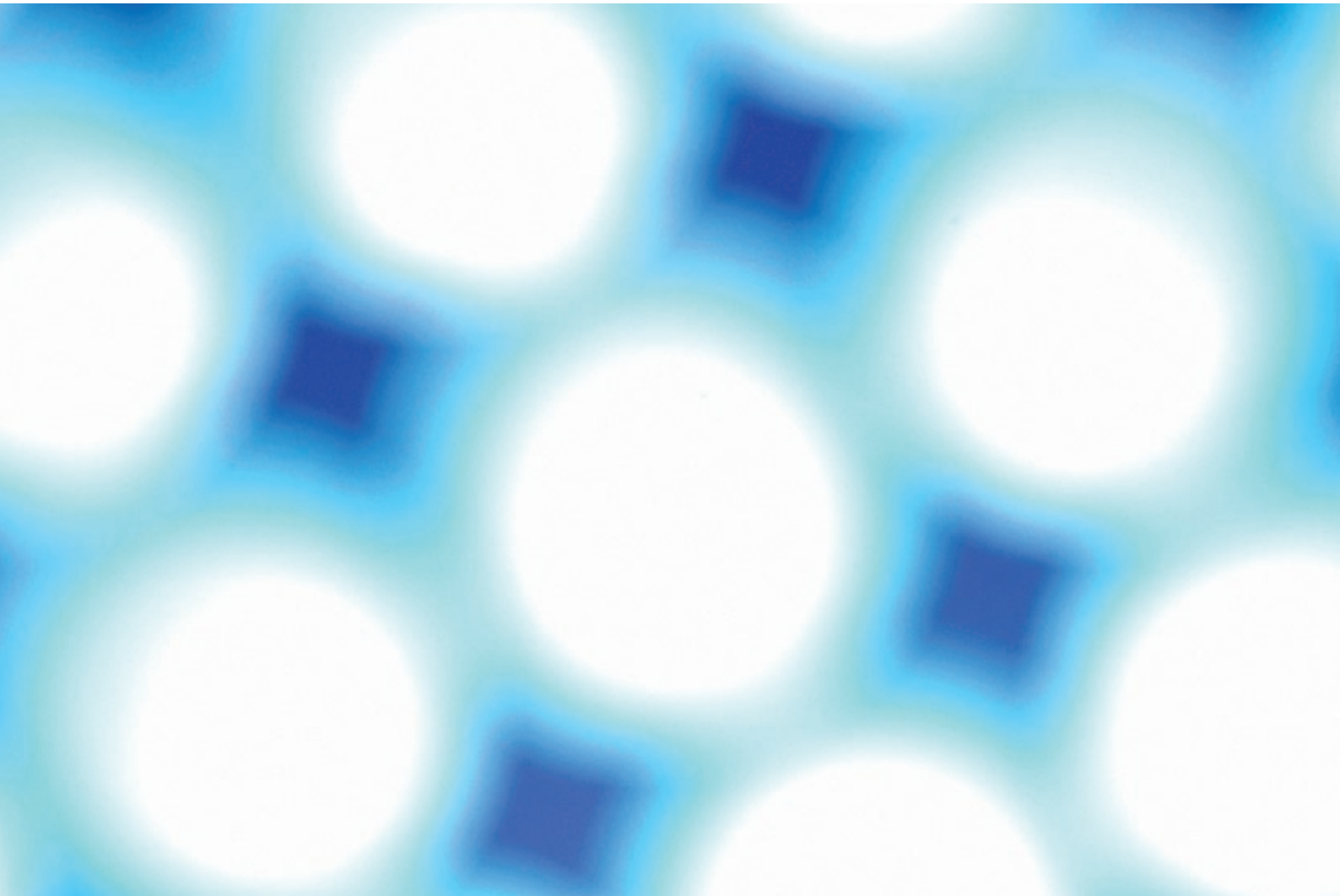


Medical Research: What's it worth?

