

# A 'DECISIVE' approach to research funding

Lessons from three Retrosight studies

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## Introduction

Research funders increasingly need to show the impact of the research they fund: the Research Excellence Framework (REF) 2014 was the first nationwide assessment of the impact of university research and used a case study approach; the UK Research Councils, and some other funders, request applicants to articulate the ‘pathway’ by which their research may translate to societal benefits and require all successful grant holders to report annually on the impacts of their research (through a system known as Researchfish). From a more conceptual point of view, there is an emerging literature looking at how to measure and support research impact and the effect of different funding approaches and environments. This report contributes to that literature providing thoughts about how biomedical and health research funders could select research and researchers to maximise the chances of making a difference to society.

We have identified eight lessons which combine to provide a ‘DECISIVE’ approach to research funding:

**Different skills:** Fund researchers with more than just research skills - individuals are key when it comes to translation of research into wider impact.

**Engaged:** Support your researchers to engage with non-academic stakeholders to help their work have a wider impact.

**Clinical:** For greater impact on patient care within 10-20 years, fund clinical rather than basic research.

**Impact on society:** If you want to have a wider impact, don’t just fund for academic excellence.

**Size:** Bigger isn’t necessarily better when it comes to the size of a research grant.

**International:** For high academic impact, fund researchers who collaborate internationally and support them to do so.

**Variety:** Simple metrics will only capture some of the impact of your research.

**Expectations:** Most broader social and economic impact will come from just a few projects.

We drew these lessons from three large scale research projects led by RAND Europe over the last ten years. Each study took examples of research funded 10-20 years ago and traced the research through to the present day to see what impacts it had led to both within and outside academia. The levels of impact for each piece of research were rated in five categories of the Payback Framework (see below). We then asked what characteristics of the research, the researchers and the research environment were associated with high impact in each category. We group the first two categories as ‘academic benefits’ and the last three as ‘wider impacts’.

**Knowledge production:** Knowledge produced as a result of the research conducted, in general captured in publications.

**Research targeting and capacity building:** Benefits for future research created by the research conducted both in terms of the direction of research and research priorities, and the building of research capacity in terms of infrastructure, skills and staff development.

**Informing policy and product development:** Impact of research on health policy (illustrated by such things as citation on clinical guidelines) and on product development as findings are taken up by the private sector for commercialisation.

**Health and health sector benefit:** Health benefits and other benefits for the health sector (such as improved efficiency or cost savings) resulting from the findings of the research being put into practice.

**Broader economic benefit:** Wider socioeconomic benefits resulting from the research, e.g. increased productivity of a healthier workforce and increased employment or the development of new markets.

Each study was in a different scientific field: arthritis; cardiovascular disease and stroke; and mental health research. Because the studies covered a wide variety of research and various fields, we think the conclusions drawn should be generally applicable to biomedical

	Mental health study	Cardiovascular disease and stroke study	Arthritis study
Number of case studies	18	29	16
Unit of analysis for case studies	Bodies of coherent research defined in collaboration with the researchers involved	Individual research project grants	Mix of institute, project, programme and fellowship grants
Selection of case studies	Selected research that was considered promising at the time (using citation as a proxy for interest in the field)	Selected to include a mix of low and high impact case studies based on a survey of principal investigators	Selected to include a mix of mid and high impact research based on bibliometric analysis
Case study timing	Based on research conducted ~20 years ago	Based on research conducted ~15-20 years ago	Based on research conducted ~10 years ago
Scoring of case studies	Scored by a panel of experts in the field and policy makers and funders	Scored by members of the study team including all case study researchers	Scored by members of the study team including all case study researchers
Analysis of case studies	Analysis by five impact categories separately	Analysis by academic and wider impact groupings	Analysis by five impact categories separately

research. The table above provides a summary of key similarities and differences between the studies.

The three studies used similar methodologies and included a total of 63 case studies of separate research projects, ideas or programmes. For this synthesis we extracted the findings from each study and made comparisons across them, taking into account differences in methodologies. Where necessary we also referred directly to individual case studies. The key lessons included those which were consistent across all three studies. The extent to which each lesson is supported by each of the three studies is illustrated in the table below. Where the conclusion was a clear study finding a bold tick is used. Where the data supports the lesson, but it was not a conclusion of that study, a grey tick is used.

