/23, 42,088 patients were recruited to industry clinical trials, leading to **£1.2 billion** of income for the NHS.

In addition, there are cost savings associated with industry-funded provision of care for patients enrolled on clinical trials, which are not included in this report.

In 2022, industry clinical trials supported **13,000** jobs in the NHS, helping to address the clinical research workforce shortage and increasing job satisfaction among NHS staff.

The value of industry clinical trials to the NHS

Delivering industry clinical trials in the UK benefits the NHS in several ways:

- **Commercial revenue.** Industry often contracts NHS providers to deliver clinical trials, giving them a per-patient payment for doing so.
- **Avoided treatment costs.** Industry clinical trial sponsors will provide pharmaceutical products free of charge for trial participants.
- **Strengthening the clinical research workforce.** Commercial revenue received by NHS Trusts for delivering industry clinical trials consists of three components: direct costs, overheads, and a capacity build charge. Both direct costs and the capacity build charge fund the NHS clinical research workforce.

Commercial revenues

Industry sponsored trials are typically delivered by NHS staff on NHS premises. These NHS Trusts receive an income for delivering this activity that covers direct staff costs, overhead costs, and a capacity build charge. The capacity build charge is intended to build sustainable research and innovation capacity, including clinical research workforce, for the benefit of all research partners. This income is referred to as a 'per-patient payment'.

Based on data shared by the NIHR, the average per-patient payment in 2022/23 across commercial studies sponsored by the NIHR Clinical Research Network (CRN) was £26,311 (£28,808 once adjusted for inflation to 2024 prices). This is a significant increase compared to the average per-patient payment values in the previous analysis for NIHR (£9,189 in 2018/19 prices, £11,458 in 2024 prices), and this per-patient figure will vary significantly from trial to trial.

In 2022/23, 42,088 patients were recruited to industry clinical trials, leading to **£1.2 billion of income for the NHS for trials initiated in 2022/23.**

Avoided treatment costs

In addition to providing a revenue stream to the NHS, industry clinical trials also lead to avoided treatment costs. Industry trials that involve replacing standard treatment with new pharmaceutical products lead to a direct cost saving for the NHS. Furthermore, in some trials, industry will also fund treatment on the 'control arm' - that is, patients who receive normal standard of care during the trial. This offers an additional saving to the NHS.

While the value of avoided treatment costs have not been quantified in this study, previous work carried out for the NIHR estimated that 31% of industry trials involved replacing standard treatment with new pharmaceutical products, resulting in £28.6 million of treatment cost savings to the NHS in 2018/19.[3]

The avoided treatment costs for the NHS in 2022 depend on the mix of clinical trials and changes in treatment costs since 2018/19.

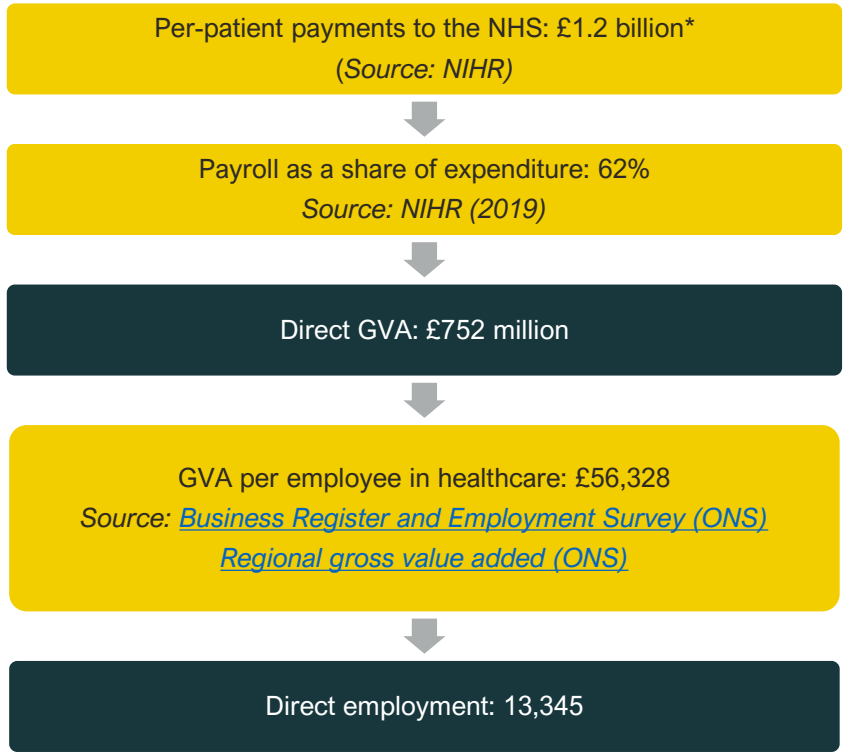
Clinical research workforce

The UK has an international reputation for delivering high-quality clinical research and scientific leadership. This plays a key role in attracting global industry to invest in the UK. Delivery of these studies is possible because of leading clinical academics based within the NHS, supported by a clinical research workforce, most of whom are also embedded within the NHS.

However, the UK is facing shortages across the research workforce,[24] and rates of clinical research engagement are lower in the UK than both the EU and the US.[25] Both government[26] and wider stakeholders[27] have called for greater investment in this area.

Participation in research raises job satisfaction among clinicians. Surveys of medical graduates have consistently showed that over 40% of graduates look for posts in the NHS that include an element of research, and a survey of senior UK doctors found that more dedicated time for research was considered desirable.[28]

Clinical trials are one of the most common ways in which clinical academics participate in research.[29] Our analysis estimates that industry clinical trial activity directly supports around **13,000 FTEs in the NHS** in 2022, noting that there is some uncertainty around this estimate as it uses historical data on wage costs, which may have changed over time.



*£ figures expressed in 2024 prices using the Consumer Prices Index including owner occupiers' housing costs (CPIH). CPIH is the lead inflation index used by the government as it is the most comprehensive measure of inflation.

3. Benefits to the UK's research and development base

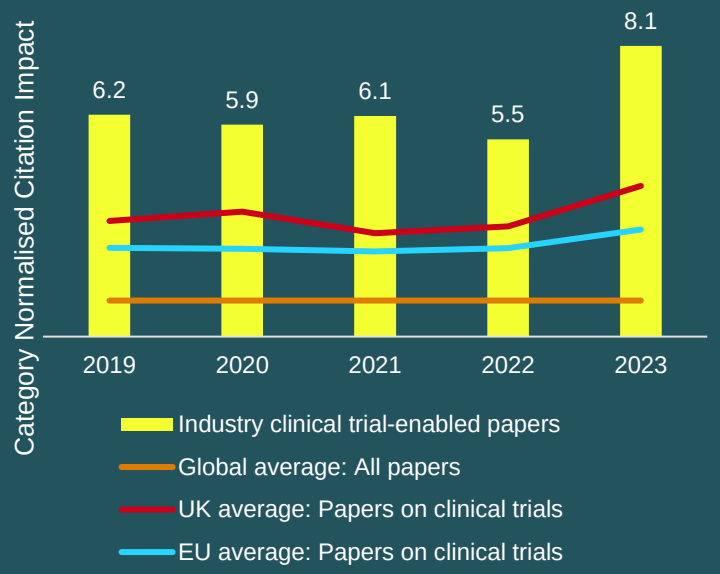
Industry contributed to approximately 5,000 papers over the past 5 years, either through funding or authorship, 11% of which were highly cited. These went on to support 283 patent applications.

4,841 academic publications.

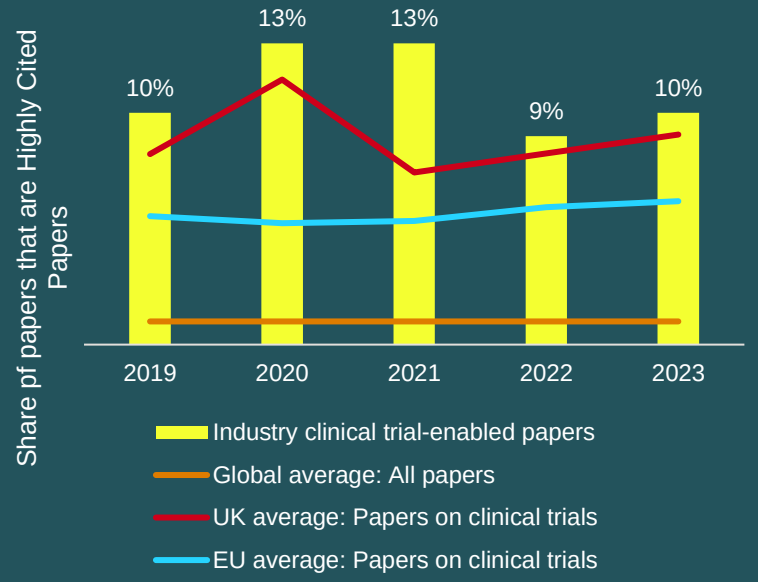
Cited by **283** patent applications.

40% of publications were collaborative between industry and hospitals or the Department for Health and Social Care.

On average these papers were cited **over 6x** the global average, demonstrating their high impact.

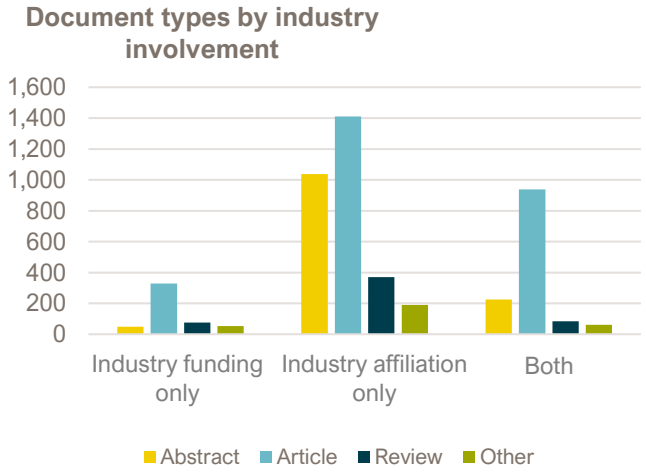


11% of papers were in the top 1% most cited papers published in the field that year.



Impact on UK research publications

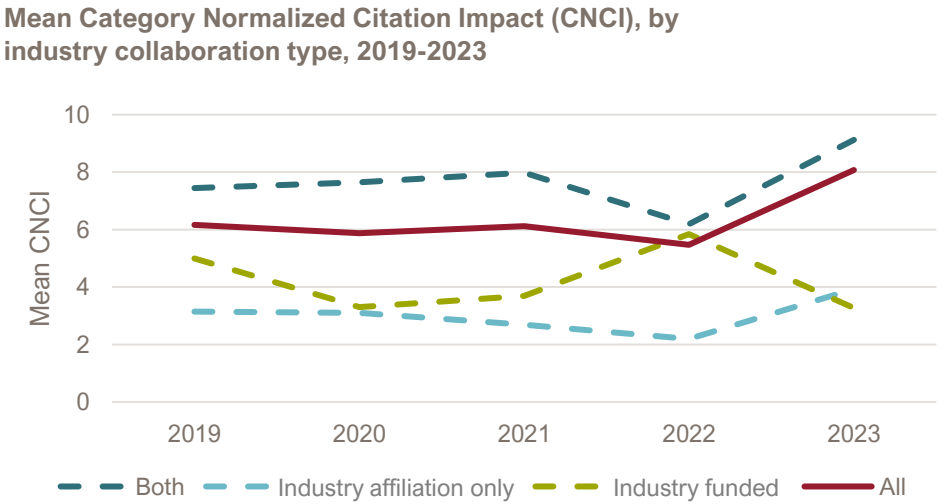
Industry clinical trials produce world-class research and help to maintain the UK's position as a global leader in clinical research. Clarivate carried out a bibliometric analysis of publications arising from industry clinical trials, the potential spillover benefits of this research into commercial activities via patents, and future collaborative research via collaboration analysis. A dataset was constructed consisting of UK documents indexed in the Web of Science™ published between 2019 and 2023 that were related to clinical trials and were either funded or authored by the pharmaceutical industry. It was not possible to identify the underlying funding structure of the clinical trial itself, which means that papers assessed in this section could cover both industry clinical trials and commercial collaborative studies. Around 27% of publications were produced by authors with an industry affiliation while also acknowledging industry funding. The majority of publications (62%) were produced by authors with an industry affiliation. Another 10% were publications that acknowledge industry funding without being authored by researchers with an industry affiliation.



