exploring the future of medical research

An example and guide on how to generate Foresight regarding the future of UK medical research

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Asia setting the research agenda, Apple competing with Google to provide healthcare, the end of phase III clinical trials, and the use of real-world patient data collected from mobile technology... Thinking about the future can throw up some interesting ideas!

As strategic investors in medical research we need ways to think about the future so that we can spot opportunities and head off threats. There is a way we can take advantage of the future rather than be caught out by it. We can do this by generating Foresight.

I am an Assistant Director for Research and Strategy at Breast Cancer Now and a 2014 Clore Social Fellow. As part of my Fellowship I set out to explore the future of UK medical research. Despite the fact it can take decades to create new therapies I rarely see us spending time thinking about what the world will be like when those therapies will be ready for clinical use.

What is ‘Foresight’?
Foresight is a tool, a process for helping us think about what the future may have in store for us, our organisations and the people we want to save from illness.

If our planning looks at the next two or three years and our strategies consider the next five to 10 years, Foresight looks further ahead, to 10, 20 or even 30 years’ time.

As part of my Clore Fellowship programme, I ran a simplified Foresight project to dip my toe into the future of UK medical research, looking ahead to 2035.

What did I find?
The work generated a lot of insight into strategic and financial issues, from the role of Asia in setting global priorities to the role mobile technology companies in delivering health care. You can explore all the insights online and in this guide.

Examples of the insight generated
- The quality of scientific output from Asia has increased over the years and is set to continue to do so, and the influence of Asia on global research is starting to increase. This may lead to the East dominating global research priorities in the future.
- Within the UK, there have been some shifts to local, rather than national, agenda setting, with power being devolved to local organisations, such as Clinical Commissioning Groups, and local authorities being given a mandate for public health. This may affect how research priorities are set in the future.
- There are new disease challenges facing us, such as drug resistance, and the increasing threat that infectious diseases may take priority over diseases of old age, despite our aging population. Climate change may also bring with it new and unexpected health challenges.
- An interesting shift is occurring in which mobile technology companies are increasingly interested in helping individuals collect health data about themselves. These companies are in a position to collate and analyse this data on a large scale. However, this data collection is not research focused; bias will emerge in the data if only a self-selected and resourceful group of people engage with the data collection.

How might you use the insights or run a Foresight process?
The insights are primarily discussion starters. The questions posed below might help open up discussions.

- Are any of the insights particularly interesting to you and your organisation and why?
- Do you particularly agree or disagree with any of the insights and why?
- Do the insights shed light on a more operational issue that you are dealing with?
- Does your current strategy take into account the issues highlighted? Does it need to?
- What do you think might happen, as relevant to medical research, when the outcomes of different insights interact?

The scenarios and the insight you generate along the way can be used in different ways. For example:
- Strategy and new areas of innovation. You could stress test your current strategy; would it cope with the scenarios you have created? New ideas might emerge as you go through the process.
- Culture, spotting opportunities and threats. Shifting your focus to the future could, I suspect, create a culture of responding to change, and possible future change, simply because you can spot new opportunities and challenges.
- Thought leadership. Or perhaps, like me, you simply find exploring the future interesting and want to share your experience and thoughts.

This guide will help you consider these ideas, with the help of examples of the insights I generated doted along the way.

My experience and conclusions
I was interested to see whether a Foresight process would generate useful insights for medical research organisations.

To my mind the answer is yes, the insights generated through the process are interesting and, I hope, will be of use to others and myself. Some of them are not new to me (personalised medicine anyone?), but some of them are.

The idea that phase III trials might not be needed if we can collect, and regulators would accept, real-world data from patients is an example of something I had not considered before. Further, while I knew the NHS is changing, I had not really considered the fact that should the Five Year Forward View be successful, there will be fewer district general hospitals from which to run large clinical trials.

On a more practical note, in my organisation, Breast Cancer Now, a newly merged charity, we are starting the process of developing our future strategy. The insights will prompt me to encourage Breast Cancer Now to consider several issues that we might not have otherwise spotted.

While we may know what we want for the future, the world might have other ideas. I can see a role for Foresight in helping us ensure that we get the best for our beneficiaries, rather than being caught out by a very uncertain world.

I hope you find this guide useful.