Estimating the economic benefits
from medical research in the UK



BRIEFING | NOVEMBER 2008

Summary

- This briefing describes the outcomes of a one-year study into the economic benefits of the UK's public and charitable investment in medical research.
- The work was carried out by a consortium involving the Health Economics Research Group at Brunel University, the Office of Health Economics and RAND Europe. The study was commissioned by the Academy of Medical Sciences, the Medical Research Council and the Wellcome Trust under the auspices of the UK Evaluation Forum.
- The research has involved the development of a methodology to calculate the health and economic (GDP) gains from investments in cardiovascular disease and mental health research.
- Using this methodology, the researchers estimate that the health and GDP gains derived from UK public and charitable investments in cardiovascular disease research (specifically over the period 1975–92) is equivalent to an annual rate of return of around 39% (37% for mental health research).
- In other words, a £1.00 investment in public/charitable cardiovascular disease research produced a stream of benefits equivalent to earning £0.39 per year *in perpetuity*.
- This figure of 39% adds together an annual rate of return of 30% in GDP gains (i.e. direct returns to the UK economy) and an annual rate of return of 9% in health gains (arising from new preventative and therapeutic interventions for disease).
- From their analysis, the researchers estimate that the time lag between research expenditure and eventual health benefits is around 17 years. Their findings also emphasise that shortening this time lag would improve the rate of return still further.
- These impressive results are the first quantitative estimates of the economic benefits of the UK public and charitable investment in medical research. The work has opened up many new questions and lines of enquiry about how to assess, for example, research spend in different areas, the impacts of global research on the UK and vice versa, and the time lag between research and the development of treatments.

The full report of *Medical Research: What's it worth?* was produced by the team from the Health Economics Research Group at Brunel University, the Office of Health Economics and RAND Europe, and is available as a PDF from www.wellcome.ac.uk/economicbenefits

Introduction

The UK Evaluation Forum was first initiated by the Academy of Medical Sciences, the Medical Research Council (MRC) and the Wellcome Trust in 2004. Drawing together representation from Government, research councils, medical charities and academia, the broad aim of the Evaluation Forum was to coordinate activity in determining the socioeconomic benefits of UK medical research.

Following an international symposium of research stakeholders, including patient groups, research charities, the UK Treasury, industry, doctors and academics, the Evaluation Forum published a report in 2006, *Medical Research: Assessing the benefits to society*.¹ The report described a range of methods for evaluating research impacts and made a number of recommendations, including a call for UK funders to “support research to assess the economic impacts of UK medical research”.

Acting on this recommendation, in 2007 the Academy, the MRC and the Wellcome Trust commissioned a one-year study to compare the economic benefits accruing from UK public and charitable medical research with the costs of that research – ultimately to give a *quantitative* assessment of the benefit of medical science to the UK. The research was conducted by a consortium led by the Health Economics Research Group (HERG) at Brunel University, and including the Office of Health Economics (OHE) and RAND Europe.

The HERG/OHE/RAND consortium’s final report was published in November 2008. The methodology involved in the consortium’s work was necessarily complex and readers should consult the team’s full report for a detailed explanation of the findings and concepts presented in this leaflet. The full report can be found at www.wellcome.ac.uk/economicbenefits

Background

There has been a growing recognition in recent years of the need to demonstrate the wide range of impacts resulting from public and charitable investments in medical research. Yet there have been few serious attempts to tackle this issue. Of the few studies that exist, the most well-known is a US initiative sponsored by the Lasker Foundation called *Exceptional Returns*.² This work focused on the economic value of the reduction in deaths from cardiovascular disease (CVD) that occurred in the USA between 1970 and 1990. The top-line findings of the study were dramatic:

- Increases in life expectancy of USA citizens from 1970 to 1990 were worth around US\$2.8 trillion per year.
- The reduction in deaths from CVD alone was worth roughly US\$1.5 trillion per year.
- Assuming that only a third of the reduction in CVD deaths could be attributed to medical research, spending on medical research yielded an annual 20-fold rate of return.

These results were published in 2000 and they stimulated renewed interest in how the impacts of medical research could be evaluated. In 2003, the Australian Society for Medical Research used a similar methodology to show that returns on Australian research were also ‘exceptional’: the total return on the investment in CVD research in the year 1998–99 was estimated to be as high as 788%.³ But both the US and Australian studies had important limitations.

A key element of the evidence base underpinning the work came from US research suggesting that individuals’ willingness to pay for small reductions in the risk of death is equivalent to a value of around US\$5 million to prevent a fatality or gain a ‘statistical life’. The appropriateness of some of the empirical assumptions made in the US and Australian work has been strongly questioned. Nevertheless, these studies have been influential and have provided important insights for the research presented here.

A key objective of the HERG/OHE/RAND work was to address some of the limitations and assumptions of the US and Australian studies and to consider how the question of calculating economic returns could be tackled in the UK context. Overall, the intention was to open up the field to new lines of inquiry – to inform methodologies for future assessments and to develop thinking around economic impact analysis.

Rationale and scope

As far as possible, the HERG/OHE/RAND team aimed to develop a transparent approach to estimating the economic returns from UK public/charitable medical research. The team grouped these economic returns into two, additive, elements:

- **health gains**, net of the health care costs of delivering them
- **economic gains** in terms of GDP, i.e. increases in UK national output, productivity and income.