For more detail on each of the three studies, see the following documents:

- Wooding et al. (2005) Payback arising from research funding: an evaluation of the Arthritis Research Campaign. *Rheumatology* 44:1145–1156.
- Wooding et al. (2011) Project Retrosight. Understanding the returns from cardiovascular and stroke research: Policy Report (MG-1079-RS). Cambridge, RAND Europe.
- Wooding et al. (2013) Mental Health Retrosight. Understanding the returns from research (lessons from schizophrenia): Policy Report (RR-325-GBF). Cambridge, RAND Europe.

	Mental health study	Cardiovascular disease and stroke study	Arthritis study
Different skills	✓	✓	✓
Engaged	✓	✓	✓
Clinical	✓	✓	✓
Impact on society	✓	✓	✓
Size	✓		✓
International	✓	✓	
Variety	✓	✓	✓
Expectations	✓	✓	✓



## Different skills: Fund researchers with more than just research skills - individuals are key when it comes to translation of research into wider impact

The evidence in the studies shows that individuals contribute a variety of key skills in addition to their research skills that support translation. These skills can be more important than the academic credentials upon which funders often base their decisions. The importance of these wider roles in research translation have been recognised in previous studies.<sup>1</sup> To maximise the chances of the research translating into impact, look for Principal Investigators (PI) and groups who have the motivation and ability to pursue those impacts, looking for some of the skills identified below.

### Details

**Attitude and conviction:** The arthritis study found that translation was not associated with the type of research, mode of funding, or the publication impact of the PI (as measured bibliometrically). In contrast it found that when translation did occur, it was largely due to the conviction, effort and personal networks of the PI. This was true in both non-commercial and commercial settings. The case study narratives led to the conclusion that the PI is the key factor in translation.

**Strategic thinking by clinical researchers:** The cardiovascular disease and stroke report found that strategic thinking by the PI is associated with a high and wider impact. Here, strategic thinking meant that the PI had thought through the pathway from research to impact or application before carrying out the research.

**Working across boundaries:** Another trait identified, this time in the mental health study, was that those involved in research who work across boundaries are associated with achieving wider health and social benefits. In some cases, this meant working across different disciplines, whereas in others, researchers worked at different stages of the translation pathway (e.g. in both basic and clinical research, or also spanning into the policy domain).

**Motivated by patient need:** The mental health study found some evidence to suggest that researchers who are motivated by patient need are more likely to achieve it. The study also identified an important role for effective champions of research areas or translation into practice.

**Clinical motivation for basic biomedical research:** The cardiovascular disease and stroke study found that, for basic biomedical research, clear clinical motivation was associated with high academic and wider impacts. Co-location of basic biomedical research in a clinical setting was also found to be associated with higher and wider impact.

### Caveats

**Does the tendency of clinical research to have more impact skew some of these comparisons?** In the mental health study, we found that most of the researchers motivated by patient need were involved in clinical research, and in the cardiovascular disease and stroke study, most basic research with clinical motivation was carried out by clinicians.

**Are these qualities intrinsic?** The studies did not address the question on the relative importance of ‘innate’ qualities versus training, i.e. whether these skills can be improved and developed through training or whether you have to select researchers who already display them.

**Limited evidence:** Some of these characteristics only come from one or two of the studies. However, the overall picture that the wider skill set and motivation of researchers around translation is important is seen across the studies.

<sup>1</sup> E.g. Swan, J., Newell, S., Bresnen, M., Mendes, M., Perkmann, M., & Robertson, M. (2005). Exploring interactivity in biomedical innovation: a framework and case study analysis. In *Proceedings of the Organizational Knowledge, Learning and Capabilities Conference, Boston*. Harvard Business School Press; Owen-Smith, J., Riccaboni, M., Pammolli, F., & Powell, W.W. (2002). A comparison of US and European university-industry relations in the life sciences. *Management Science*, 48(1), 24–43.



## Engaged: Support your researchers to engage with non-academic stakeholders to help their work have a wider impact

Many different groups have an interest in the outputs of research, from policymakers and industry to patients, practitioners and the public. Our evidence suggests that researchers who have engaged with these groups are more likely to have a wider impact through their research. This conclusion is supported by the existing literature on the importance of wider groups in research translation.<sup>2</sup> Supporting researchers to engage with wider groups at various stages of the research process, or funding researchers who show they have these networks, should help maximise the impact of research funding.

