Impact: Investing in Medical Research for the UK's Health and Wealth

July 2014

cruk.org

CANCER RESEARCH UK

CANCER RESEARCH UK

Cancer Research UK spends more than £330 million each year funding medical research in the UK. Research saves lives by developing new ways to prevent, control and cure cancer.

Our vision is to bring forward the day when all cancers are cured. In the 1970s, less than a quarter of people with cancer survived. But over the last 40 years, survival has doubled – today half will survive. Our ambition is to accelerate progress and see three-quarters of people surviving the disease within the next 20 years[1].

Cancer Research UK does not receive any Government funding for our research; our work to bring forward the day when all cancers are cured is made possible due to the overwhelming generosity of our supporters.

This report was written by Jennifer Boon, Daniel Bridge and Dr Hollie Chandler with input from Cancer Research UK staff and funded researchers.

For more information please contact hollie.chandler@cancer.org.uk 0203 469 5337

[1] http://www.cancerresearchuk.org/sites/default/files/cruk_research_strategy.pdf

EXECUTIVE SUMMARY

The Government was right to continue its support for medical research in the 2013 comprehensive spending review following its initial protection of the budget in 2010. A guarantee of sustained future investment in research provides confidence for industry to invest in the UK and delivers clear and substantial improvements in the health of the UK population[2].

As we approach the next general election, the benefits derived from this support must not be lost; it is vital that the next Government ensures that support for medical research continues now, and in the future. Cancer Research UK calls on the next Government to:

- Maintain current spend on science and research and the diversity of funding streams, so that patients and the public can continue to reap the benefits of a vibrant medical research sector. The UK's investment in medical research must be protected by continuing the ring fence of the science budget for the Research Councils, the National Institute for Health Research (NIHR) and the Higher Education Funding Councils.

- Maintain commitment to a long-term plan to support both recurrent (resource) spending on science and capital spending on research infrastructure. This will help provide certainty for future funding decisions and give confidence to charitable funders, industry and scientific researchers.

Two thirds of cancer research publications have relied on multiple funders[3]

Medical research in the UK not only leads to improvements in health that benefit millions, but also generates significant wealth and investment.

Medical research in the UK benefits from a unique combination of stakeholders. The mixture of support from Government, charities, industry, universities and the National Health Service (NHS), provides the breadth and diversity that are crucial to tackling existing and future healthcare challenges.

£198m allocated through the Charity Research Support Fund in 2013-14, leveraged £774m spend by charities in UK universities[4]

The UK has a prestigious history of success in research, especially in life sciences; one eighth of the world's most popular prescription medicines were developed here[5]. This success is reflected in the strong international reputation of our science base. Medical research continues to be an area of strength for the UK because of investment and support from Government.

[2] Department of Business, Innovation and Skills, 2013, *Leverage from public funding of science and research.*
[3] OHE and SPRU, 2014, *Exploring the interdependencies of research funders in the UK.*
[4] https://www.hefce.ac.uk/media/hefce/content/whatwedo/fundingandinvestment/fundinginstitutions/annualfundingallocations/201314/march/research/businesscharity1314.xls
[5] The Association of British Pharmaceutical Industry, *Delivering value to the UK*, 2014

This report provides compelling evidence that research infrastructure and funding from Government are key to providing the foundations on which the rest of the medical research sector is built. Through our extensive experience of funding cancer research in the UK we demonstrate the impact of medical research on the health and wealth of the nation. Specifically, we show how Government investment in medical research contributes to:

- Income generation and cost efficiencies for UK PLC — Chapter 1
- Leveraging investment and funder interdependencies — Chapter 2
- Developing and maintaining the UK's global standing — Chapter 3
- Continuous improvements in healthcare — Chapter 4

"As a child I took part in clinical research at Birmingham University, sponsored by Cancer Research UK. Having experienced the value of research first hand, I know how important it is to patients. Government support for research in the UK is critical. I hope that government will continue to recognise and invest in medical research for the benefit of all future cancer patients."

Lucy Speechley, studying Cellular and Molecular Medicine at the University of Bristol.

CHAPTER 1 - INCOME GENERATION AND COST EFFICIENCIES FOR UK PLC

Investments in medical research produce substantial returns to the economy[6,7]. As the UK's economy becomes increasingly knowledge-based, it is vital that investment in science is maintained in order to provide the basis for growth[8].

Every £1 the public invests in cancer research returns 40p to the UK economy each year[9]

Cancer Research UK, the Department of Health, the Academy of Medical Sciences and the Wellcome Trust, recently commissioned research to estimate the economic return of public and charitable investment in cancer research in the UK. Published in 2014, this research found an annual rate of return of 40% to the UK economy[10].