Two therapeutic areas were chosen for the study: **cardiovascular disease** (CVD), where a good deal is known about the impact of different interventions on health and lifespan, and **mental health** – more problematic because it is less well-defined in research terms and there is less understanding about the impact of different therapies and interventions.

Measuring health gains

To estimate the net value of health gains in the area of CVD, the HERG/OHE/RAND team addressed a number of questions:

- **What did UK public and charitable funders spend on CVD research from 1975 to 1992?**
- **What proportion of global CVD research can be attributed to the UK?**
- **What is the time lag between research expenditure and its impact on health?**
- **What were the key CVD treatments and health interventions over the period 1985–2005?**
- **What was the value of the health gains from each of these treatments?**
- **How many people used these interventions?**
- **What was the cost of delivering those interventions?**

Essentially the same questions were asked in the area of mental health.

As a first step, the researchers gathered data from UK research funders, including the MRC, the Department of Health, Higher Education Funding Councils, the Wellcome Trust and the British Heart Foundation, to determine how much public and charitable funding had been directed at CVD research between 1975 and 1992. This time period was selected partly to reflect the time lag between research and the development of specific interventions, and partly because the consistency of spending data between funders was greatest during this time. This issue of consistency in classifying research spend – both within and between funders – is identified by the researchers as an area for future consideration (see final section).

CVD clinical guidelines were used to estimate the UK's research contribution to CVD interventions and the time lag between research and treatment. UK clinical guidelines, published by the National Institute for Health and Clinical Excellence (NICE), the medical Royal Colleges and other bodies, consist of evidence-based recommendations on the appropriate treatment and care of people with specific diseases and conditions. Seven CVD clinical guidelines were analysed, and the cited evidence was examined for country of origin and time of publication.

The researchers investigated over 45 different interventions to prevent and treat CVD. To give just a few examples: use of aspirin, ACE inhibitors, beta blockers, statins and warfarin; defibrillation for acute heart attacks; surgical interventions; and stopping smoking.

The health gains for specific CVD interventions were calculated using quality adjusted life years (QALYs). QALYs are a way of measuring the quantity and quality of life gained from a particular health intervention and are widely used to appraise new medicines and to inform cost-benefit decisions about treatments. NICE currently gives a central estimate for the value (or more accurately, the opportunity cost) of a QALY of £25,000. The team generated estimates for the monetary value of the QALYs gained for each CVD intervention, factoring in the number of users of the intervention and adjusting for health care costs.

The researchers present 'best' estimates for figures at each stage of their analysis, as well as the range of upper and lower estimates. Using best estimates, their results showed that:

- The total public/charitable expenditure on CVD research from 1975 to 1992 was **£2 billion**.
- The total value of QALYs gained for selected CVD interventions over the period 1985–2005 was **£69 billion**.
- The total incremental health care costs relating to those gains over the same period were **£16 billion**.
- The proportion of UK health benefits attributable to UK CVD research was **17%**.
- The mean lag time between research and its impact on CVD treatments was **17 years**.

Taking these factors together, the researchers showed that a best estimate for **the annual return in health gains from UK public and charitable CVD research is just over 9%**.

The team is careful to note that around 33% of the health gains for CVD can be attributed to a reduction in the number of smokers, making smoking cessation the health intervention with by far the largest impact on CVD. Furthermore, measures to reduce smoking accounted for only 7% of health care costs, meaning that this intervention (or more accurately, this group of interventions) was the most cost effective and provided a hugely significant return on investment.

For mental health research, the team's best estimate for the net health gains was 7%. However, the researchers stress that, compared with CVD, there are fewer economic evaluations of specific mental health interventions and there has been less work on the relevant data in this area. Data on the health impacts of mental health interventions are also more complex than for CVD and rely much more heavily on estimates around *quality* of life, rather than the more straightforward *length* of life.

Measuring economic gains

The other strand of the HERG/OHE/RAND team's work focused on estimating the economic returns from medical research in terms of impact on GDP, i.e. the income and output of the UK's economy. These wider economic gains are distinct from the monetary value of health (QALY) gains discussed above.

Importantly, investments in medical research by one UK organisation will benefit not only that organisation, but also other UK organisations (medical and non-medical) and organisations overseas. These benefits are termed 'spillovers' – a term that suggests they are accidental, when in fact they are a recognised and deliberate policy objective of public spending on research.