Citation impact

Citations are a common measure of research impact. For this analysis, Clarivate looked at two citation-related metrics: Category Normalised Citation Impact (CNCI) and Highly Cited Papers (HCPs). CNCI is a measure of a publication's scholarly influence as indicated by the volume of citations (adjusted for year and field), and HCP represent the top 1% most cited papers within their respective field, year, and document type. Publications with industry contribution performed well above the global average in both metrics:

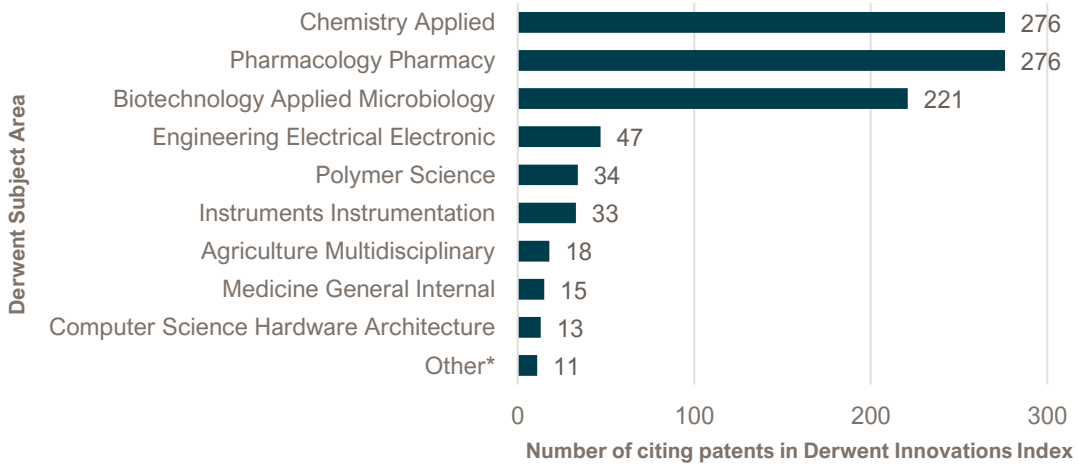
- **The average CNCI was 6.2, well above the global baseline (for all papers) of 1. This average was also higher than the average CNCI for all UK papers on clinical trials (3.36) and the average CNCI for all EU papers on clinical trials (2.54).**
- **On average, 11% were categorised as HCPs meaning they were in the top 1% most cited papers in their field. In comparison, 8.9% of all UK papers discussing clinical trials and 5.7% of all EU papers discussing clinical trials were HCPs.**



Patent citations

R&D activity generates spillover benefits. These are benefits that accrue to organisations beyond the company carrying out the research activity. This is a major driver of economic growth arising from R&D investment. In 2022, the industry invested £5.5 million in clinical trial R&D, generating £1.1 billion in spillover benefits.

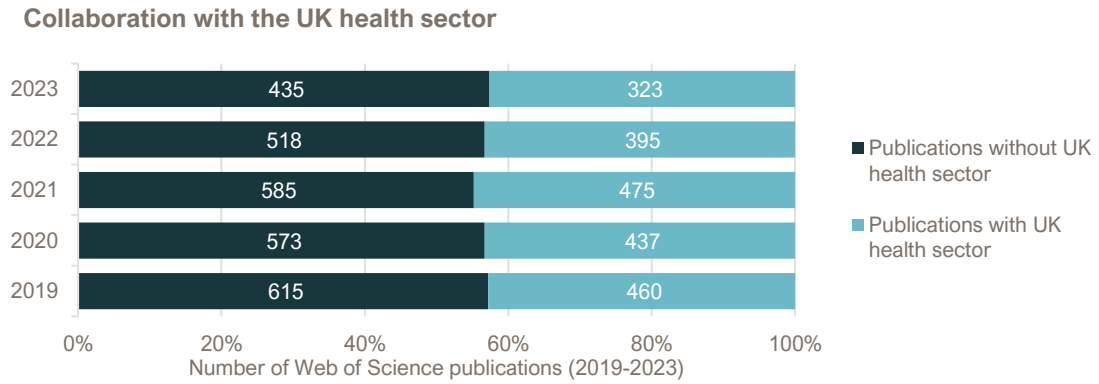
Spin-offs (companies whose business is based on products or technology initially developed in a parent company, university, or research organisation) are one way in which these spillover effects are generated and are a key part of economic growth. Patents are one indicator of spin-off activity. Identifying instances where industry clinical trial publications have been cited in patent submissions demonstrates the impact that this activity has in supporting economic growth. Collectively, the set of clinical trial publications that had industry input received a total of 330 citations from patent literature. A total of **283 patents in the Derwent Innovations Index™** were found to contain references to the set of publications related to industry clinical trials.



* Other is made up of subject areas with fewer than 5 citing patents: Nuclear Science Technology (4), Engineering Chemical (4), Optics (1), Imaging Science Photographic Technology (1), Food science technology (1)

Collaboration

Affiliation data was used to understand the degree to which industry contributions to R&D support collaboration with the NHS and DHSC. The results showed that collaboration with the UK health sector is common on research publications with industry contribution. Overall, **over 40% of considered publications featured an affiliation with a UK health sector organisation**. Throughout the analysis period, this has also remained stable on an annual basis.



4. Benefits to patients

In 2022/23, over 19,000 patients were recruited into interventional industry clinical trials, which comprised 44% of all interventional clinical trials in the UK

Early access to innovative treatments

"Clinical trials offer patients the possibility to access treatments that are not yet available on the NHS and that gives patients hope."
Cancer charity

"We are never going to get tired of having access to innovative treatments."
NHS principal investigator

"When it comes to disease assessments, sometimes the trials bring innovative ways of assessing disease that are not yet available on the NHS."
Industry representative

Personal value from participating in clinical research

"One of the reasons people join our patient and carer research panel is that they want to make a difference. They want to leave a legacy."
Cancer charity

"Some patients feel joy from being able to help other people. They value being part of education and science, and what that might bring to future patients."
Industry representative

Value to UK patients

The opportunity for patients to participate in interventional clinical trials, where new treatments are tested on participants, could offer them significant benefits. In 2022/23, over 19,000 patients were recruited into interventional industry clinical trials, which comprised 44% of all interventional clinical trials in the UK.[14]

In this work, two benefit areas have been considered for patients recruited into interventional industry clinical trials:

- Potential for improved health outcomes, including to address unmet need; and
- Personal value from participating in R&D.

A rapid literature review was carried out on these areas of potential benefit. This has been complemented by a qualitative case study on the role of industry clinical trials in cancer. Three stakeholder interviews were held, one with a pharmaceutical company who fund clinical trials, one with a principal investigator, and one with a cancer charity representative. Full details on the case study can be found on pages 24 and 25.

Potential for improved health outcomes and addressing unmet need

While the relative clinical benefits and risks for clinical trial participation will vary by the individual trial and individual patient, medical innovation is continually improving average patient outcomes. In the UK, novel medicines approved for use in the NHS between 2010 and 2020 years gave patients an additional 3 to 4 months of life in perfect health (median value) compared to the best alternative therapy.[31]

The benefits of novel treatments are particularly high in oncology.[31] International evidence suggests that each new cancer medicine launched between 2006 and 2010 reduced the number of disability adjusted life years (DALYs) lost to that cancer type in 2015 by 5.8%.[32] Evidence across multiple conditions (oncology, obstetrics, gynaecology, cardiovascular disease) finds that patients on clinical trials may have better health outcomes than non-participants.[33,49]

Participating in a clinical trial can be one of the few opportunities for patients to have early access to new treatments, and this was repeatedly highlighted in the stakeholder interviews:

> *"Clinical trials offer patients the opportunity to access treatments that are not yet available on the NHS and that gives patients hope."* ***(Cancer Charity)***
>
> *"When it's clear that a class of treatment will become important for treating a certain condition, and it's the right treatment at the right time for our patients, we aim to be a leading recruiter for the study because we understand the benefits."* ***(NHS principal investigator)***

This early access is particularly important for patients with few or no existing treatment options in routine care. New treatments that fill this unmet need, are typically referred to as "first-in-class" (FIC) and may lead to greater health improvements than new treatments that are not FIC.[34]

The role of industry clinical trials in providing early access to FIC treatments to UK patients is explored via a series of case studies on pages 22 and 23.

The role of industry clinical trials in improving health outcomes for people with rare diseases

While rare diseases (defined as conditions that affect less than 1 in 2,000 people) are individually rare, they are collectively common, with 1 in 17 people being affected by a rare disease at some point in their lifetime.[37] This is equivalent to 3.5 million people in the UK.[37] Around 95% of rare diseases have no approved treatment or cure,[38] meaning that people living with a rare disease and their families experience considerable unmet needs. Interviews with members of the ASTERIX Patient Think Tank, which aims to improve clinical trial design for rare diseases, stated that "when there are no treatments available, a trial is often the only hope".[35]

Chambers et al. (2020)[39] estimates that on average (median), orphan medicines (medicines intended to treat rare disease) approved by the US Food and Drug Association (FDA) from 1999 to 2015 gave patients an additional 0.25 year in perfect health (measured using quality adjusted life years (QALYs)). This varied significantly across medicines, with a maximum impact of 28.2 QALYs whilst other drug-indication pairings offered no clinical benefits or were less effective than existing care. The median QALY impact was used to estimate the potential value of health benefits for patients living with rare disease accessing novel treatments via industry clinical trials in the UK.

Between 2016 and 2021, there were around 114 rare disease industry clinical trials in the UK ¶, (44 phase 1 trials, 52 phase 2 trials, and 18 phase 3 trials).[40] Assuming that these clinical trials are spread equally across years, and applying evidence from the US on the average number of rare disease trial participants,[41] this means around 773 people living with rare disease were recruited into phase 2 and phase 3 industry clinical trials each year.† Of these 773 people, around 166 are estimated to receive novel treatments that will subsequently receive regulatory approval.

This estimate is then adjusted for the proportion of new medicines that are approved but may not be immediately available to all patients in the UK. In 2019 to 2022, 28% of all medicines licensed in the EU had full public availability in England, with a further 28% available on a limited basis*.[36] This leaves at least 44% of all EU-licensed medicines unavailable to patients in England. Once this is taken into account, it results in a final QALY estimate‡ of 24 QALYs per year gained by rare disease patients participating in industry clinical trials for medicines which are not immediately accessible after licensing.§ Applying the NICE £20,000 cost-effectiveness threshold leads to an estimated **£0.6 million of QALY benefits each year** (undiscounted).‖

In addition to the QALY benefits quantified above, many patients may participate in clinical trials for treatments that are subsequently licensed for use in the NHS. The benefit to these patients is *earlier* treatment. Although this is not quantified in this work, this benefit could be substantial for rare disease patients due to the rapid decline associated with these conditions. For example, 75% of rare diseases affect children and over 30% of these children will die before their fifth birthday.[42]

* The ABPI have advised us that the WAIT indicators may over-estimate access to medicines which could mean that an even larger number of patients may only be able to access orphan drugs via clinical trials.
† This analysis excludes patients recruited into phase 1 trials. See technical annex for further details.
‡ Estimated QALYs, per year, gained by rare disease patients participating in industry clinical trials.
§ The ABPI have advised us that typically in economic modelling in NICE appraisals the risks of adverse events in clinical trials, from a health technology evaluation point of view, are de minimis compared to potential benefits. We have therefore not accounted for these in the analysis
‖ We have used a value per QALY of £20,000 which is the lower end of the NICE cost-effectiveness threshold in order to take a conservative approach. We note that alternative QALY thresholds are routinely used, including: (1) an upper threshold of £30,000 by NICE, (2) £70,000 (in 2020/21 prices) for policymaking as per the HMT Green Book, and (3) the £100,000 threshold that applies to the NICE highly specialised technologies process for the evaluation of therapies of rare disease. Applying these higher QALY values would increase the monetised QALY value correspondingly.
¶ These figures are from a NIHR study on the rare disease landscape. As part of this study the NIHR identified the number of "industry funded projects" where projects is defined as "research on a specific drug, to treat a specific condition, sponsored by a single company." The study also discusses an even split between the development of biologic and small molecule treatments. Based on this, it is reasonable to assume that industry clinical trials identified were interventional trials, although we recognise that observational trials can also study patient experience of existing drugs.