These findings build on those from similar research conducted in 2008, which found that every pound spent on cardiovascular and mental health research in the UK generated health benefits equivalent to an annual rate of return of 39 pence and 37 pence respectively[11]. Together, these studies show that investments in medical research produce substantial financial returns.

The clearest way that Government spending impacts on income generation is through its support for the development of new therapies. Given the cost of drug development, the high attrition rates and the amount of capital required to undertake large scale clinical trials[13], industry investment is critical in order to take drugs through to market. However, charities and Government also play a vital role; typically by contributing to drug discovery through developing the underlying science associated with new compounds and also by carrying out early phase studies to demonstrate proof of concept. The development of Abiraterone provides a good illustration of the interdependencies of the process.

One eighth of the world's most popular prescription medicines were developed in the UK[12]

[6] Health Economics Research Group (Brunel University), RAND Europe and the Office of Health Economics, 2008, *Medical Research: What's it Worth?*
[7] Health Economics Research Group (Brunel University), RAND Europe, and King's Policy Institute, 2014, *Estimating the returns to UK publicly funded cancer-related research in term of the net value of improved health outcomes.*
[8] The Royal Society, 2010, *The Scientific Century: securing our future prosperity*, p.10.
[9] Health Economics Research Group (Brunel University), RAND Europe, and King's Policy Institute, 2014, *Estimating the returns to UK publicly funded cancer-related research in term of the net value of improved health outcomes.*
[10] Ibid
[11] Health Economics Research Group (Brunel University), RAND Europe and the Office of Health Economics, 2008, *Medical Research: What's it Worth?*
[12] The Association of British Pharmaceutical Industry, *Delivering value to the UK*, 2014
[13] Ibid

CASE STUDY 1.1: ABIRATERONE

Abiraterone (Zytiga™) can dramatically improve the quality of life for men with advanced prostate cancer and can offer them extra time with their families and friends. Around 37,000 men in the UK are diagnosed with prostate cancer each year.

The initial discovery of Abiraterone was made at the Institute of Cancer Research (ICR) and facilitated by grants from Cancer Research UK, the Medical Research Council (MRC) and BTG International LTD.

In 1993, Abiraterone entered the licensing portfolio of Cancer Research UK's commercialisation and development arm, Cancer Research Technology (CRT). It was later licensed to Cougar Biotechnology Inc. The clinical trials were led by the ICR and The Royal Marsden Hospital in collaboration with Cougar Biotechnology Inc. and funding from Cancer Research UK. Abiraterone was recommended for the treatment of prostate cancer by NICE in 2012.

Sales of Abiraterone (approximately $1.7 billion in 2013) provide royalties to Cancer Research UK, which allow for the discovery and development of more cancer treatments.

It took sixteen years from the first paper published on Abiraterone in 1995 (itself drawing on research from the early 1980s) to it being brought onto market. Recent estimates place the time lag between initial investment in cancer research and eventual health benefits at 15 years[14]. Sustained Government funding for medical research is therefore crucial to create the confidence necessary for long-term investment by other funders in drug development.

[14] Health Economics Research Group (Brunel University), RAND Europe, and King's Policy Institute, 2014, *Estimating the returns to UK publicly funded cancer-related research in term of the net value of improved health outcomes.*

Drug development generates significant income for the UK economy as well as providing new treatments for cancer patients. In 2012, the pharmaceutical sector's contribution to the balance of trade in the UK was the greatest of 9 major industrial sectors[15]. Research can also generate savings by developing treatments that improve patient outcomes and lower the cost of treatment: for example, the FAST-FORWARD trial on radiotherapy.

CASE STUDY 1.2: FAST-FORWARD TRIAL

The National Institute for Health Research (NIHR) funded FAST-FORWARD trial is a phase III randomised clinical trial looking at hypofractionation in radiotherapy for breast cancer. Hypofractionation is the delivery of a course of more intense radiotherapy over a shorter period of time than the standard schedule. Previous research funded by Cancer Research UK has suggested that this reduction of treatment is at least as safe and effective as the current standard[16]. If this is further demonstrated by the FAST-FORWARD trial, then patient care could be improved by reducing the frequency of treatment, which would also generate cost savings to commissioners.

By detecting cancer at an earlier stage, the disease is more likely to be treatable. The development of effective, cost-efficient screening technologies can promote earlier diagnosis and improve patient outcomes. Screening saves lives, but can also deliver significant cost savings: for example, the use of HPV testing in screening for cervical cancer.

CASE STUDY 1.3: HPV TESTING FOR CERVICAL CANCER SCREENING

Women between the age of 25 and 64 in England, Wales and Northern Ireland (the age range in Scotland is 20-60) are currently screened for cervical cancer every 3-5 years using liquid base cytology (cervical smear). However, trials have demonstrated that using HPV testing as the primary screening test would save both lives and money:

- HPV testing is 60-70% more effective at preventing cervical cancer than cytology[17].
- Research funded by Cancer Research UK has shown that 1 in 3 cervical cancers in screening age women could be prevented with the use of HPV testing. This would be around 600 cases per year[18].
- By using HPV as a primary test, the screening interval could safely be extended to every 5 years, as opposed to the 3 year cytology cycle. This would lead to a reduced cost and a better experience for women.