Dr Stuart Griffiths
February 2016
Contents

01 Introduction

02 What is Foresight?
What is Foresight and why use it?
I am not a fortune-teller!
Why use it?

03 How to run a Foresight process
Start with a question
Gather information
Distil and use the information gathered
Explore and work with the insights - a workshop

04 Summary of learning from running a Foresight process

05 Conclusions

06 The insights

07 Useful resources

08 Acknowledgements

09 Footnotes

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Introduction

This is a guide and a commentary on my exploration of the future of UK medical research. It is primarily written for those responsible for the research strategies and policy work of medical research organisations, and in particular for those in medical research charities, reflecting my personal background and frame of reference. However, I hope that others who are interested in the future of medical research will also find this an interesting and useful guide.

As part of my Clore Social Fellowship I came across a method called Foresight and I was struck by the fact I have not seen the medical research sector systematically think about the future.

The process of taking a drug from development to market takes around 12 years, without factoring in the basic science or drug target identification work. While medical research takes a long time, I have not seen our sector think about what the world might be like in the future. What will the world be like in, let’s say, 20 years? The time it will take for the research we fund today to see any clinical or public health application?

Many sectors and organisations use a Foresight process to ensure they are fit to tackle the future, to take advantage of opportunities and head off threats. The US National Intelligence Council produces a Global Trends Report for each returning or newly incoming President following a presidential election.

The reports look 20 years ahead to allow the President and senior policy-makers “the opportunity to weigh the report’s judgments and lay the groundwork to address long-range issues of importance to national and global security”. The latest publication looks ahead to 2030 and provides a fascinating read!

The UK Government Office for Science runs Foresight projects on specific areas to aid policy-making, with the aim of covering issues from 20 to 80 years into the future. The Foresight reports cover everything from the future of flooding risk, manufacturing and computer trading in financial markets, to the future of aging and future of cities.

Foresight projects can take years to complete. Indeed, some open-source projects, such as Future Agenda (which I highly recommend you take a look at), could continue for as long as they are useful. My project took place over the space of several months and so the work here presents an interesting ‘dip of the toe’ into the Foresight process to see if it would be useful for medical research organisations.

The following section outlines the concepts behind Foresight and the reasons why it might be of use in the real world. Section three is a ‘how to’ guide, outlining my thoughts on what might work for medical research organisations wanting to run a Foresight process. This is all based on the Foresight method taught by Patrick Harris and Rebecca Nash, who have a lot of experience in running Foresight projects, as part of the Clore Fellowship Programme.

Sections four and five then summarise my experiences of running a Foresight project and offer some conclusions on the exercise. And section six lists the insights that were generated (these are presented online if you wish to just refer to them alone).

Clore Social Leadership Programme

This research report is published as part of Stuart Griffiths’ Clore Social Fellowship. As part of the Clore Social Leadership Programme, each Fellow is required to undertake a piece of practice-based research.

The purpose of the research is to help develop Fellows’ skills as critical users of research, and to help develop the evidence base for the sector as a whole. The research focus, methodology and output are all chosen by the Fellow.

If you would like to discuss anything in the guide or the insights themselves, you can contact Stuart at:

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What is Foresight?
Foresight is a tool, a process for helping us think about what the future may have in store for us, our organisations and the people we want to save from illness.

If our planning looks at the next two or three years and our strategies consider the next five to 10 years, Foresight looks further ahead to 10, 20 or even 30 years’ time.

There is considerable uncertainty about the future that far out. Very few of the events and activities we will be involved in will have been predetermined.

The Foresight process essentially involves identifying the key drivers of change and then exploring how these drivers of change may interact to generate scenarios of the future. A simple schematic of the process is shown below.

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**What is Foresight?**

I cannot predict the future. Neither can you, I suspect, otherwise you wouldn’t be reading this. The aim of Foresight isn’t to predict precise details of what will and won’t happen in the future. The idea is to identify the underlying drivers of sweeping changes that *could* take place.

When we have some ideas about what could happen, we can develop scenarios of the future. Using scenarios in planning is not a new or ground-breaking idea, but here we are applying it to the world 10 or 20 years in the future.

The aim is to shift our focus from thinking about the world as it is now to thinking about the world as it could be at some time in the future.
The scenarios and the insight you generate along the way can be used in different ways.

You might want to stress test your current strategy. Would it cope with the scenarios you have created?