In addition to the potential clinical benefits arising from access to novel treatments, there is some discussion in the academic literature on benefits that trial participants may experience even if they do not receive the novel treatment because they have been allocated to the control arm. These are sometimes referred to as the 'participation effect' and include the:

- **Protocol effect** arising from closer adherence to treatment regimens defined in the clinical trial manual.
- **Care effect** which arises from differences in care between trial and non-trial participants.
- **Hawthorne effect** which describes changes in patient or clinical behaviour as a result of knowing they are being observed.
- **Placebo effect** where a patient's health appears to improve even with a sham or simulated intervention.

There is limited empirical evidence on these participation effects.[43] However, examples of the care effect were discussed as part of the case study conversations; for instance, access to more regular check-ups and greater continuity of care. It was pointed out that:

> *"Some patients really value the regular check-ins, which gives them that continuity of care. There may also be more frequent disease assessments (blood tests, biopsies and scans) when patients participate in a clinical trial."* ***(Industry representative)***

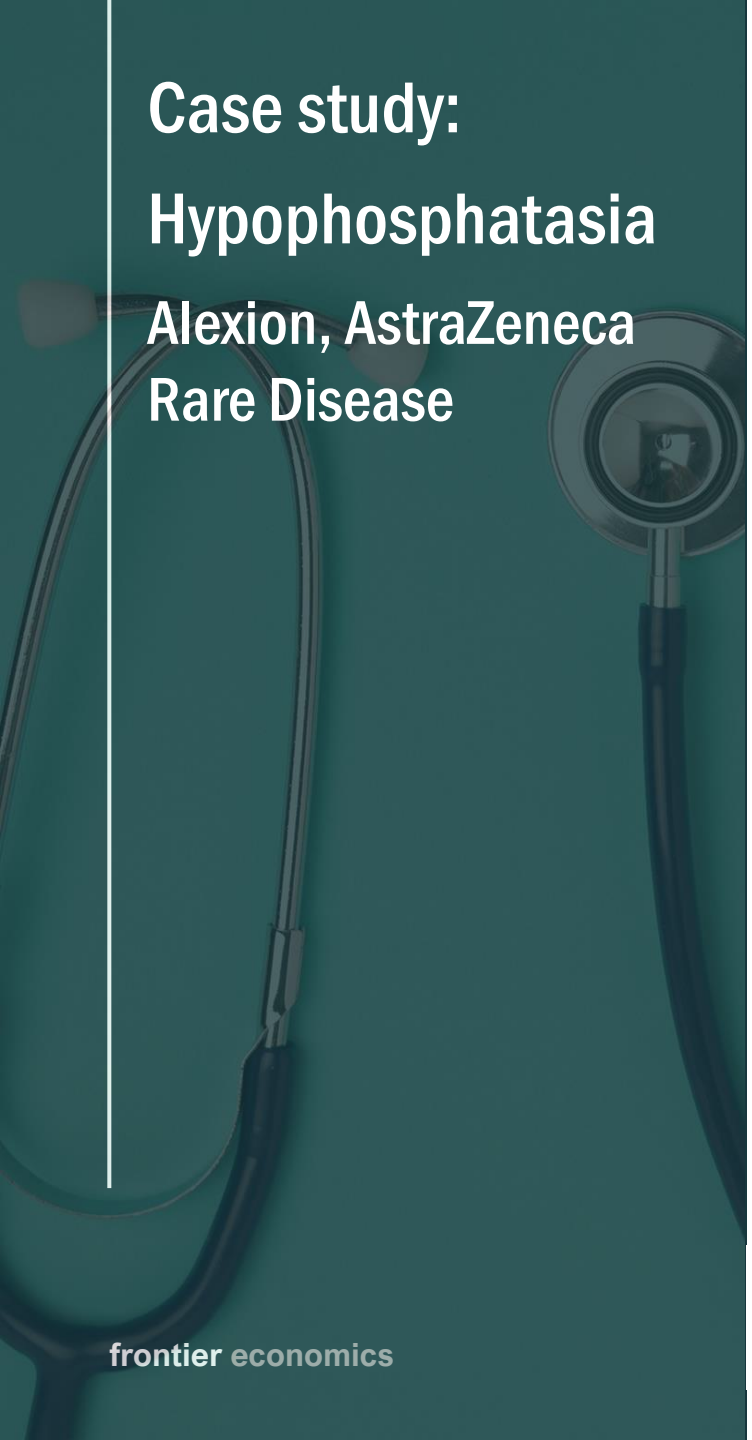
Personal value of participating in clinical research

Aside from the clinical benefits of clinical trials, evidence suggests that research participation can lead to wider wellbeing benefits for some patients. Trial participation was often associated with higher levels of optimism,[40,44] with the opportunity to access novel treatments leading to a more positive outlook.[45]

Furthermore, some patients experience a sense of personal satisfaction from contributing to clinical research and the opportunity to be part of groundbreaking research and supporting future medical advancements.[46] This was raised in the stakeholder interviews:

> *"One of the reasons people join our patient and carer research panel is that they want to make a difference. They want to leave a legacy."* ***(Cancer charity)***

> *"Some patients feel joy from being able to help other people. They value being part of education and science, and what that might bring to future patients. The value of that is huge."* ***(Industry representative)***



Case study: Hypophosphatasia

Alexion, AstraZeneca Rare Disease

Hypophosphatasia (HPP) is a rare genetic metabolic condition that causes bones to develop abnormally. Around 1 in every 6,370 people in the UK have HPP,[50] and it can appear at any time between pre-birth to adulthood. HPP is often fatal in babies, and it causes painful bone deformities in older children and adults.[50]

An enzyme is a substance that speeds up (catalyses) a chemical reaction in the body. Without enzymes, these reactions would happen more slowly, affecting the body's ability to function. One of these enzymes is called tissue nonspecific alkaline phosphatase (TNAP). The body uses TNAP to build and maintain bones in a process known as mineralisation. HPP is caused by a change (or mutation) to the gene that produces TNAP.[51] This genetic mutation results in a shortage of TNAP, which slows down mineralisation and causes HPP.

A series of phase II-III clinical trials generated evidence on the efficacy and safety of a lab-produced version of TNAP designed to fill this shortage and treat the symptoms of HPP.[52-53] To generate additional evidence, a real-world study was established in 2017 as part of a managed access agreement between NICE, NHS England, the manufacturer, and a relevant patient organisation.[50] The study involved 11 sites in England and involved 54 patients.

This study enabled the collection of real-world data on how the treatment impacted patients' health and quality of life. This evidence was then used to inform NICE's decision in 2023 to recommend the treatment for routine use in patients with paediatric-onset HPP.[54]

Anna Turner was diagnosed with HPP soon after being born. She was able to receive its treatment on a 'compassionate use' basis before then participating in the managed access data collection programme. Anna's data was subsequently collected in this real-world study, and her family was happy to do that. The ABPI spoke to Anna's mother, Jenna, to get her perspective on the value of clinical studies:

> *"Before Anna was treated, she was ventilated and very weak. Most children with HPP go into respiratory distress, as their bones don't grow but their lungs do. We were told that she would suffocate, and we would have maybe six months."*
>
> *"I thought at the time – we have to try something and if this medicine doesn't help my child, they might be able to make changes so that it will at least help someone else's."*
>
> *"Clinical trials are simply essential. Without them Anna would not be here today."*

Case study: Advanced melanoma

Bristol Myers Squibb

Melanoma is a type of skin cancer. Around 17,500 people are diagnosed with Melanoma in the UK each year, and it is the fifth most common cancer in the UK.[55] This clinical trial specifically looked at advanced (or metastatic) melanoma. This type of melanoma has spread from where it started to another part of the body. A decade ago, when this clinical trial started, around 25% of patients with advanced Melanoma were alive one year after being diagnosed.[56]

Immunotherapy is a treatment that uses the body's immune system to treat disease. This phase III clinical trial tested two immunotherapies, separately and in combination, as treatments for advanced melanoma. The clinical trial involved patients in 22 countries, with 7 study sites recruiting adult patients with melanoma in the UK.[57] A total of 1,296 participants were recruited to the clinical trial globally, which began in 2013 and ended in 2016.[57] The clinical trial then continued to collect long-term data on the participants' health, with the latest data released in 2024.

The clinical trial discovered that patients treated with both immunotherapies experienced higher rates of survival, compared with patients treated with just one immunotherapy. Of the patients who received both immunotherapies, 43% were still alive 10 years after entering the clinical trial.[56]

As a result, the combined immunotherapy treatment was approved for use in patients with advanced Melanoma in 2016.[58]

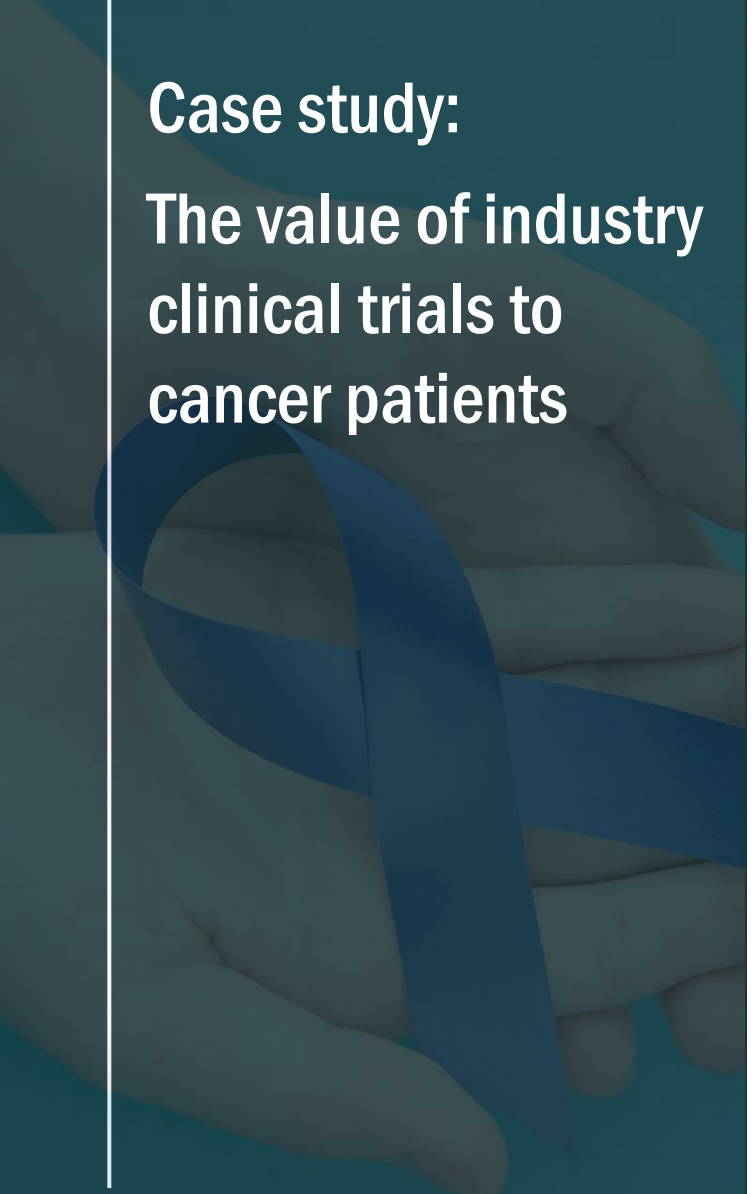
Lucy Davis joined the clinical trial after being diagnosed with stage 3 melanoma. After receiving surgery to remove the cancer in 2011, Lucy was told in 2013 that the disease had progressed to stage 4 and that she had only months to live:[59]

> *"Before I started the trial I was really ill, I could barely eat, I was losing weight and was in a lot of pain, but three months later I felt completely different, my appetite was back and scans showed that the treatment was working,"*

> *"My children were five and seven years old when I received the news that I had just months to live; and they are now 16 and 18. I have been able to see them complete their exams and go to college, which is absolutely amazing."*

Case study:

The value of industry clinical trials to cancer patients



Of the 411 industry clinical trials started in the UK in 2022, 139 were focused on trialling innovative cancer treatments, involving approximately 3,400 patients.* To understand how industry clinical trials affect cancer patients, Frontier Economics interviewed a pharmaceutical company that funds cancer trials, an NHS researcher who delivers these trials, and a cancer charity that enables patient involvement in research.