Cervical screening has already been a significant public health success. Research is allowing us to see how it can be refined to save more lives, at a reduced cost.

[15] The Association of British Pharmaceutical Industry, Delivering value to the UK, 2014
[16] http://www.cancerresearchuk.org/about-us/cancer-news/press-release/study-confirms-fewer-bigger-doses-of-radio-therapy-benefit-breast-cancer-patients
[17] Ronco, G., et al., 2014, Efficacy of HPV-based screening for prevention of invasive cervical cancer: follow-up of four European randomised controlled trials. Lancet.
[18] Castanon, A., R. Landy, and P. Sasieni, 2013. How much could primary human papillomavirus testing reduce cervical cancer incidence and morbidity? J Med Screen..

Government's investment in research supports the UK economy in a number of ways. It contributes towards the generation of income from commercialised products and supports the development of more efficient treatments, allowing commissioners to make savings while also improving outcomes. It helps to develop and pilot more sophisticated screening techniques which allow us to diagnose cancer earlier and, in some cases, prevent it altogether[20]. Research fundamentally improves the nation's health (see Chapter 4) and, as such, delivers savings to Government by reducing the incidence of disease or limiting its impact. Finally, by investing in science, the UK Government leverages investment from charities and industry, generating further growth, both scientifically and economically.

In 2010, cervical screening delivered health gains equivalent to £1.6 billion for UK patients[19]

[19] Health Economics Research Group (Brunel University), RAND Europe, and King's Policy Institute, 2014, *Estimating the returns to UK publicly funded cancer-related research in term of the net value of improved health outcomes.*
[20] http://scienceblog.cancerresearchuk.org/2013/03/21/new-bowel-screening-test-introduced-in-england/comment-page-2/

CHAPTER 2 - LEVERAGING INVESTMENT AND FUNDER INTERDEPENDENCIES

UK medical research benefits from a unique funding model, derived from the interdependency of funders, which include the Government, the National Health Service, universities, industry, and medical research charities. Continued investment by all funders is vital to ensure future growth.