The authors reviewed a range of literature on so-called research spillovers, which describes the mechanisms by which spillovers from public and charitable research are transmitted, for instance:

- Through universities – in terms of skilled graduates, ideas generated by faculty members, networking opportunities, high-quality libraries etc.; it is no coincidence that high-tech firms choose to locate themselves near centres of excellence in higher education.
- Through absorptive capacity – research not only generates *new* information, but also enhances an organisation's ability to exploit *existing* knowledge.
- Through the creation of entrepreneurial opportunities.
- Through international trade.

The researchers note that most of the literature in this area comes from the USA and relates to the agricultural sector, with only a small proportion relevant to medical research. Nevertheless, the team were able to use techniques described in this literature to estimate the relationship between publicly funded research and pharmaceutical industry investment in the UK context.

They estimated that each £1 of extra public/charitable investment in UK medical research yields £2.20–£5.10 of extra pharmaceutical company investment, which taken together **earns an extra £1.10–£2.50 GDP per year for the UK economy**. However, caution is needed in applying these US-based figures to the UK, not least because the publicly funded research sector in the USA is vastly bigger than that in the UK, giving much more scope for public funding to influence private-sector investment. The HERG/OHE/RAND team combined these figures with estimates from other analytical approaches, to give an estimate that **the GDP returns on the investment in medical research are between 20% and 67%, with a best estimate of 30%**.

Even at the bottom of the range, 20% represents a very healthy investment return, even before any account is taken of the health (QALY) gains produced. For instance, if all the £122 million of public and charitable CVD research invested in 1992 was to yield a 20% return it would be equivalent to £24 million of annual GDP *every year thereafter*.

The team noted that the available evidence did not permit estimates to be made for GDP returns for different therapeutic areas of research. Thus for mental health, as for CVD, the best estimate of the additional rate of return to the public/charitable investment from GDP gains is 30%.

Overall returns and future considerations

Bringing the various strands of the study together, and accounting for sensitivity analyses around the different estimates, the team's **best estimate for the total health and GDP returns from public and charitable CVD research, for the period 1975–92, is around 39%**. In other words, a £1 investment in public/charitable CVD research produced a stream of benefits thereafter equivalent to earning £0.39 per year in perpetuity. The best estimate for the combined health and GDP gains from mental health research is 37%.

The findings from this study provide the first real quantitative estimates of the economic benefits of UK public and charitable investment in medical research. This work has focused on the specific impacts in CVD research, and to a lesser extent, mental health; the implication is that the total health and GDP gains arising from medical research aggregated across *all disease areas* will be even larger.

The aim of the study was to develop an appropriate methodology to generate realistic estimates of the economic impacts of medical research; it should be possible to apply this methodology to other disease-specific research areas. However, the study's authors – and sponsors – emphasise that it should not be viewed as a one-off exercise, but as a contribution to an emerging research field that will hopefully lead to even more robust estimates in the future. As such, the study has a number of implications for the future research agenda (see box).

Implications for future research agenda

This study has highlighted the need for more work in several important areas:

- Understanding the time lag between research expenditure and health gain. Does the lag vary between research/disease areas or over time?
- Investigating the 'spillover' effects of public and charitable research expenditure, specifically in relation to the UK economy.
- Analysing the international flows of knowledge and research. What are the *global* health benefits from UK medical research?
- Understanding the importance of *local* research. Does research conducted overseas have the same impact on UK health?
- Exploring economic impacts in different disease areas and the extent to which impacts in different areas are marginal or additive.

The work presented here also raises important questions about the availability and consistency of research-related data, specifically around funders' research spend. The study's authors recommend that it would be beneficial for research funders to adopt more standardised ways of classifying their data – an issue that could be taken forward by the UK Evaluation Forum.

Finally, a key issue highlighted in this study is the influence that the time lag between research discovery and health intervention has on economic returns. An obvious way to improve returns would be to reduce the estimated 17-year time lag. But how to do this? This is a complex question that is currently taxing public, charity and industry research funders alike. The time period for research spend examined in this study was 1975–92, and the results do not tell us if the return will be the same in the future, or if the return on a greater level of expenditure would rise proportionately. These are questions that certainly merit further attention.

In the meantime, the results of this study confirm that, even by cautious estimates, the returns on CVD and mental health research are substantial. Whether the returns on investment in other areas of medical research are as great remains to be explored.

1 A copy of this report can be downloaded from www.wellcome.ac.uk/economicbenefits.

2 www.laskerfoundation.org/advocacy/pdf/exceptional.pdf.

3 www.accesseconomics.com.au/publicationsreports/showreport.php?id=33&searchfor=2004&searchby=yearEarlier.

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