All three stakeholders said the key benefit for patients is the opportunity to access innovative treatments that are not available on the NHS. Whilst treatments being trialled are not guaranteed to lead to better health outcomes,† examples that do work were described as "transformative" by the cancer charity. Enabling access to these treatments was the primary motivation for NHS hospitals to get involved in clinical trials, particularly for innovative treatments that look particularly promising for their specific patient cohort.

> *"We are never going to get tired of having access to novel treatments. When it's clear that a class of treatment will become important for treating a certain condition, and it's the right treatment at the right time for our patients, we aim to be a leading recruiter for the study because we understand the benefits."* ***(NHS principal investigator)***

> *"Clinical trials offer patients the opportunity to access treatments that are not yet available on the NHS and that gives patients hope."* ***(Cancer charity)***

Clinical trials were also discussed as one way in which cancer patients could access a line of treatment outside of the usual NHS programme of care, although the overall clinical benefit of doing so will depend on each individual patient.

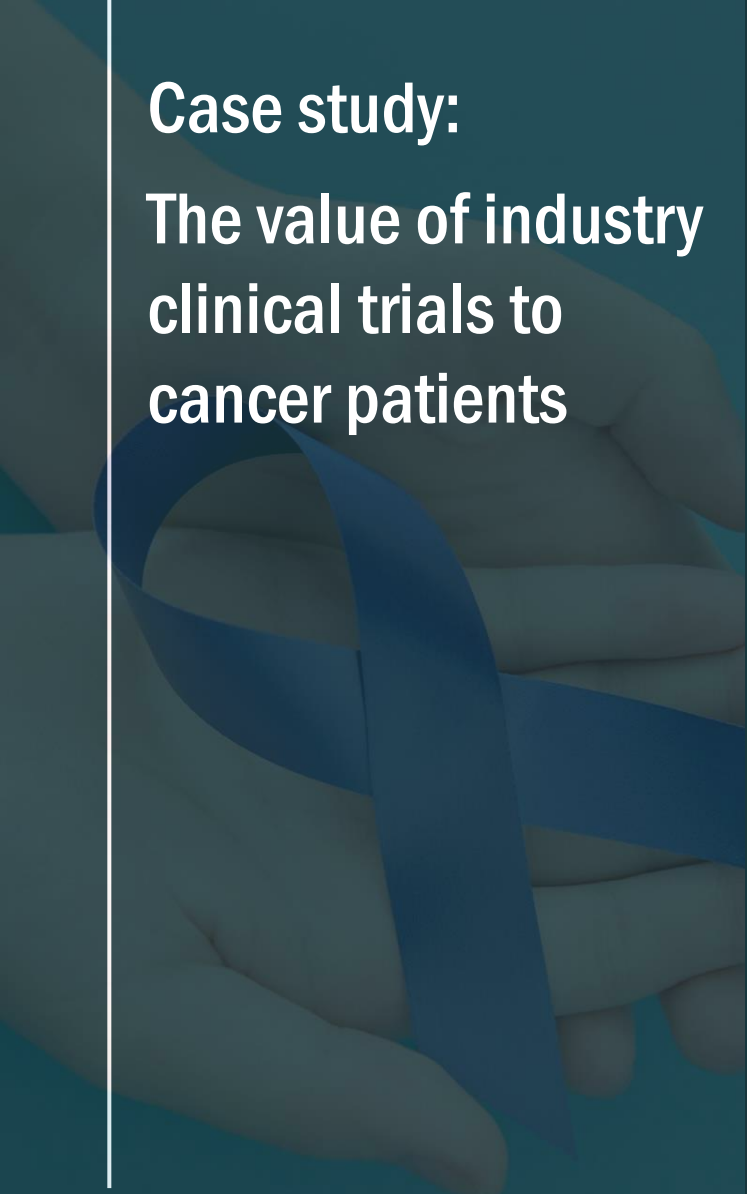
> *"Sometimes a clinical trial is the only way to access some of these cancer treatments earlier. For example, if the registrational study trial population is based on a heavily pre-treated population,‡ it gives scope to investigate bringing innovative treatments into earlier lines of therapy, benefitting patients sooner."* ***(Industry representative)***

> *"Patients do get an additional line of therapy, but whether it is positive or not will depend on the individual patient. If it works for them then that's great, but it could also lead to toxicity. Patients become frailer with each line, so each time you want to use the best treatment you can."* ***(NHS Principal investigator)***

* Patient number estimate based on analysis of NIHR statistics reported by ICR, which has 16651 oncology patients recruited in England from 2017/18-2020/21. Comparing with 812 UK oncology trials in the period, and scaling England patient recruits total to UK by 1.19, suggests 24.4 patients recruited per oncology trial. Over the 139 trials started in 2022, this implies 3,396 patients.

† The nature of treatments at clinical trial stage means that there are both risks and benefits associated with clinical trials participation. The overall impact will vary by individual trial and patients. The report was reviewed for accuracy by the organisations interviewed.

‡ Pre-treated patients refer to patients who have previously received treatment for that specific cancer type.



Case study:

The value of industry clinical trials to cancer patients

Several other areas of potential clinical benefit were discussed. Clinical trials are typically highly structured in the number of patient visits and assessments, which often leads to more frequent diagnostic testing and assessment than they might otherwise receive.

> *"Some patients feel that because there are trial nurses, they might be monitored and followed-up a bit more regularly and you might get more investigations and scans than you would do otherwise. But there's pros and cons, sometimes clinical trial protocols are more rigid in what care you can provide."* ***(NHS principal investigator)***

Aside from the clinical benefits of participating in clinical trials, stakeholders also discussed the value that patients may gain from supporting clinical research. Patients feel that they are part of something that not only could bring them benefits, but also benefit people in the future.

> *"One of the reasons people join our patient and carer research panel is that they want to make a difference. They want to leave a legacy."* ***(Cancer charity)***

When asked about the impact of increasing the number of industry clinical trials on patients, stakeholders spoke about increasing opportunities for patients to access innovative treatments as well as expanding the number of NHS hospitals involved in clinical research.

> *"It would mean that patients wouldn't feel like they are in a two-tier system. It would give them hope. If we had a greater diversity of clinical trials, we'd have more real-world evidence and the possibility of getting drugs into the pathway."* ***(Cancer charity)***

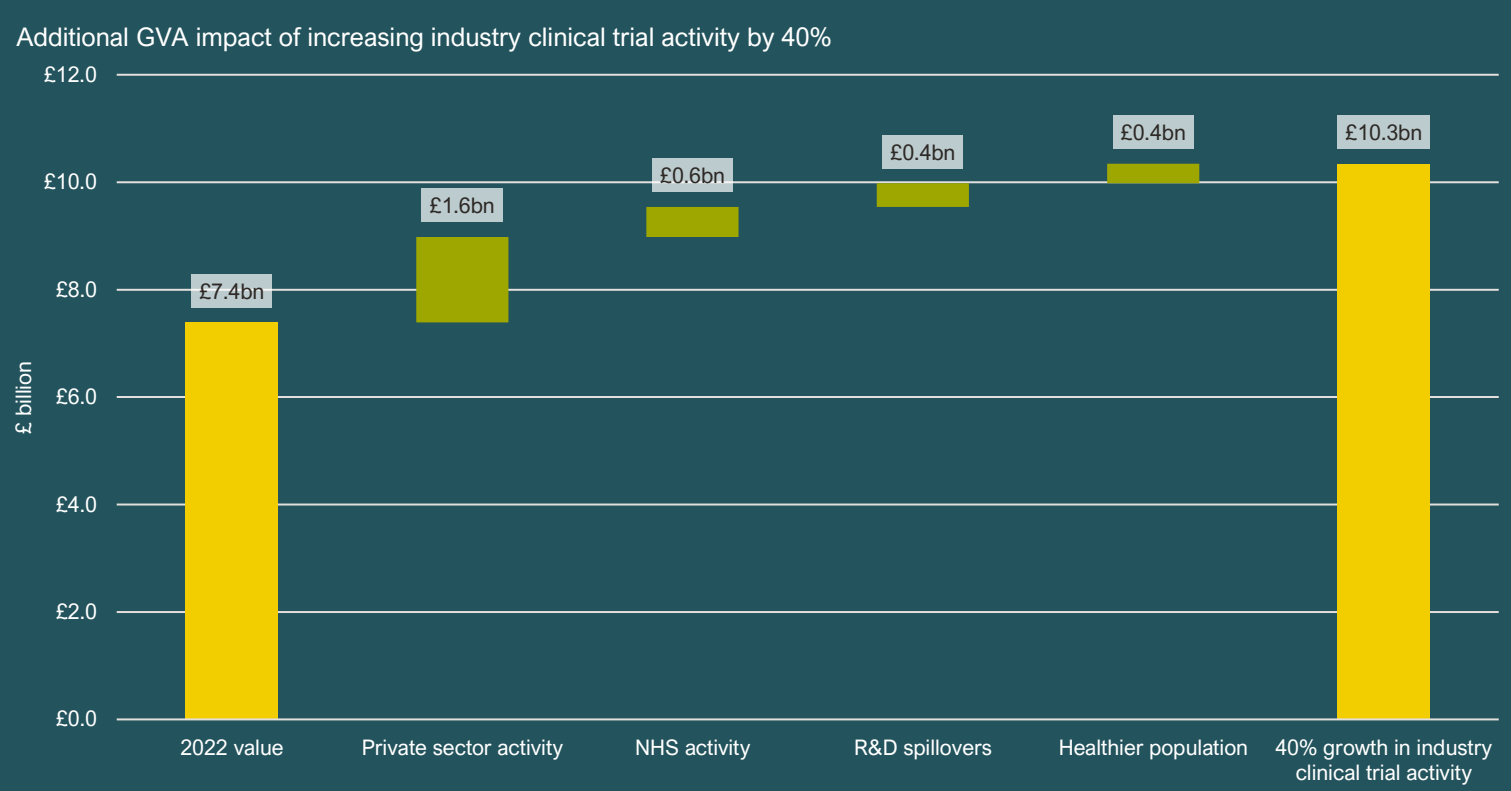
Restoring the UK's capacity to deliver industry clinical trials would significantly advance the government's NHS and economic growth missions

Increasing UK industry clinical trial activity by 40% (comparable to 2017 levels) would generate:

£3 billion of additional GVA for the UK economy.

26,000 additional jobs, **5,000** of which are in the NHS.