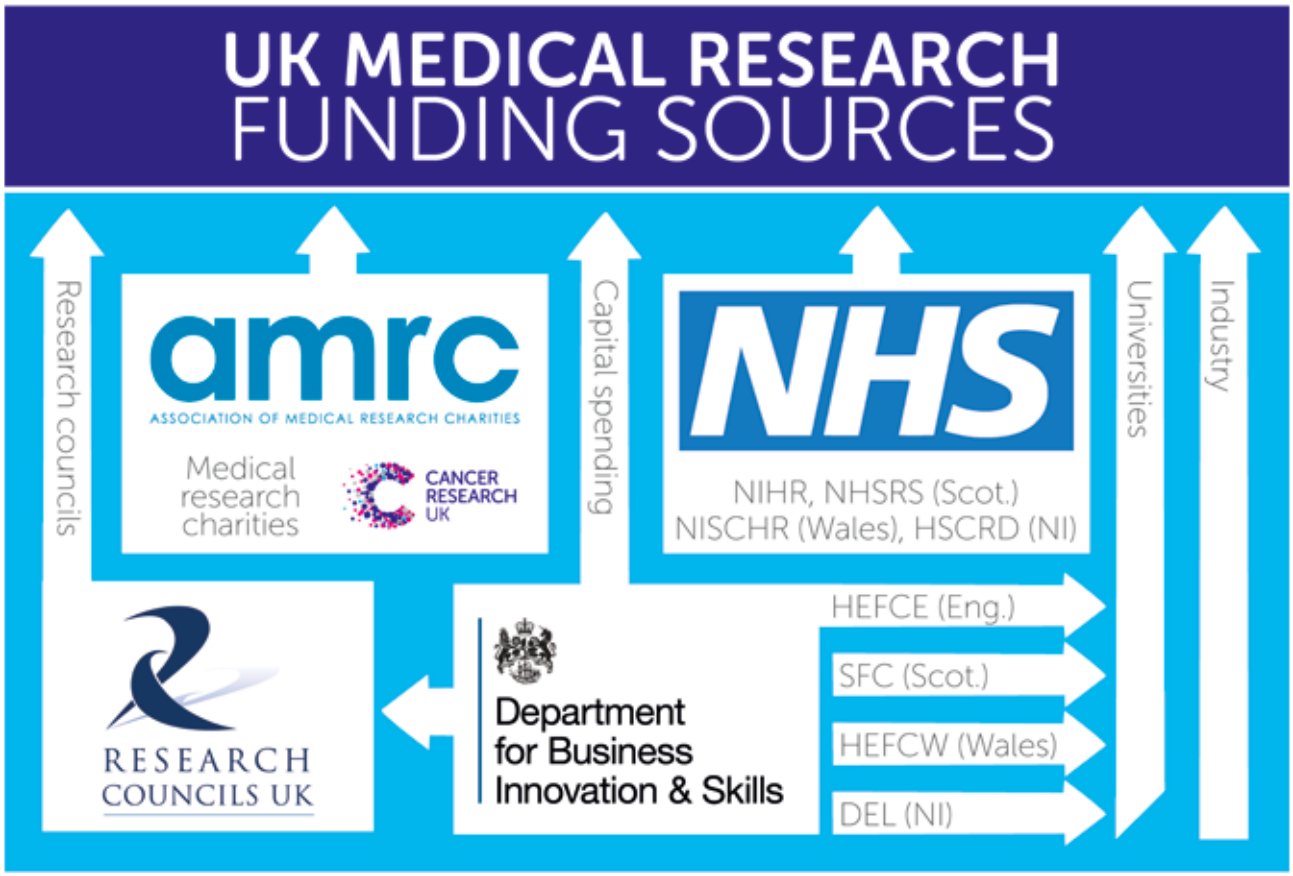

Diagram illustrating the different funding sources for UK medical research.

These funding sources include: Research Councils UK; members of the Association of Medical Research Charities (AMRC) (including Cancer Research UK); the National Institute for Health Research (NIHR); NHS Research Scotland (NHSRS) in Scotland (Scot.); the National Institute for Social Care and Health Research (NISCHR) in Wales; the Health and Social Care, Research and Development (HSCRD) in Northern Ireland (NI); the Higher Education Funding Council for England (HEFCE); the Scottish Funding Council (SFC); the Higher Education Funding Council for Wales (HEFCW); and the Department for Employment and Learning (DEL).

Recent research commissioned by Cancer Research UK has uncovered the extent to which funders of cancer research are interdependent, both nationally and internationally. Data show that two thirds of research publications acknowledging external support have relied on multiple funders, while just under half benefited from overseas funding, and almost a fifth are also supported by industry[23].

Two thirds of cancer research publications have relied on multiple funders[22]

£198m allocated through the Charity Research Support Fund in 2013-14, leveraged £774m spend by charities in UK universities[21]

The activities and funding of the charity, public and private sectors are complimentary and mutually reinforcing, rather than duplicative or merely substituting for one another. This can be seen in the investment that Government funding leverages from both charity and industry sources.

Recent research commissioned by Campaigning for Science and Engineering (CaSE) has shown that universities that receive higher levels of public funding generate more research income from other sources (charity, industry and overseas)[24]. The Charity Research Support Fund demonstrates how Government funding directly leverages money from the UK charity sector.

CASE STUDY 2.1: CHARITY RESEARCH SUPPORT FUND

The Charity Research Support Fund (CRSF) forms part of the quality-related research grants issued through the Higher Education Funding Council for England (HEFCE). Its allocations are based on the amount of charitable research a university attracts.

The CRSF exists because medical research charities spend their money directly on projects that support their stated missions rather than indirect costs such as basic infrastructure. In 2013-14, £198 million of costs were allocated through the CRSF which, in turn, leveraged £774 million spend by charities in UK universities[25].

Cancer Research UK spends around £215 million in grants to universities across the UK each year. The CRSF is crucial to enable this investment.

[21] https://www.hefce.ac.uk/media/hefce/content/whatwedo/fundingandinvestment/fundinginstitutions/annualfundingallocations/201314/march/research/businesscharity1314.xls
[22] OHE and SPRU, 2014, *Exploring the interdependencies of research funders in the UK.*
[23] Ibid
[24] Haskel. J., Hughes. A., and Bascavusoglu-Moreau. E., 2014, *The Economic Significance of the UK Science Base.*
[25] https://www.hefce.ac.uk/media/hefce/content/whatwedo/fundingandinvestment/fundinginstitutions/annualfundingallocations/201314/march/research/businesscharity1314.xls

Medical research is the UK's most popular charitable cause, with 11.2 million people donating each month[26]. However, even with this level of support, if there were reductions in the level of Government investment in medical research, charities would not be in a position to step in and bolster research[27]. For example, emerging research suggests that although the general public does not want Government funding of cancer research to be reduced, it would not donate enough to charities to compensate for reductions in public spending[28].

Interdependency is not only financial; the differing skills and knowledge offered by funders leads to more productive collaborations and helps to ensure that funding is complementary. The benefits of interdependent funding models, both financially and in terms of scientific outputs, are demonstrated by the Farr Institute.