### Details

**Collaboration with industry:** In both the arthritis and cardiovascular disease and stroke studies, we found that basic biomedical research carried out in collaboration with industry was associated with greater and wider impacts. In the arthritis study, all cases of successful translation were PIs that had a close and friendly relationship with an industrial collaborator. For cardiovascular disease and stroke, although we did not find evidence of industry collaboration being associated with wider impact, we did find that it was associated with greater academic impact.

**Writing guidelines:** The arthritis study found that in the two case studies where research had been

incorporated into clinical guidelines, the PI had been involved in writing the guidelines.

### Engagement with patients and practitioners:

The cardiovascular disease and stroke report found that researcher engagement with practitioners and patients, in relation to the planning of the research or translation phases of the project, was associated with both higher academic and wider impacts.

### Collaboration with policymakers:

There was also evidence from the cardiovascular disease and stroke and arthritis case studies that, looking specifically at PIs with the highest impact on policy, all had a prior record of collaboration with policymakers; this relationship was stronger for clinical research than for basic.

### Interactions with regulators:

In the mental health study, interactions with regulators were identified as important for the adoption of pharmaceutical interventions, and it was recommended that funders encourage collaborative approaches by researchers.

### Caveats

**Causality:** Does the engagement generate impact or does impact stimulate engagement? Or does some external factor drive both? The evidence we have on this is not conclusive.

<sup>2</sup> E.g. Consoli, D., & Mina, A. (2009). An evolutionary perspective on health innovation systems. *Journal of Evolutionary Economics*, 19(2), 297–319; Wong, P.K. & Singh, A. (2013) 'Do co-publications with industry lead to higher levels of university technology commercialization activity?' *Scientometrics* 97:245–265.



## Clinical: For greater impact on patient care within 10-20 years, fund clinical research rather than basic research

All three studies found that clinical research had a greater impact on patient care than basic biomedical research within the time period considered. Alongside that, the studies found that clinical research also had a greater impact in the categories of ‘informing policy and product development’ and ‘economic benefit’. In all the studies, the size of the impacts were judged by a panel of assessors through a consensus scoring technique. This suggests that for greater impact on patient care or other societal impacts within 10-20 years, it is more effective to fund clinical research, as suggested by previous research in this area.<sup>3</sup>

### Details

**10 years:** The arthritis study found that clinical research tended to have more payback further along the translational pathway – i.e. more wider societal benefits.

**15-20 years:** In the cardiovascular disease and stroke study, 7 out of 15 basic biomedical case studies had impact on health and the health sector, compared with 12 out of 14 clinical case studies.

**20 years:** The mental health study looked at different ways of distinguishing basic from clinical research and found significantly higher health and health sector benefits for clinical research, regardless of the classification approach used.

### Caveats

**Is the time period long enough?** It is possible that the basic research takes more than 20 years to have an impact outside academia. For example, in the arthritis study, the identification of TNF-alpha as an important signaling molecule in cartilage damage was reported from basic research in 1986; however, the case study followed this story from 1992 as a clinical research project. But over a 20 year timescale, the lesson message remains.

**Are the impacts bigger but less frequent?** Perhaps basic research has a lower probability of a much larger impact, whereas clinical research has more consistent smaller impacts. The experimental approach might then underestimate the impact of basic research.

<sup>3</sup> E.g. Sherwin, C.W., & Isenson, R.S. (1967). Project Hindsight. A Defense Department study on the utility of research. *Science*, 161, 1571–1577.



## Impact on society: If you want to have a wider impact, don't just fund for academic excellence

Research that has high academic impact does not necessarily have a wider impact on society. Most funders have academic quality as a key criterion for the selection of research to fund. Our studies suggest that there is not a strong relationship between the academic performance of research and the impact it has outside of academia, on policy, practice and health. So if you are looking to make a difference beyond academia, looking solely for the highest academic quality might not be the best strategy.

### Details

The mental health and arthritis studies showed only a weak to moderate correlation between academic impact and wider impact and the cardiovascular disease and stroke study showed no significant correlation between academic impact and wider impact.