1.1 million additional avoided sick days from improved quality of care, leading to a healthier population.



What's the opportunity?

While the UK remains active in the global clinical trial market, both the number of industry clinical trials initiated in the UK and number of participants recruited have been declining since 2017.[30] Frontier Economics investigated the opportunities available to the UK if investments in its capacity for industry clinical research enabled a 40% increase in industry clinical trial activity (that is, a rise comparable to 2017 levels).

The economic opportunity

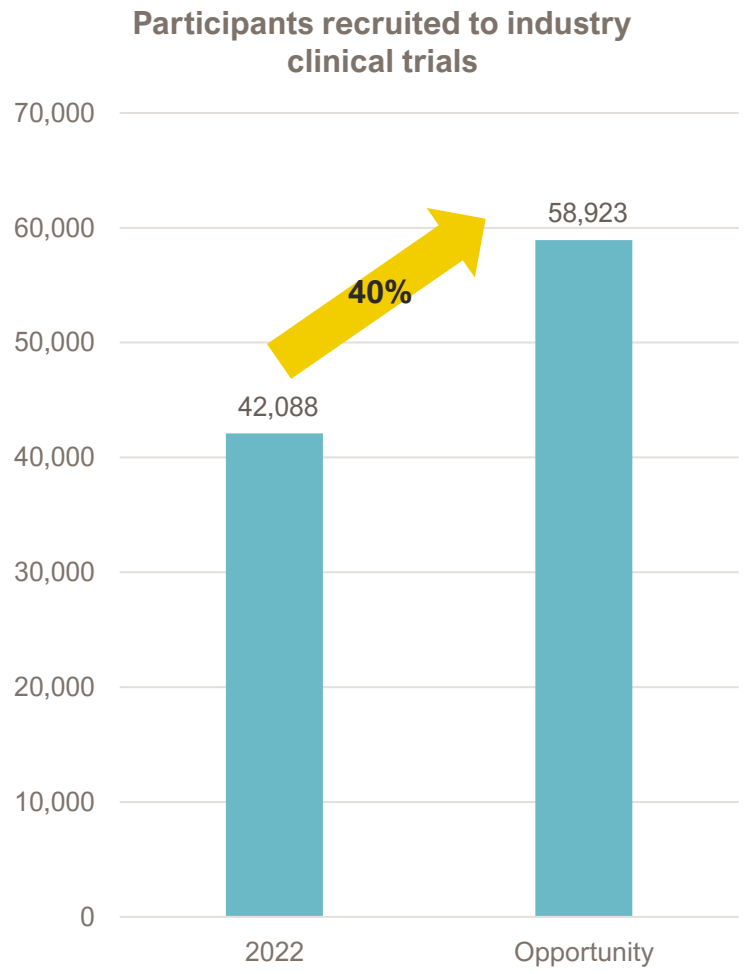
Assuming that the average cost of industry clinical trials (in 2024 prices) remains the same, growth in the number of patients recruited (and trials initiated assuming average patients per trial remains the same) would lead to an **additional £3 billion of GVA for the UK,** made up of:

- £1.6 billion generated from the direct, indirect, and induced effects of additional people employed in industry.
- £0.6 billion generated from the direct, indirect, and induced effects of additional NHS clinical research activity (this estimate is more uncertain and is excluded from the lower range of the estimate above).
- £0.4 billion created by R&D spillovers.
- £0.4 billion attributed impact from avoided sick days due to improved quality of care in hospitals that participate in research, equivalent to 1.1 million additional avoided sick days.

This growth in the clinical research sector would create 26,000 additional jobs, 5,000 of which are in the NHS.

Opportunity for the NHS

This additional industry clinical trial activity would generate **£485 million of commercial revenue for the NHS,** enabling **5,000 additional NHS jobs.** Growth in industry clinical trial recruitment would also increase the number of patients receiving industry-funded treatments, leading to additional cost savings for the NHS over and above this revenue.



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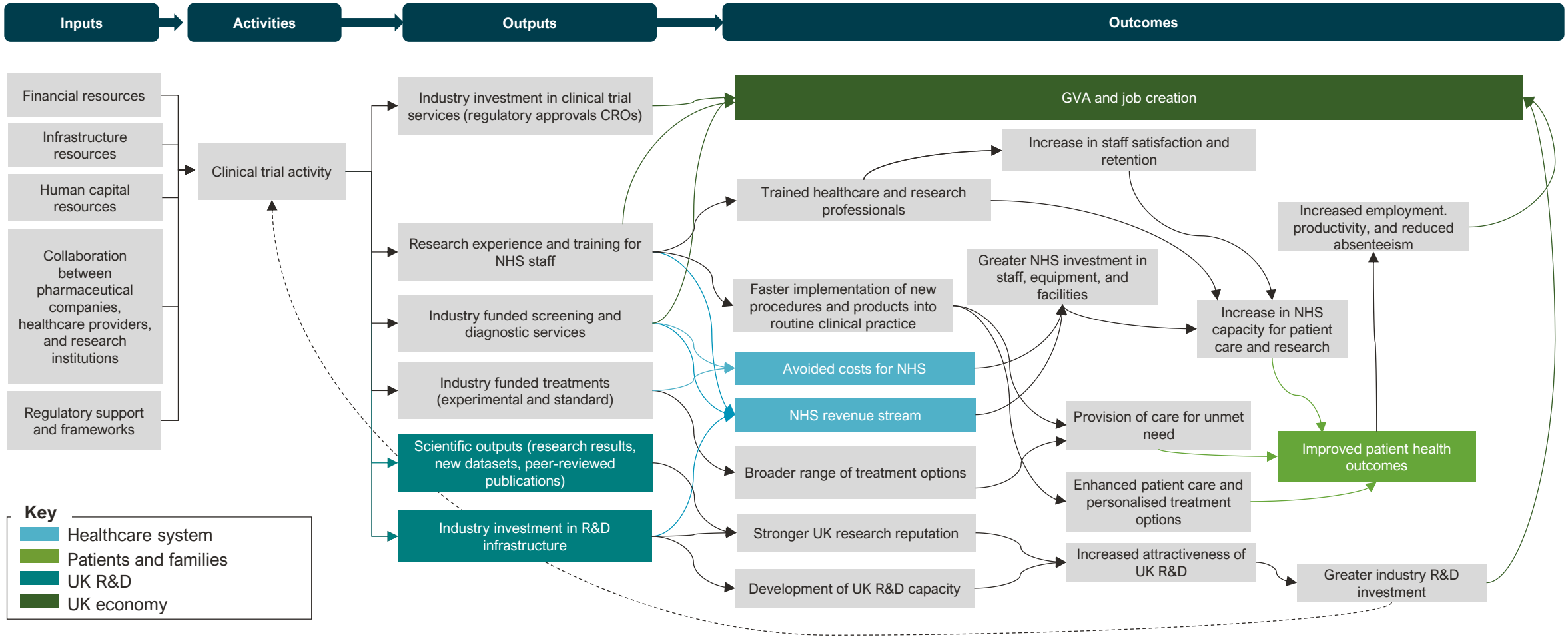
Technical appendix

Glossary

ABPI	The Association of the British Pharmaceutical Industry
Category Normalised Citation Impact (CNCI)	Citation rates vary between research fields and with time. Consequently, analyses must take both publication field and year into account. In addition, the type of publication will also influence the citation count. For this reason, only citation counts of papers (as defined below) are used in calculations of citation impact. The standard normalisation factor is the world average of citations per paper for the year and subject category in which the paper was published. This normalisation is referred to as 'rebasing' the citation count. A CNCI value of more than 1.0 indicates performance higher than the world average for the relevant publication field, year, and document type.
Citation count	The citation count is the number of times that a citation has been recorded for a given publication since it was published. Not all citations are necessarily recorded since not all publications are indexed. The material indexed by Clarivate, however, is estimated to attract about 95% of global citations.
Citation impact	Citations per paper is an index of academic or research impact (as compared with economic or social impact). For a single paper, raw citation impact is the same as its citation count. For a set of papers, it is calculated by dividing the sum of citations by the total number of papers in any given dataset. Impact can be calculated for papers within a specific research field such as clinical neurology, or for a specific institution or group of institutions, or a specific country. Citation count declines in the most recent years of any time period as papers have had less time to accumulate citations (papers published in 2007 will typically have more citations than papers published in 2010).
Clinical trial sponsor	The organisation that has overall responsibility for running the clinical trial. This can be different from the organisation that funds the research.
Commercial collaborative studies	Commercial collaborative studies are typically funded, either wholly or in part, by the life sciences industry and sponsored by a combination of industry and non-commercial organisations.
GVA (direct, indirect, and induced)	Gross value added (GVA) measures the contribution of a specific sector to the overall economy. GVA impacts are often split into direct, indirect, and induced impacts. Direct impacts refers to changes in the value of goods and services produced by that industry. Indirect impacts refer to changes in the use of inputs across their supply chain. Together, direct and indirect impacts will impact the level of household income of employees, some of which will be re-spent on buying products. This known as the induced impact.
Industry clinical trials	Industry clinical trials (also known as commercial contract studies) are sponsored and fully funded by the life sciences industry.
Publications	A collection of research outputs regardless of document type, as indexed in the Web of Science™. In addition to articles and reviews, publications can cover a wide range of document types such as books, conference proceedings, editorial material, bibliographies, meeting abstracts, etc. While these are all relevant forms of scholarly communication, only articles and reviews (that is, papers) are considered in citation analyses.
Papers	A subset of publications consisting of 'articles' and 'reviews' only. Articles are reports of original research published in a peer-reviewed journal and/or presented at a symposium. Reviews are renewed studies of previous research, such as literature reviews and meta-analyses. Papers are the primary means of scholarly communication and considered the most informative for citation analysis. All citation-related results in this report (except patent citations) are therefore based on papers only.
Highly Cited Papers (HCPs)	Highly Cited Papers are papers that are recognised as having a greater impact than other papers published in a similar year and field. For a paper to be considered highly cited it must be in the top 1% in terms of citation frequency, considering the field and year of publication. High citation rates have shown to be correlated with other qualitative research performance evaluations, such as peer reviews.
Non-commercial studies	Non-commercial studies are sponsored and wholly funded by one or more non-commercial organisations, including medical research charities, universities, and public funders.
Web of Science subject categories	Journals are assigned to one or more categories, and every article within that journal is subsequently assigned to that category. Journals in the Web of Science Core Collection can be assigned to up to six categories, which are selected on the basis of a range of criteria including journal subject matter and scope, author and editorial board affiliations, funding agencies providing grant support, cited references as well as citing and cited reference relationships, journal sponsors, and categorisations in other bibliographic databases. The selection procedures for the journals included in the citation databases as well as the scope of each subject category are documented here: http://mjl.clarivate.com/.

Logic model

A logic model was developed to support the identification of potential benefits of delivering industry clinical trials in the UK. This underpins the impact framework.



Overview of impact estimation approach

A mixed-methods approach was applied for estimating the benefits of industry clinical trials to the UK. This brought together evidence generated via several approaches:

- Rapid evidence review of existing published literature.
- Scale of existing estimates of the impact of industry clinical trials to reflect changes in trial activity.
- Analysis of key impact metrics such as NHS commercial revenues.
- Economic impact assessment, using multipliers to estimate the direct, indirect, induced, and spillover economic benefits of clinical trial activity.
- Health economics productivity modelling.
- Bibliometric analysis using a curated database of relevant publications indexed in the Web of Science™.
- What if analysis which scales up modelled benefits based on a theoretical scenario: an increase in clinical trial activity of 40% compared to 2022 levels.