CASE STUDY 2.2: FARR INSTITUTE

The Farr Institute of Health Informatics Research[29] was founded in 2013 and aims to deliver high-quality, cutting-edge research linking electronic health data with other forms of research and routinely collected data, as well as to build capacity in health informatics research. The Institute comprises four nodes (London, Manchester, Swansea and Dundee).

At a time when the volume of data available to science is expanding exponentially and challenging ethical questions are being raised about its use, the Institute is working to address key issues in health informatics research. These include governance, computer science infrastructure, public engagement, and training and education. It will support innovation in the public and private sector, leading to advances in preventative medicine, healthcare delivery and drug and diagnostic development.

The Farr Institute is funded by a consortium of ten organisations (medical research charities (including Cancer Research UK), Research Councils, the NIHR, the Chief Scientist Office (Scottish Government Health Directorate), and the National Institute for Social Care and Health Research (Welsh Government)), plus £20 million capital funds from the Medical Research Council. The involvement of multiple funders, both Governmental and charitable, has allowed the development of this innovative project, supporting the public and private sector to deliver tangible health benefits.

[26] The Charities Aid Foundation (CAF), 2014, UK GIVING 2012/13 – an update...
[27] OHE, 2011, *Exploring the interdependency between public and charitable medical research.*
[28] OHE and SPRU, 2014, *Exploring the interdependencies of research funders in the UK.*
[29] http://www.farrinstitute.org/

For every pound spent by Government on R&D, private sector R&D output rises by 20p per year in perpetuity[30]

The commercial sector relies on Government investment to support infrastructure and jointly fund projects that private capital alone would not be able to fund. Government spending on research demonstrates to the public and other funders that a particular area is viewed as a priority, helping to attract investment[31]. In addition, Government investment increases private sector productivity: for every pound spent by Government on R&D, private sector R&D output rises by 20p per year in perpetuity, by raising the level of the UK knowledge base[32].

Academics in the UK work closely with industry to leverage access to free drugs and/or educational grants, which enables more research to be carried out. For example, since 2008 over 50 pharmaceutical companies have provided over £240 million of financial support and free drugs to trials that have been supported by Cancer Research UK's Clinical Trials Awards and Advisory Committee. This research has offered patients the opportunity to access treatments that otherwise may not have been available.

Since 2008, over 50 pharmaceutical companies have provided over £240m support to CRUK trials

Representation of the proportion of support provided by companies to Cancer Research UK clinical trials.

As well as leveraging access to drugs to benefit the healthcare system and patients, Cancer Research UK and other medical research organisations partner with the commercial sector to help accelerate the development of new drugs. The collaboration helps pool risk and share expertise, thus allowing for innovative new approaches to be tested for the first time. An example of this approach is Cancer Research UK's Combinations Alliance.

[30] Haskel. J., Hughes. A., and Bascavusoglu-Moreau. E., 2014, *The Economic Significance of the UK Science Base.*
[31] Department of Business, Innovation and Skills, 2013, Leverage from public funding of science and research.
[32] Haskel. J., Hughes. A., and Bascavusoglu-Moreau. E., 2014, *The Economic Significance of the UK Science Base.*

CASE STUDY 2.3: CANCER RESEARCH UK'S COMBINATIONS ALLIANCE

The Combinations Alliance supports industry collaborations to create new treatment options for patients by combining different cancer therapies in early phase trials. This is a joint initiative between Cancer Research UK's Drug Development Office, pharmaceutical partners and the Experimental Cancer Medicine Centre (ECMC) network, which receives funding from the National Institute of Health Research and the Departments of Health in Scotland, Northern Ireland and Wales.

"The Combinations Alliance allows Astex's drugs to be developed and tested in specialist cancer centres that have different disease expertise to our committed development path, and in clinical trials that we may not otherwise have been able to do. It also serves as a platform to promote working with other companies. Ultimately, this increases research into innovative drug combinations and allows a wider pool of patients access to these treatments".

Dr Jeremy Carmichael, Astex Pharmaceuticals

The Alliance promotes industry-industry and industry-academia collaborations and offers access to world class early-phase clinical trial expertise and infrastructure through the ECMC network. The joint funding model is an efficient way to conduct clinical development, providing patient benefit, enhancing the global reputation of the UK for conducting experimental medicine and leveraging significant external funding for each pound that Cancer Research UK invests.

The expertise the UK has in developing existing drugs, as demonstrated through the Combinations Alliance, is also crucial for leveraging funding for innovative new projects. The ability to draw together expertise from a range of fields coupled with existing infrastructure in both the NHS and academia, means that the UK is an attractive location to trial projects that explore whole new systems of medicine. The Stratified Medicine Programme exemplifies this.

CASE STUDY 2.4: STRATIFIED MEDICINE PROGRAMME

Cancer Research UK's Stratified Medicine Programme (SMP) is a fantastic example of how Government, charity and industry, can work together to bring the benefits of forefront research and discoveries to patients within the NHS.