Alternatively, you could try to develop a strategy that would not just cope with, but would thrive in all the scenarios you have devised. Would such a strategy be likely to be successful in any future - whether your scenarios come to pass or not?

Either way, ask yourself: Is my organisation powerful enough to steer global society toward a particular scenario? For most of us the answer is probably no. However, could you develop strategies to influence government and global organisations toward creating the future society you want to see?

Culture, spotting opportunities and threats

I suspect that by shifting your focus to the future, a culture of responding to change, and possible future change, could emerge simply because opportunities and challenges are spotted. The Foresight methodology often relies heavily on narrative descriptions, which can flesh out the possibilities or threats in order to prompt action.

New areas of innovation

Perhaps you or your colleagues are stumped on how to tackle a problem. It is likely that the approach you are using to solve it doesn’t require you to think about what the world will be like in 20 years’ time. By viewing the problem from the perspective of the future, new ideas might arise.

Thought leadership

You might want to stimulate discussion, rather than having a single aim in mind. Or perhaps, like me, you just find this all very interesting and want to share your experience and thoughts!

Figure 3 - Uses for the insights and scenarios generated by the Foresight process

Spot new opportunities, responsive culture

Build a more adaptive, responsive culture

Ensure our strategies are robust

Identify new areas of innovation

Provide thought leadership

Foresight process

Insights and scenarios generated
How to run a Foresight process
Some organisations spend a lot of time and resources to generate foresight to aid their strategic thinking. My exploration of this issue, as part of my Clore Social Fellowship, led me to design a simple, streamlined approach that would fit around my day job over the course of six months. This goes to show that it is possible to do this on a small scale and generate some interesting and useful insights.

The basic process I used was as follows:

1. Ensure everything is framed by a single over-arching question.
   “What is the future of UK medical research up to 2035?”

2. Survey a wide range of people online.
   I asked a range of medical research professionals what they thought the key changes over the past five to 10 years have been, what is changing now, and what might change in the future.

   I worked through the responses and wrote up a summary of insights, grouped into themes.

4. Hold a workshop to explore the insights in more depth.
   I invited everyone who took part in the survey to come to a workshop to explore how the different insights from the survey could interact to form different scenarios of the future.
1. Start with a question

I framed my research via a single question:

**What is the future of UK medical research up to 2035?**

I did this to ensure the results of the research would be relevant to my work, that of a UK medical research charity. Further, it provides a focus, but not a narrow limit to help guide the participants in the research.

**Why did I ask this?**

As I was thinking about this research, my charity - Breast Cancer Now - was just emerging out of the merger of two previous breast cancer research charities. We were forming around a very clear ambition that by 2050 everyone who develops breast cancer will live.11 There were some intermediate ambitions too, a lot of which were clustered around 2025 to 2035, 10 to 20 years in the future - the precise time frame where Foresight 2025 to 2035, 10 to 20 years in the future?

We have good reasons to think that these ambitions are realistic, but it struck me that the world was very different 20 years ago. Just think back to 1995 - no smartphones with 4G internet, indeed not really much of an internet at all. No contactless payments, no iPod, no Google and no Facebook! How did we cope? Things changed dramatically in those 20 years, but did medical research funders keep pace? I don’t know the answer to that, but I am interested in Breast Cancer Now being as well prepared as possible for what could happen in the run up to 2025 and 2035 around our key ambitions. I am also interested in spotting future opportunities to bolster those ambitions and make them a reality.

**What is your question about the future and why are you asking it?**

The future is a large place - I suggest you don’t try to think about everything the future may hold, but that you narrow down your scope to a topic you are interested in. A good way to do this is to frame the work within a single question.

Some food for thought:

- What timescale are you interested in?
- Who are your stakeholders?
- What will you do with the insight you generate?

2. Gather information

Having thought about the question, the next step is to gather information from lots of different sources. There are a great many ways to do this, from in-depth interviewing of experts to reading randomly selected magazine articles to prompt thinking about the question you are interested in.

In my simplified process I decided to conduct an online survey. The survey asked three questions and I gave an example answer for each (see box one).

My aim at this stage was to see if I could identify any key themes in regard to what might drive change in the future. We all know that past performance is not necessarily an indicator of future results. However, I think it reasonable to suggest that where we identify changes that are likely to continue, and we can create some interesting assumptions as to why that change is happening, then we can explore where things might go next.