The table below sets out the approaches used to generate evidence for each type of impact in this work:

Benefit area	Benefit type	Approach
UK economy	Direct, indirect, and induced benefits from private-sector activity	Economic impact assessment (income approach)
	Direct, indirect, and induced benefits from NHS activity	Economic impact assessment (income approach)
	Spillover effects from private-sector activity	Economic impact assessment (income approach)
	Impact of a healthier population	Rapid evidence review Health economics productivity modelling (avoided sick days) Case study (colorectal cancer)
NHS	Commercial revenue of industry clinical trials	Analysis of key impact metrics
	NHS clinical research workforce	Economic impact assessment (income approach)
UK R&D base	Volume and impact of industry clinical trial-enabled research	Bibliometric analysis

Benefits to the UK economy: Approach

Direct, indirect, and induced benefits from private-sector activity

An 'income approach' was used to measure Gross Value Added. This assumes that the total payroll cost corresponds to the value added, plus associated profit margin (some of the value added is captured by the owners as profit (item D).

This amount was further scaled to account for the fact that only a subset of pharmaceutical R&D is in trials (B), there will be trials involving medical devices that are not captured in the pharmaceutical industry total (C), as well as inflation (E). This gives 'direct' GVA of £1.93 billion. The proportion of clinical trials that are concerned with medical devices was provided by NIHR based on their 2023/24 clinical trial portfolio.

Multipliers were then applied to account for:

- Indirect GVA from activity and output supported in the supply chain.
- Induced GVA as direct and indirect employees spend their money elsewhere in the economy.

This gives total GVA of £3.99 billion.

Employment follows the structure as the GVA calculation.

R&D employment was measured using ONS BERD and the same scaling factors were applied to account for the share of clinical studies in R&D and uplift for medical devices. Note that the 48.4% R&D spend share was used as no comparable employment statistic is available. Thus, it is implicitly assumed that clinical trials have the same GVA per employee as other types of pharmaceutical R&D. Multipliers were than applied to account for indirect and induced employment. This gives total employment of 42,300.

Item		Value	Source
Payroll costs in pharmaceutical R&D (2022)	(A)	**£3,116m**	ONS BERD (2022)
Proportion of pharmaceutical R&D spent on clinical studies*	(B)	48.4%	PhRMA survey (2023)
Uplift for proportion of clinical trials involving medical devices	(C)	13%	NIHR
Profit margin	(D)	2%	Deloitte (2018)
Inflation to scale 2022 estimates to 2024 prices	(E)	9.5%	ONS CPIH
Direct GVA	(F)	**£1,934m**	A*B*(1+C)*(1+D)*(1+E)
Type 1 GVA multiplier parameter	(G)	0.67	ONS (2020)
Type 2 GVA multiplier parameter†	(H)	0.39	Scottish Govt+ONS(2020)
Indirect GVA	(I)	**£1,304m**	(F)*(G)
Induced GVA	(J)	**£746m**	(F)*(H)
Total GVA	(K)	**£3,994m**	(F)+(I)+(J)

**The proportion of pharmaceutical spend on R&D on clinical studies is based on phase 1/2/3 trials. Phase 4 trials represent a further 11.5%*
†Type 2 multipliers are reported by the Scottish Govt but not ONS. The ratio of Type 2 to Type 1 reported by Scottish Govt is applied to the ONS Type 1 multiplier to give a Type 2 estimate

Item		Value	Source
Employment in pharmaceutical R&D	(A)	**38,000**	ONS BERD (2022)
Proportion of pharmaceutical R&D spent on clinical studies	(B)	48.4%	PhRMA survey (2023)
Uplift for proportion of clinical trials involving medical devices	(C)	13%	NIHR
Direct employment	(D)	**21,100**	A*B*(1+C))
Type 1 Employment cost multiplier parameter	(E)	0.70	ONS (2020)
Type 2 Employment multiplier parameter	(F)	0.30	ONS+Scottish Govt(2020)
Indirect employment	(G)	**14,700**	(D)*(E)
Induced employment	(H)	**6,400**	(D)*(F)
Total employment	(I)	**42,300**	(D)+(G)+(H)

Benefits to the UK economy: Approach

Direct, indirect, and induced benefits from private-sector activity: Comparison with previous estimates

The estimates of direct, indirect, and induced benefits from private-sector industry clinical trial activity are considerably larger than previous estimates calculated for the NIHR (£1.5 billion GVA and 23,000 employees in 2018/19) despite adopting the same overarching approach. Partly, this reflects differences in scope (UK-wide rather than England-only, all commercial activity rather than just CRN-supported) as well as inflation. However, the key driver is the substantial increase in R&D activity shown in BERD. There has been a recent revision to the BERD methodology that has significantly increased estimates, principally involving estimates for small firms.

If this revision has materially impacted estimates, there would be large jumps as the methodology changes. Unfortunately, it is not possible to explore this systematically, as the available data points vary over time, with revised estimates for 2020 and 2021 only recorded down to the level of an aggregated 'chemicals and pharmaceuticals' category, and payroll costs not reported for 2020 or 2021. As can be seen in the table to the right there is no change in employment for the 'chemicals and pharmaceuticals' group with the revision change, while expenditure sees a 20% increase. However, there are substantial increases in 2021 and 2022, all of which points to significant growth. This is also consistent with pharmaceutical employment growth from 30k in 2020 under the old methodology to 38k in 2022, a 27% increase.

Payroll costs for 2020 are not available on the revised basis but comparing 2020 on the old methodology with 2022 on the new methodology, there is a 47% increase. This would suggest GVA per employee rose 16% over the period, which exceed inflation. This is also corroborated by other information on pay, with the Annual Survey of Hours and Earnings dataset (ASHE) showing a 43% increase in annual pay (from £43,000 in 2020 to £61,000 in 2022).

ONS BERD data

	2014	2015	2016	2020 (old)	2020 (revised)	2021	2022
Employment ('000s)							
All sectors	192	206	210	283	629	712	652
Chemicals	8	8	10	9			8
Pharmaceuticals	24	24	24	30			38
Chemicals and pharmaceuticals	32	32	34	39	38	39	46
Expenditure (£m)							
All sectors	19,935	20,885	22,224	26,937	43,995	46,929	49,942
Chemicals	682	826	1,020	814			861
Pharmaceuticals	3,924	4,178	4,122	5,017			8,961
Chemicals and pharmaceuticals	4,606	5,004	5,142	5,831	7,083	8,200	9,822
Payroll costs (£m)							
All sectors	9,489	10,238	10,504	13,657			27,770
Chemicals	319	401	469	362			464
Pharmaceuticals	1,676	1,796	1,761	2,114			3,116
Chemicals and pharmaceuticals	1,995	2,197	2,230	2,476			3,580

Benefits to the UK economy: Approach

Direct, indirect, and induced benefits from NHS activity

Commercial revenues to the NHS was used as the basis for this calculation (see page 33). Estimates from prior analysis of NHS Trust data was applied, which found that staff costs make up 62% of total clinical research costs.* Using the same GVA income approach as previously, this suggests the commercial research activity carried out in the NHS has a direct GVA of £752 million. Multipliers were then applied, which brings the total GVA up to £1,403 million.

The direct GVA estimate was then converted into a corresponding direct employment figure by applying ONS GVA per employee estimates for SIC code 86. This gives direct employment of 13,300 workers (FTE). Employment multipliers are then applied, which brings the total up to 22,500.

**The proportion of pharmaceutical spend on R&D on clinical studies is based on phase 1/2/3 trials. Phase 4 trials represent a further 11.5% but are out of scope for this work.*

†Type 2 multipliers are reported by the Scottish Govt but not ONS. The ratio of Type 2 to Type 1 reported by Scottish Govt is applied to the ONS Type 1 multiplier to give a Type 2 estimate.

Item		Value	Source
GVA calculation			
Total value of payments	(A)	£1,212m	
Payroll as share of expenditure in NHS Trust	(B)	62%	KPMG (2019)
Direct GVA	**(C)**	**£752m**	**(B)*(C)**
Type 1 GVA multiplier parameter SIC 86	(D)	0.50	ONS (2020)
Type 2 GVA multiplier parameter SIC 86	(E)	0.37	ONS + Scottish Govt (2020)
Indirect GVA	(F)	**£372m**	(C)*(D)
Induced GVA	(G)	**£279m**	(C)*(E)
Total GVA	(H)	**£1,403m**	(C)+(G)+(H)
Employment calculation			
GVA per employee SIC 86 (2022 prices)	(I)	£51,128	ONS
Inflation from 2022 to 202	(J)	10.2%	ONS
GVA per employee SIC 86 (2024 prices)	(K)	£56,328	(I)*(J)
Direct employment	**(L)**	**13,345**	**(C)/(K)**
Type 1 employment multiplier parameter SIC 86	(M)	0.40	Scottish Govt(2020)
Type 2 employment multiplier parameter SIC 86	(N)	0.28	ONS + Scottish Govt(2020)
Indirect employment	**(O)**	**5,300**	**(L)*(M)**
Induced employment	**(P)**	**3,800**	**(L)*(N)**
Total employment	**(Q)**	**22,500**	**(L)+(O)+(Q)**

Benefits to the UK economy: Approach

Economic spillovers

As with other forms of R&D, clinical trials give rise to the creation of knowledge that can be used by other firms and open up new areas of treatment that other firms can become active in. They also stimulate activity in a productive sector of the economy and employ a skilled workforce who can benefit other firms when they move jobs, either within or outside the sector. All of this means that the 'social' economic return of clinical research may be wider than the private economic return to the firm undertaking the R&D.

Using the same BERD data used for the commercial GVA calculation, annual R&D investment is £5.5 billion (2024 prices). This comes from taking the £9.0 billion pharmaceutical figure from BERD and applying the 48.4% clinical trials share, 13% medical device uplift, and adjusting for inflation.

A broad literature has estimated the rate of return on R&D and the spillovers. A previous meta-analysis finds central estimates of a private rate of return to R&D of 20% and a social rate of return of 40%, with the difference between the two interpreted as the spillover.[6]

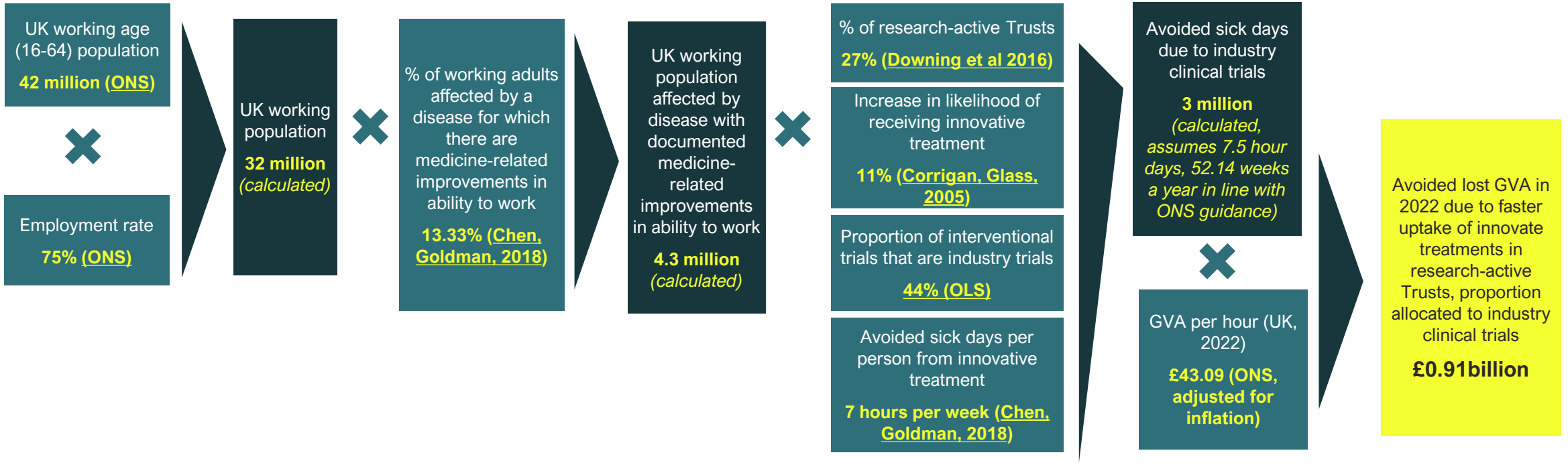
A report by York University for NIHR focuses on R&D in the biomedical industry and reaches a consensus spillover figure of 30%.[7] This includes a result from Garau and Sussex (2007)[8], which finds the rate of return generated by investment in R&D by two UK private-sector pharmaceutical companies in the UK was 51%, of which 14% was captured by the investing firm, 26% was captured by other firms in the same sector, and 11% was captured in other non-pharmaceutical sectors of the UK economy.