"By investing £11.5million a day into research and development for the life sciences we have made this country one of the best places in the world to carry out and invest in clinical trials, which has made groundbreaking programmes like this possible.

Cancer Research UK's Stratified Medicine Programme will see top scientists work with industry and the NHS to collaborate on innovative, life-saving research, and I look forward to the benefits this will bring for cancer patients and their families."

Jeremy Hunt, Secretary of State for Health

The first stage of the programme, SMP1, leveraged £4 million from its pharmaceutical partners AstraZeneca and Pfizer. This supplemented Cancer Research UK's funding and support from the Technology Strategy Board (TSB), the NIHR National Cancer Research Network (NCRN) and Experimental Cancer Medicines Centres (ECMC).

Together, the programme provided real-time, genetic analysis for over 9,000 NHS cancer patients' tumours over two years. As a direct result, additional pharmaceutical companies have been working with Cancer Research UK to set up genetically stratified clinical trials in the UK.

In SMP2, Cancer Research UK is going even further to drive the development of the next generation of targeted cancer therapies within the UK by developing a nationally recruiting, multi-armed trial - The National Lung Matrix Trial.

"With this Matrix trial, cancer medicine in the UK now becomes a key global player in the search for more effective targeted therapies for people suffering from this devastating disease."

Professor Gary Middleton, Chief Investigator and Trial Lead, Cancer Research UK

This groundbreaking study will build on the existing, Government-supported research infrastructure to provide an efficient and internationally competitive environment for conducting early phase trials of targeted therapies in the UK.

Cancer Research UK, AstraZeneca and Pfizer are jointly funding the programme, with support from the NHS. In total this represents about £25 million worth of research. The innovative design of the trial allows for further partnerships throughout the study's lifetime, ultimately, providing NHS patients access to even more cutting edge therapies.

"This innovative collaboration will help establish the framework for how patients will be treated in the NHS in the future"

Menelas Pangalos, AstraZeneca

CHAPTER 3 – DEVELOPING AND MAINTAINING THE UK'S GLOBAL STANDING

It is vital that the Government continues to invest in science to ensure that the UK maintains its current global standing, both in terms of generating healthcare improvements and in order to support income generation. This is a competitive field and our position is vulnerable as other countries invest in research; retaining the country's leading position will be challenging.

The UK is currently a world-class centre for scientific research. Our research base is highly regarded internationally: while the UK represents just 0.9% of global population, it is responsible for 6.4% of world publications and 15.9% of the world's most highly cited articles[34]. Being a global leader in research is self-reinforcing; the more the UK is known for its research, the more investment and talent it will attract, supporting it to succeed further.

The UK is world-leading in the number of cancer patients that participate in research: nearly 57,000 in 2012 - 1 in 5 of all UK cancer patients[33]

The UK produces world-class quality research, being second only to the USA in numbers of most-cited papers[35]

The strength of the UK's position in the international research community brings with it concrete economic gains. It is because of this world-leading knowledge base that new intellectual property is generated and exploited in the UK. In 2010, UK medical biotech companies led Europe in the number of drugs in clinical development with over 20% of the total[36]. This is due to established research skills which UK companies possess to develop these drugs, and the expertise held by the numerous UK organisations that companies use to support clinical development.

The strength of our position globally also allows us to benefit from international collaboration. In 2007, 47% of the UK's scientific publications had a non-UK co-author – up from 33% in 1999. The impact of these multi-nationality publications, measured by citations, is significantly higher than the average impact of UK papers[37].

Government funding provides a stable foundation of financial support for researchers. Having a range of grants and funding sources creates a competitive environment for researchers seeking funding and leads to an overall increase in the quality of funding applications.

[33] http://www.ncri.org.uk/wp-content/uploads/2013/11/2013-NCRI-CSG-prospectus.pdf
[34] Department of Business, Innovation and Skills, 2013, *International Comparative Performance of the UK Research Base.*
[35] Ibid
[36] Ernset & Young, 2011, *Beyond borders: global biotechnology report*
[37] Ibid

The UK is leading the world in establishing innovative funding mechanisms, for example multidisciplinary research centres, such as the Francis Crick Institute. As well as pioneering new approaches to research, the Crick will be one of the largest biomedical research centres in Europe, attracting investment and talent globally and placing the UK at the cutting edge of research.

Nearly 4% of the world's researchers are based in the UK[38]

CASE STUDY 3.1: THE FRANCIS CRICK INSTITUTE

The Francis Crick Institute, scheduled to open in 2015, will be a world-leading biomedical research centre in central London. The partnership forged to develop the Francis Crick Institute includes Cancer Research UK, the Wellcome Trust, the Medical Research Council, University College London, King's College London, and Imperial College London.