Examples from the cardiovascular disease and stroke study include the following:

- High academic impact and low wider impact: One case study directly resulted in 20 peer-reviewed papers with a total of 849 citations and, although the PI moved to work in industry, we could not trace any impact from the research, even 20 years later.

- Low academic impact and high wider impact: Another case study contributed directly to only two peer-review papers, but the work of the laboratory provided a screening service, which then influenced an NHS decision to provide genetic screening for Marfan syndrome (MFS). The research group also provided 'official' advice for clinicians and patients from the Marfan Trust and British Heart Foundation. Internationally their improved diagnostic test informed preventative management that increased the average survival of MFS patients and led to substantial health gains for some patients, reassurance to family members who did not carry the familial mutation and potential cost savings through reduced check-ups on unaffected family members.

### Caveats

**Academic impact does not preclude wider impact:** Studies that have a high academic impact can have wider impacts. However, the evidence from these studies suggests that research that has a high level of academic impact is no more likely to have a wider impact than research that does not.





## Size: Bigger isn't necessarily better when it comes to the size of a research grant

The size of the grant does not seem to be a key factor determining the impact of research. Research funders offer very different amounts of funding over different lengths of time and there is much debate about the relative merits of different approaches. In the arthritis study, a main conclusion was that short focused project grants seemed to provide value for money. While the other two studies did not specifically draw these conclusions, their findings did not find any clear evidence that larger studies were more likely to have an impact, in academia or more widely.

### Details

The main evidence for this comes from the arthritis study, which found that short focused project grants seemed to provide value for money:

- Despite the variation in the median value of grants analysed in the arthritis study, £90k for project grants compared to £250k for fellowships, £480k

for programmes and £450k for institutes, similar impact was observed.

- It was noted that the small grants were often focused on specific questions with an actionable answer, rather than being more exploratory, which may have helped to support the ultimate impact of such grants.
- The mental health study found that the amount of resources used was not connected to impact.

### Caveats

**Limited evidence:** There was insufficient evidence in the cardiovascular disease and stroke study to draw firm conclusions in relation to grant size, as the range of sizes was relatively small, differed between countries and was not always available for the retrospective sample in the funders' records. In addition, the analysis in the mental health study is based only on rough estimates of the total resources associated with each case study.



## International: For high academic impact, fund researchers who collaborate internationally and support them to do so

To have an impact on the frontiers of knowledge, our evidence suggests funding researchers that collaborate internationally and supporting them to do so. This conclusion is supported by previous bibliometric evidence suggesting that the work of international collaborations is more highly cited.<sup>4</sup>

### Details

The cardiovascular disease and stroke study found that international collaboration is associated with higher academic impact, which was supported by evidence from the mental health study.

- **Cardiovascular disease and stroke study:** The cardiovascular disease and stroke study found that 7 out of 9 high academic impact case studies were associated with international collaboration, but only 1 out of 10 of those with low impact. This relationship was stronger for clinical research than for basic research.
- **Mental health study:** For the mental health study, 5 out of 7 case studies with high knowledge production mentioned international collaboration, compared to 0 out of the 5 with low impact on knowledge production.
- **There may be value in other types of collaboration:** The cardiovascular disease and stroke study found that research collaboration in general (not specifically international or with academic

partners) is also associated with higher impact, particularly higher academic impact.

### Caveats

**More limited evidence:** Only the cardiovascular disease and stroke study provided sufficiently strong enough evidence to include this as a finding. The arthritis study did not contain the right type of evidence for us to be able to test this claim, but the finding is supported by evidence from the mental health study.

**Causality:** It could be that international collaboration leads to high academic impact because the work is likely to be publicised in a greater number of countries and influence academics in multiple networks. However, it could equally be that researchers who produce work of greater academic significance are in greater demand for international collaboration, or that their academic success leads to greater opportunities for international collaboration. Either way, these researchers are likely to be worth backing due to the impact they have in academia.

**Potential longer term consequences:** This approach may reduce the pool of potential researchers to fund and could discriminate against early career researchers with smaller networks. The long term development of the field also needs to be considered.

<sup>4</sup> 'International Comparative Performance of the UK Research Base – 2013.' A report prepared by Elsevier for the UK's Department of Business, Innovation and Skills (BIS). October 2013.