Applying the 20% spillover parameter would suggest spillovers in the order of £1.1 billion.

Benefits to the UK economy: Approach

Avoided absenteeism

Evidence has been drawn from the rapid evidence review to estimate the attributable impact of industry clinical trials to improved patient outcomes from hospitals with research participation, and the impact this has on UK GVA via avoided sick days. The approach used by Chen and Goldman[20] was used to estimate the population-wide productivity impacts of new treatments. They found that in the absence of new treatments, hours worked per person would have fallen by 7 hours a week. Evidence from Corrigan and Glass[18] found that at 18 months after launch, 23% of consultants that participated in clinical research had prescribed the new treatment compared to 12% of consultants who did not. Finally, evidence from Downing et al (2016)[13] was used to estimate the proportion of NHS Trusts that are 'research-active' to reach an estimate of avoided sick days due to hospital participation in research. 44% of this was attributed to industry clinical trials based on the proportion of interventional trials in 2022 that were industry clinical trials.



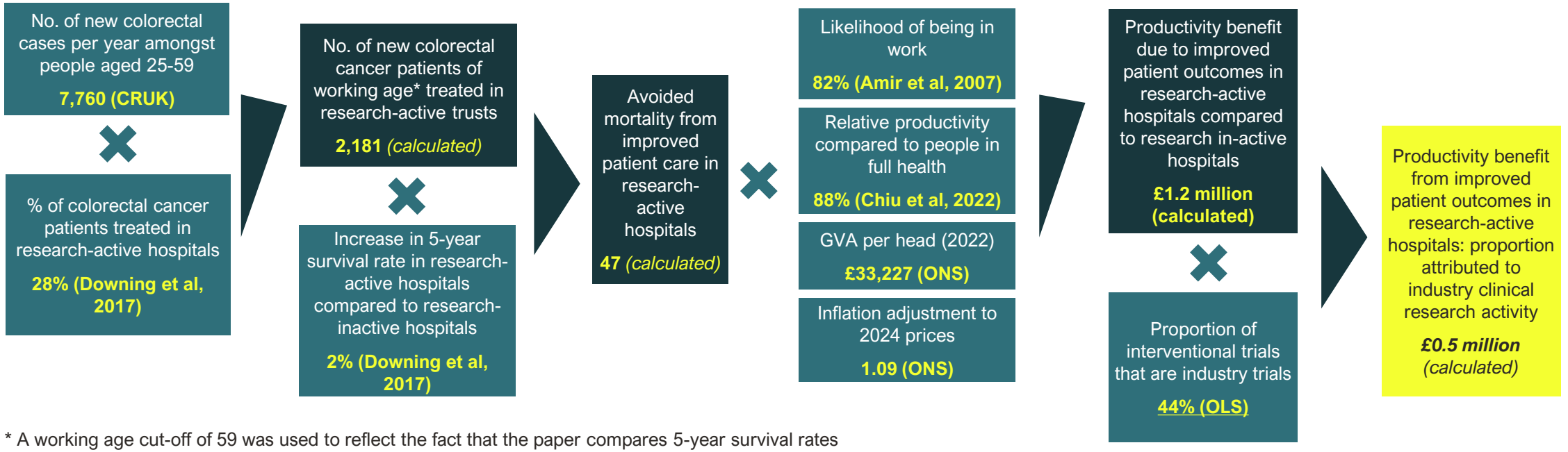
This study quantifies potential GVA benefits from avoided absenteeism. However, this is likely to be only a subset of the total productivity benefits associated with industry clinical trials and their role in accelerating the uptake of innovative treatments. Other benefits that have not been quantified include:

- Benefits of avoided mortality from other disease areas aside from colorectal cancer.
- Increase in productivity per hour worked associated with improved health outcomes.
- Increase in GVA due to higher labour force participation. For example, research into the use of radiation therapy for breast cancer found that it reduced the risk of being on welfare by 33-41%.[22]
- Increase in GVA from reducing absenteeism of carers. For example, taking a multi-pronged approach to treating coronary heart disease increases family income by 4% compared to 3% for the patient.[23]

Benefits to the UK economy: Approach

Case study: Improved patient outcomes for colorectal care

Research by Downing et al (2016)[13] has shown that surgical colorectal cancer patients treated in hospitals with high research participation have better outcomes. The study looked at average outcomes across all patients treated with major resection, not just those that were participating in clinical trials at the time. It found that being treated in Trusts with high participation in interventional clinical research is independently associated with better outcomes, and this effect applies across all NHS Trusts that provide care for patients with colorectal cancer. Findings from this research have been used to estimate the productivity impacts associated with improved patient outcomes. A proportion of these benefits was attributed to industry clinical trials based on their share of interventional trials in 2022/23 to reflect the role that industry trials play in creating opportunities for hospitals to participate in clinical research.



* A working age cut-off of 59 was used to reflect the fact that the paper compares 5-year survival rates

Benefits to the NHS: Approach

Commercial revenues

Commercial revenues were calculated using an average per-patient payment provided by the NIHR.

The average amount paid to the NHS by commercial studies supported by the NIHR CRN (excluding other parts of the NIHR) in 2022/23 was £851 million. The NIHR advised us that this was based on expected recruitment of 32,328 people, leading to an average per patient payment of £26,311. This is a significant increase compared to the average per-patient payment values in the previous analysis for NIHR (£9,189 in 2018/19 prices, £11,458 in 2024 prices).

This was inflated to 2024 prices using CPIH to reach an average per-patient payment of £28,808.

This was then multiplied against a total of 42,088 patients recruited to industry clinical trials in 2022/23 to give a total NHS commercial revenue estimate of £1.2 billion in 2024 prices.

This approach has some limitations:

- Average NIHR per-payment payments have been applied to the devolved authorities.
- Data on average per-patient payments in 2022/23 has been provided by NIHR. This value represents the average across all industry clinical trials (commercial studies) supported by the NIHR Clinical Research Network. However, per-patient payments will vary significantly across individual studies to reflect factors such as specialty, trial, duration, study type, and product type.

Item		Value	Source
Per-patient payment for NIHR CRN commercial trials in 2022/23, 2022/23 prices	(A)	£26,311	NIHR
Inflation	(B)	1.095	ONS
Per-patient payment, 2024 prices	(C)	£28,808	A*B
Number of patients recruited to industry trials in 2022, UK	(D)	42,088	ABPI
Estimated UK commercial revenues	(E)	£1,212,450,303	C*D

Benefits to the UK R&D base: Approach

The following approach was used to carry out the bibliometric analysis for benefits to UK R&D:

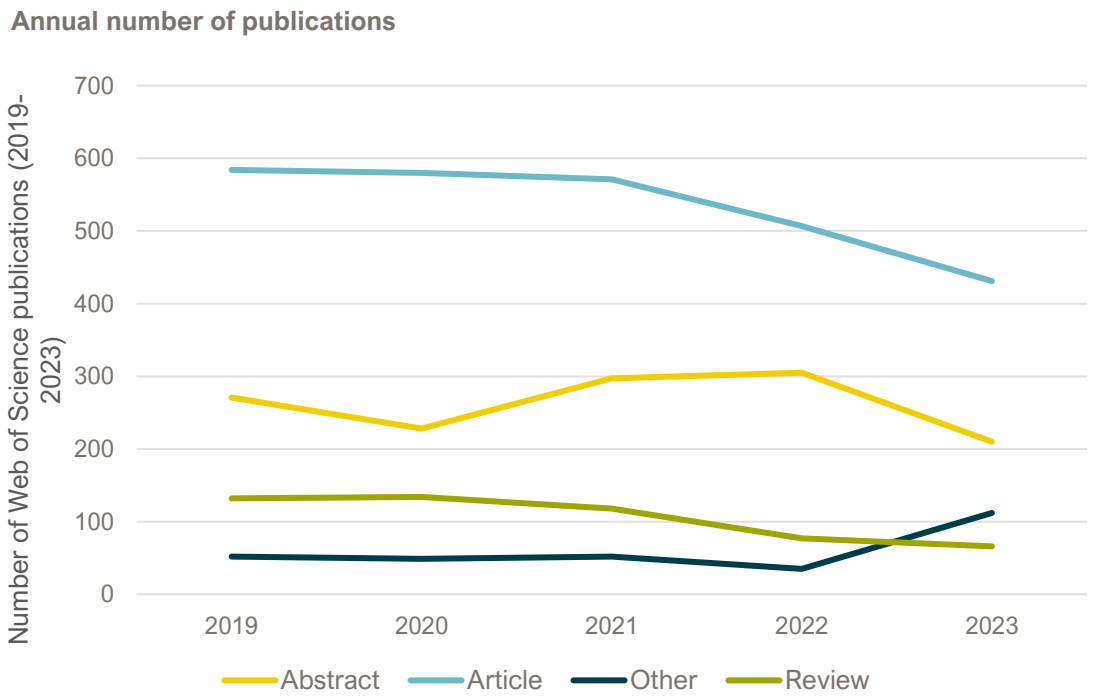
1. **Identification of academic publications related to clinical trials.**
    a. Extraction of publications discussing clinical trials with a UK affiliation and published between 2019-2023 from the Web of Science database
    b. Relevant publications were selected based on their titles and Medical Subject Headings (MeSH terms)
2. **Identification of publications related to clinical trials and with a link to industry.**
    a. Within the initial dataset, publications with a link to industry were identified based on either the affiliations of their authors or funding acknowledgements
    b. Manual checks were conducted to confirm the resulting publications are related to clinical trials that are run or funded by industry. False positives were excluded.
3. **Bibliometric analysis to assess the research performance of UK industry clinical trial publications.**
    a. Number of papers, average citation impact, Highly Cited Papers, citations from patents
    b. Disaggregation of the results by year of publication and subject category (with a focus on oncology and rare diseases)
4. **Collaboration analysis based on co-authors listed on the identified publications.**
    a. Levels of international collaboration between the UK and other countries
    b. Collaboration with the NHS and DHSC (including NIHR and NHS trusts)
    c. Identification of key collaboration partners and recurring collaborative partnerships over time

The main limitation with this analysis is that that papers were included where there is a link to industry based either on author affiliation or funding acknowledgements. It has not been possible to identify whether the specific clinical trial discussed was funded wholly or in part by industry. There is therefore a risk that some of these papers may reference collaborative trials or non-commercial trials. Throughout this work, this has been reflected by presenting the results of the analysis in terms of industry contributions to R&D.

As part of the collaboration analysis, recurring partnerships were identified. Recurring partnerships were defined as pairs of organisations that have co-authored two or more publications. In total, the set of publications related to industry clinical trials include over 297,000 partnerships. Approximately 26% of these are instances where the collaborating organisations co-authored two or more publications together.