"The economic opportunities arising from medical research are considerable, there is increasing international competition to attract the best scientists, as well as the most innovative companies and the investment they bring.

High quality discovery research is not easy, and the UK happens to be good at it. This gives us a head start, but we need to step up a gear if we are to continue to be competitive on the global stage. The UK biomedical research endeavour requires greater support and cohesiveness. This is the opportunity presented by the Crick."

Sir Paul Nurse, Director of the Francis Crick institute

The organisations in the consortium will invest a total of around £650 million to establish the Institute. When it is fully operational, it will employ 1,500 staff, including 1,250 scientists, and have an operating budget of over £100 million per year.

The core of world leading researchers and cutting edge technologies within the Francis Crick Institute will be a magnet for the brightest and best scientists from around the world. In addition, through these founding partners, the institute will build upon existing strong relationships with research centres across the globe, laying solid foundations for international collaboration.

[38] OECD MSTI, 2013/2, *Researcher employment measured in full-time equivalent.*

The Francis Crick Institute
© Justin Piperger Photography/Wadsworth3d

The NHS is an invaluable research resource and is itself committed to supporting UK research[39]. The existence of historic, universal healthcare puts the UK in a strong position to foster clinical trials, promote the uptake of innovation and fully realise the value of our wide ranging and comprehensive data sets, for example the cancer registries. For the potential of such data to be realised, it is important that the regulatory environment supports its use for medical research.

CASE STUDY 3.2: CANCER REGISTRATION

In the UK, regionally-based cancer registries have been collecting population-based cancer data for over 40 years. The result of this is an invaluable resource for population researchers, which traces historic trends in cancer incidence and survival across the four nations. The UK cancer registries are global leaders, in terms of their comprehensiveness, their quality and the length of time over which they have been continuously working.

Cancer registries support a wide range of research. Examples include studies that benchmark UK health outcomes against the rest of the world (see Case Study 4.3 on the International Cancer Benchmarking Partnership); research into stratified medicine (see Case Study 2.4 on Cancer Research UK's Stratified Medicine Programme); and large scale population studies, such as the Million Women Study that looks at risk factors for breast cancer.

"The National Health Service in the UK was one of the first national healthcare systems to provide universal access for the entire population. Its information systems provide a unique opportunity for researchers to observe national trends in disease and outcome. Cancer registries realise that potential and allow the UK to utilise fully its information resources to advance public health."

Michel Coleman, Professor of Epidemiology and Vital Statistics, London School of Hygiene and Tropical Medicine

[39] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/138273/C8.-Research-270412.pdf

International collaboration is fundamental to all scientific research. It attracts the most talented individuals, leverages investment and ensures that new insights and perspectives are continually generated. In certain fields, this is particularly important, for example in research into rare diseases. Where fewer people are diagnosed with a condition, clinical trial recruitment is more challenging and international collaboration becomes crucial. This is true of rarer cancers and virtually all medical conditions affecting children. In order to facilitate these international collaborations, it is vital that the UK has world leading trial centres. The Children's Cancer Trials Team at the University of Birmingham shows how our excellence ensures we take the lead in collaborative efforts.

CASE STUDY 3.3: CHILDREN'S CANCER TRIALS TEAM

Research into childhood cancers is especially challenging; all cancers occurring in children are rare and, as such, recruiting a sufficient number of participants to clinical trials is potentially problematic. For this reason, international trials are particularly important for paediatric research and it is vital that the UK has research centres which are world class.

"In the 1960s a quarter of children diagnosed with cancer survived, today that figure is three quarters. This represents fantastic progress, but we still need to do better and through innovative trials, made available to all children in the UK, CCTT at Birmingham's Cancer Research UK Clinical Trials Unit are working hard to improve tomorrow's treatments"

Pamela Kearns, Professor of Clinical Paediatric Oncology, University of Birmingham

The Children's Cancer Trials Team (CCTT), based at the University of Birmingham and funded by Cancer Research UK, is working with investigators around the world to develop new treatments for children with cancer and leukaemia. It works on both early and late phase trials, coordinating a network which covers 21 centres across the UK. Thanks to their work 60% of children with cancer in the UK are taking part in clinical trials.

CHAPTER 4 - CONTINUOUS IMPROVEMENTS IN HEALTHCARE

The drive to achieve better public health and medical treatments underpins all medical research in the UK. Investment in science and research by Government results in continuous improvement in the health of the UK population.

In the 1970s, 25% of cancer patients survived; today that figure is 50%. CRUK wants to see 75% of cancer patients beat their disease in the next 20 years

A patient diagnosed with cancer today is more than twice as likely to survive their disease as a patient would have done 40 years ago. We now understand far more about the causes of cancer, we have more diagnostic tools to pick up cancer cases earlier and, once diagnosed, we have more advanced techniques and treatments which allow us to achieve better outcomes. In the UK, the mixture of support from Government, charity and industry partners, university research laboratories, and the National Health Service, provides the breadth and diversity that are crucial to tackling existing and future healthcare challenges.