## Variety: Simple metrics will only capture some of the impact of your research

The impacts of research are diverse and can be unexpected, therefore a variety of measures should be used to capture the full impact of research. This finding reflects evidence in the literature, which states that a multifaceted approach to research evaluation is important.<sup>5</sup> Rarely will simple metrics be able to capture all the impacts across a portfolio of research and the most appropriate methods of impact assessment will vary from project to project. Impacts may also be unexpected, so a narrow set of metrics might miss wider unexpected benefits from the research. Case studies are a good approach to capture broader impact from research and if they are structured within a framework the impacts can be compared.

### Details

In all three studies there is strong evidence of a considerable diversity of research impacts across academia, policy, practice, industry, health and the economy. All of the studies show that case studies provide a useful way to capture this diverse range of impacts.

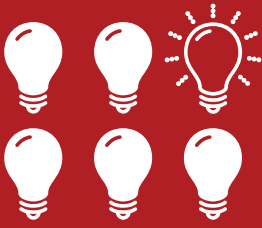
Examples of some case studies showing a range of different impacts include:

- An arthritis case study that had 41 papers receiving 330 citations per year and led to three PhD and MD qualifications being awarded. The work promoted the use of biologicals in therapy leading to the development and licensing of three drugs in the UK. One of these has been included in NICE guidelines and adopted by consensus groups in Europe and the United States, leading to significant health benefits, and substantial profits from drug sales for an industrial partner.
- A case study in the cardiovascular disease and stroke study had diverse impacts despite the slightly more limited academic impact of six papers that received 287 citations and one MSc degree being awarded. The findings informed international, European, national, sub-national and professional body guidelines and training documents. They informed management decisions of the Heartstart Scotland programme and influenced the renewal of automated external defibrillators in Scotland from Scottish Office funds. They also contributed to the decisions of wider ambulance services (UK and international) to adopt automated external defibrillators. Ultimately, it contributed to increased survival rates in out-of-hospital cardiac arrest and more people returning to work.
- A mental health case study on PET scanning and schizophrenia had eight papers with 546 citations and provided a methodological innovation in how mental health disorders can be studied to understand their biological effects on the brain, and improved the understanding of schizophrenia as a biological, not a psychological, disorder. This research led to an increase in the capacity within the NIH to do PET scanning and contributed to the advancements in the field of PET imaging. It has also led to a new drug reaching phase IIb in clinical trials so far.

### Caveats

**Attribution:** As impacts become more diverse and more distant from the original research, they also become more difficult to attribute directly to an individual piece of research.

<sup>5</sup> E.g. Wilsdon, J. et al. (2015) *The Metric Tide: Report of the Independent Review of the Role of Metrics in Research Assessment and Management*.



## Expectations: Most of your broader social and economic impact will come from just a few projects

The evidence from all three studies shows the majority of broader social and economic impacts coming from a minority of the projects. It is important to bear this in mind when setting expectations for the broader social and economic impact that will arise from any particular project.

### Details

No evidence of broader downstream social and economic benefits was found in 19 out of the 29 cardiovascular disease and stroke case studies, 12 out of the 18 mental health case studies and 11 out of the 16 arthritis case studies.

Looking across all three studies, only 21 of the case studies identified broader social and economic benefits; however, only half of these 21 produced substantial impacts. This translates into less than 15 per cent of case studies.

Taking into account that the mental health case studies were selected with the aim of identifying research that was considered promising at the time, this is a low fraction of case studies. However, the overall impact of this small number of case studies was substantial.

Examples include:

- One of the cardiovascular disease and stroke case studies had a high social and economic

impact when the findings of the group's research established them as experts in transgenic technology. This translated into the establishment of a knockout facility and commercial ventures with significant economic benefits.

- A mental health case study investigating outcomes following, and characteristics prior to, first schizophrenic episodes had high social and economic impact through making an important contribution to the development of early intervention services. Benefits from this include healthcare cost savings, improvements in quality of care benefitting both patients and families and bringing potential social benefits.

### Caveats

**Attribution:** Downstream impacts are also more difficult to measure, as they are further from the research. Some impacts might be missed and those that are identified are unlikely to result solely from one piece of research. That isn't to say that these impacts shouldn't be measured, as they are important in showing the ultimate outcomes of research, rather than expectations should also be managed regarding the strength of evidence around these impacts.