Trend analysis

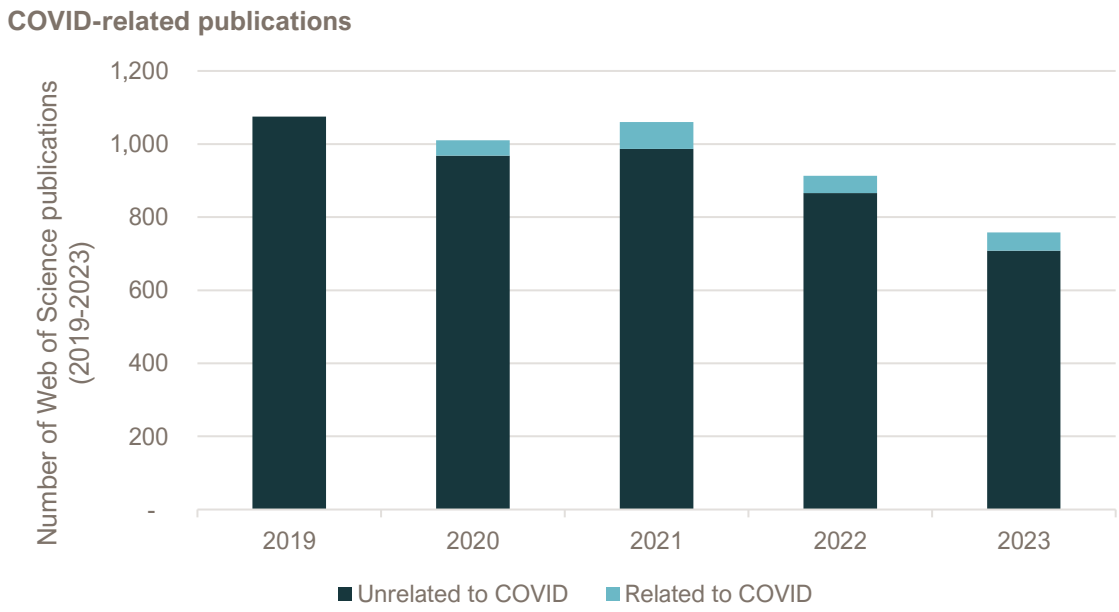
Considering the number of publications per year, a slight downward trend can be observed, particularly in the number of journal articles and reviews published. The relative uptick in 2023 of the number of 'other' document types is largely driven by the publication of early-access materials. It is possible that this reflects a displacement of clinical research activity in favour of other kinds of research following the COVID-19 pandemic.



Effects of COVID-19

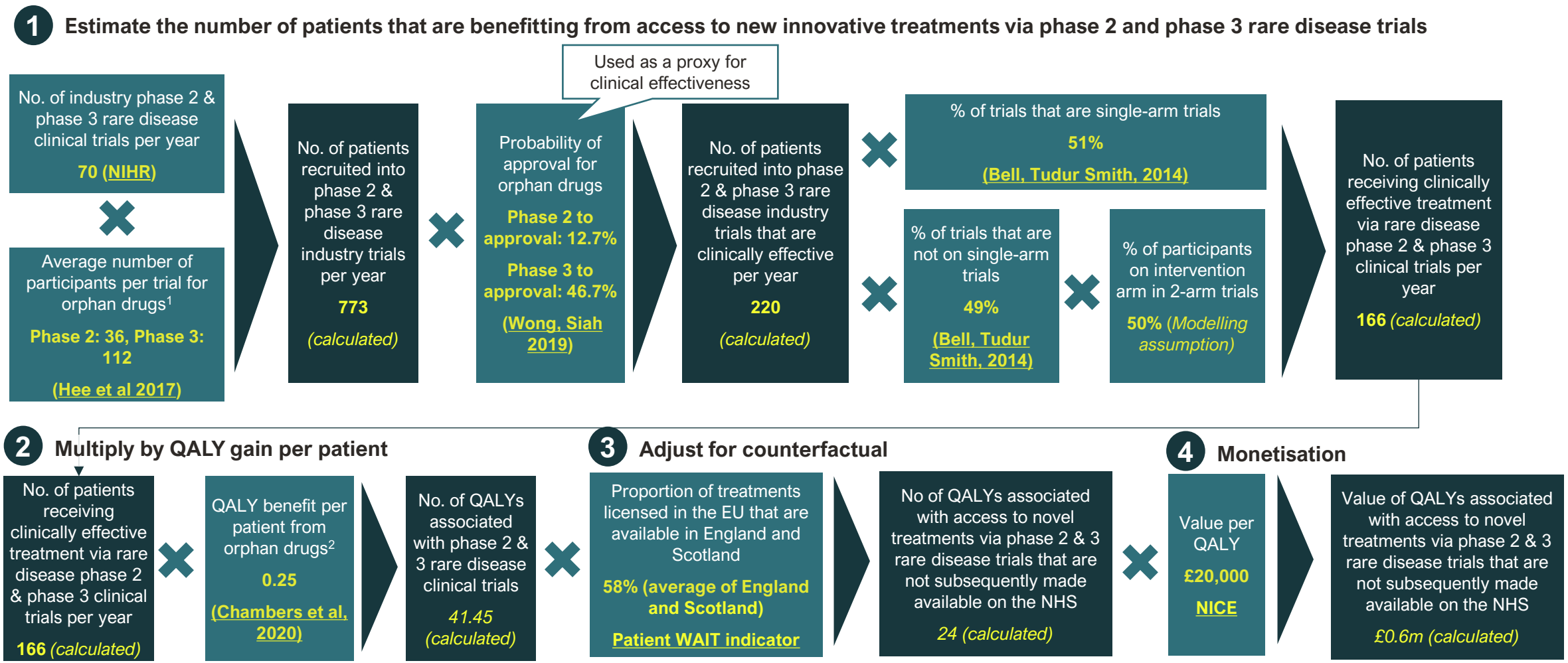
From the total set of publications, the vast majority are unrelated to COVID-19. Approximately 4% (212) of the publications was found to be related to COVID-19. These publications are spread relatively evenly across the years 2020 to 2023 with most appearing in 2021 (34%).

However, the downward trend in publications shown below may be due to reduced numbers of clinical trials during the pandemic (2022 and 2021), accounting for the lag between clinical trial activity and associated publications.



Benefits to patients: Approach

Case study: Health improvements for patients accessing new treatments for rare disease via clinical trials



1 Hee et al (2017) present the median number of participants per trial broken down by prevalence bands. Weighted averages of these using number of trials is used to estimate average number of participants

2 This estimate is based on the median incremental QALY gains compared to previous treatment options for all orphan drugs approved by the FDA from 1999 through to 2015. The individual incremental QALY impact will vary significantly across individual orphan drugs, and ranged from +28.2 years to a negative QALY impact (minimum incremental QALY impact not reported in paper)

Benefits to patients: Approach

Case study: Health improvements for patients accessing new treatments for rare disease via clinical trials

Counterfactual

This work estimates the value of hosting clinical trials in the UK. It is assumed that if a clinical trial is not hosted in the UK, it would still be carried out elsewhere in the world. The evidence generated from these international trials would be used to inform UK medicine approvals by MHRA and NICE. This means that even if a new treatment is not trialled in the UK, it may still be licenced and approved for use in the NHS if it meets the approval criteria.

This counterfactual is reflected in the approach for estimating benefits to patients participating in UK clinical trials. We first estimate the overall QALY benefit to patients accessing new treatments via these trials. We then split this QALY benefit into two categories:

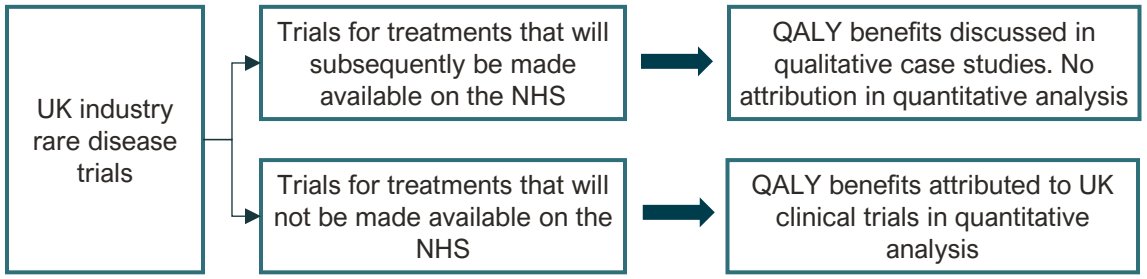
1. QALY benefits associated with new medicines that are not subsequently made available on the NHS.
2. QALY benefits associated with new medicines that will subsequently be made available on the NHS.

For the first group, we attribute the full QALY impact to the incremental benefit of hosting clinical trials in the UK versus anywhere else in the world. Without participation in these industry clinical trials, it is assumed that patients would otherwise have had no opportunity to access these treatments on the NHS.

For the second group, the incremental benefit of hosting clinical trials in the UK is **earlier** access to these treatments. Without these clinical trials, it is assumed patients would eventually have received new treatments once they were approved for use in the NHS.

The benefits of earlier access include the value of time (NICE uses a discount rate of 3.5% whereas the Green Book uses a discount rate of 1.5% per year for QALYs). There are also additional benefits for patients whose condition would otherwise have deteriorated during the time it takes for new treatments to be approved by MHRA and NICE. However, quantifying these benefits would require modelling individual conditions which is out of the scope of this work. We therefore do not attribute these benefits in this analysis but address them in the qualitative case studies.

The proportion of orphan drugs that are not subsequently made available on the NHS is assumed to be 58% which is based on IQVIA research on the availability of EU approved orphan drugs in England and Scotland.



Benefits to patients: Approach

Case study: Health improvements for patients accessing new treatments for rare disease via clinical trials

Value of a QALY

A value of £20,000 per QALY has been adopted for this analysis. This is the lower end of the NICE cost-effectiveness threshold and represents a conservative approach. However, there are several higher QALY values that are routinely used:

- NICE uses QALYs to compare different drugs, devices, and other technologies for different conditions. The threshold over which treatments are less likely to be recommended for use in the NHS is typically between £20,000 and £30,000 per QALY.[47]
- NICE has a separate process for evaluating the cost effectiveness of drugs for rare conditions in England, called the Highly Specialised Technologies (HST) process. This has a higher cost-effectiveness threshold of £100,000.[48]
- This is particularly relevant as this analysis looks at access to innovative treatments for rare disease via industry clinical trials.

In addition to these alternative NICE thresholds, the Government Green Book guidance which is used to appraise policies, programmes, and projects has a value per QALY of £70,000 (20/21 prices).

Adopting any of these higher per QALY values would increase the monetised value of QALYs estimated in this analysis.

Benefits to patients: Approach

Case study: Health improvements for patients accessing new treatments for rare disease via clinical trials

Limitations

There are several limitations that should be taken into account in this analysis.

Data limitations

- The number of patients recruited into industry rare disease industry clinical trials has been estimated using global average recruitment numbers for phase 2 and phase 3 clinical trials. Actual patient numbers were not available for this analysis.
- The definition of rare disease varies across papers. Where we have drawn assumptions from the academic literature, we have not done a detailed analysis to compare rare disease definitions.

Methodological limitations

- QALY benefits are only quantified for patients on phase 2 and phase 3 trials. Patients on phase 1 trials are not included in the analysis due to (1) lack of data on average recruitment numbers, and (2) the fact that phase 1 trials are typically focused on safety rather than clinical efficiency. Exclusion of these patients is not expected to be material as average recruitment numbers per trial are typically lower in phase 1, and probability of success for approval is significantly lower.
- ABPI have advised us that the WAIT indicators that are used to estimate the counterfactual may overestimate access to new medicines which means that the analysis could under-estimate QALY benefits.
- Probability of success for approval is used as a proxy for clinical effectiveness. However, we note that there may be other factors that impact approval by regulators such as the MHRA, EMA, or FDA. As regulatory approval is used as a proxy for clinical efficacy, the model does not account for adverse events in clinical trials of medicines that did not reach and pass the regulatory approval stage.
- More broadly, this analysis only looks at the potential benefits of innovative treatments for rare disease. It does not account for potential negative impacts of clinical trial participation such as risk of adverse events. ABPI have advised us that the risks of adverse events in clinical trials, from a health technology assessment perspective, are negligible compared to the potential benefits. Other potential disbenefits such as the need for additional travel or cost such as childcare have not been accounted for.