Research is the foundation of all of today's cancer treatments and continues to drive innovation to produce more effective drugs, surgical techniques and advances in radiotherapy. The PARSPORT trial, funded by Cancer Research UK, describes research into the use of Intensity-Modulated Radiotherapy to reduce the side effects of treatment.

CASE STUDY 4.1: THE PARSPORT TRIAL

Around 40% of patients whose cancer is cured receive radiotherapy as part of their treatment. Conventional radiotherapy causes significant side effects for patients. Intensity-Modulated Radiotherapy (IMRT) can be targeted to fit the shape of a tumour and so allows doctors to boost the amount of radiation to the tumour, whilst limiting damage to surrounding healthy tissues.

The PARSPORT trial, funded by Cancer Research UK and run by The Institute of Cancer Research and The Royal Marsden Hospital[40], showed that IMRT could reduce the side effects for patients with head and neck cancer, which can affect speech, eating and oral health. Other studies have since shown that IMRT can increase patient survival of head and neck cancer, a disease that affects around 900,000 people around the world[41].

[40] C Nutting et al., 2010, http://www.clinicaloncologyonline.net/article/S0936-6555(10)00351-1/fulltext
[41] http://www.cancerresearchuk.org/cancer-info/cancerstats/types/oral/incidence/uk-oral-cancer-incidence-statistics#source13

We know that earlier diagnosis of cancer is crucial to delivering improved outcomes. For example, ovarian cancer has over 90% five year survival rates when diagnosed at the earliest stage, falling to less than 10% at late stage cases. Ongoing research into the ways in which we can diagnose cancers earlier is vital: for example the UK Collaborative Trial of Ovarian Cancer Screening (UKCTOCS).

CASE STUDY 4.2: UK COLLABORATIVE TRIAL OF OVARIAN CANCER SCREENING (UKCTOCS)

There is currently no national screening programme for ovarian cancer, although early detection is associated with improved outcomes. UKCTOCS is a large scale (over 200,000 women) randomised control trial examining whether screening tests would be useful for diagnosing ovarian cancer in the general population. The trial is co-funded by Cancer Research UK, the Eve Appeal, NHS Research and Development and the Medical Research Council.

"Ovarian cancer is usually diagnosed at an advanced stage, has poor outcomes despite advances in surgical treatment and chemotherapy and is responsible for over 4,000 deaths each year in the UK and over 100,000 worldwide. In 2015 after 15 years' research UKCTOCS will report and establish how many lives could be saved by a national screening programme for ovarian cancer."

Professor Ian Jacobs, Principal Investigator

Initial results, published in 2009, indicate that an ovarian screening programme would be possible. The trial team is now continuing to follow up with the women until 2014 to establish whether screening would be useful in the long term. Final results are expected in 2015.

Currently, fewer than half of women diagnosed with ovarian cancer will survive beyond five years. If demonstrated to be effective, a screening programme of this type could lead to the earlier diagnosis of ovarian cancer, reducing the economic burden of this disease as well as allowing those diagnosed to have their cancer treated more effectively.

Many members of the public appreciate the opportunity to be involved in research. Over 30,000 of the women involved in UKCTOCS have since written to Cancer Research UK to express what the trial meant to them.

"I have been very happy to be involved in this study and maybe one day it will be of help to other women such as my daughter or her friends."

A trial participant

Research delivers improved health outcomes, not only through improved diagnostics and treatments, but also by providing us with population-based insights, for example, into cancer incidence and survival. Studies of this kind provide individuals with better information on how to protect themselves from risks, and inform health policy makers on how best to improve national outcomes. Studies such as the International Cancer Benchmarking Partnership illustrate how research can influence health decision making and planning in order to promote ongoing improvements in both national and global health.

CASE STUDY 4.3: INTERNATIONAL CANCER BENCHMARKING PARTNERSHIP

The International Cancer Benchmarking Partnership (ICBP) is a unique international partnership which is looking at variation in cancer survival between countries. We know that the UK doesn't have the best survival in the world, but we don't completely know why. This is the key question which the ICBP is addressing.

The ICBP, which is supported by Cancer Research UK, has already produced interesting findings: for example, while English patients are generally as knowledgeable about cancer as people in other countries, they are more likely to be concerned about wasting doctors' time or to be embarrassed by their symptoms. Such insights are extremely valuable when planning public health work, such as the Department of Health funded Be Clear on Cancer campaign.


PREVENT
DIAGNOSE
TREAT
OPTIMISE
WE'RE TACKLING CANCER
ON ALL FRONTS


Let's beat cancer sooner.
CANCER
RESEARCH
UK