I was conscious that I wanted a mix of perspectives from different types of research scientists, research funders and industry. I also wanted a cross section of people working on different medical conditions and research areas. The Association of Medical Research Charities was kind enough to distribute my request for people to take part. I made use of my personal networks, which are predominately cancer focused.

I had 20 responses to my survey, which I was delighted with. They came from a wide range of stakeholders; from industry strategy teams to academic researchers, from research funders to clinicians.

**How could you gather information?**

Some food for thought:

- Could you do face to face interviews?
- How might you find a wide variety of participants?
- What written resources are available to you?

**Box 1**

Questions for the online survey

Looking back over the last 10 years what have been the biggest changes you have noticed affecting UK medical research and what has been the impact?

For example: “Progress in computing has allowed larger data collection and analysis leading to greater insights and progress in areas such as genetic analysis, personalised medicine and disease risk prediction.”

What is happening now that is affecting UK medical research?

For example: “Wearable tech and smartphones are allowing more health data capture from individuals, yet there are public concerns about the use of personal health data by large organisations whether they be governmental, charitable or private enterprises. The results of the debate will have a large impact on our ability to make best use of this data.”

What can you see changing in the next 20 years that will affect UK medical research?

For example: “New business and financial models for drug development investment are starting to be discussed and identified. I imagine over the next 20 years these will be put into practice and tested with new types of health organisations coming into existence.”
3. Distil and use the information gathered

I used a ‘pseudo-qualitative’ approach to summarise the information from the survey. The first step was to assess the comments to see if they grouped under different subheadings. In the end I had 10 categories, ranging from the role of the patient and public involvement in research to financial issues. The next step was to see if the comments could be distilled down to a set of common and key insights. A few narratives started to emerge from the comments as well.

I must make it clear that the Foresight process is more of an art than a science. As such I took some licence to elaborate on issues I thought were interesting when distilling and interpreting the information from the survey.

How could you deal with the information?

Some food for thought:
• Who might help you work through all the information?
• Who will be looking at the distilled information you create? What might they expect?
• Will you be publishing information outside your organisation? Does this change the way you might work through the information?

The full set of insights is listed in section six of this guide and online and examples are given in box two.

Box 2
Examples of the insight generated

**East and West**
The quality of scientific output from Asia has increased over the years and is set to continue to do so, and the influence of Asia on global research is starting to increase. This may lead to the East dominating global research priorities in the future.

**Research priorities**
Within the UK, there have been some shifts to local, rather than national, agenda setting, with power being devolved to local organisations, such as Clinical Commissioning Groups, and local authorities being given a mandate for public health; this may affect how research priorities are set in the future.

**Patient and public influence**
In line with other social justice issues, there has been a movement towards ensuring that beneficiaries are at the heart of the work we do. Patient and public involvement is increasingly seen as not only the right thing to do, but as a key component in ensuring that medical research benefits those who need it. It helps us to design research that asks the right questions, to ensure patients will benefit from it.

**New diseases challenges**
There are new disease challenges facing us, such as drug resistance, and the increasing threat that infectious diseases may take priority over diseases of old age, despite our aging population. Climate change may also bring with it new and unexpected health challenges.

**Technology and data**
An interesting shift is occurring in which mobile technology companies are increasingly interested in helping individuals collect health data about themselves. These companies are in a position to collate and analyse this data on a large scale. However, this data collection is not research focused; bias will emerge in the data if only a self-selected and resourceful group of people engage with the data collection.

The insights are identifying what has changed, what is changing and where things might be heading in the future.

The next steps of thinking about the insights and how they interact with one another start to help us think about what the future might hold.

**How might you use the insights?**
The insights are primarily discussion starters to aid strategic thinking. The questions posed below will help open up discussions.

• Are any of the insights particularly interesting to you and your organisation? If so, why? Could you find others who are interested in the same issue to discuss it further?

• Do you particularly agree or disagree with any of the insights? If so, why? This may shed light on any hidden assumptions you and your organisations hold. Not that they will necessarily a negative thing, but flushing out assumptions can be a helpful exercise to make sure strategies are robust.

• Do the insights shed light on a more operational issue that you are dealing with? Could you approach the issue from a different angle?

• Does your current strategy take into account the issues highlighted? Does it need to?

• What do you think might happen, as relevant to medical research, when the outcomes of different insights interact? There is more on this question in the following section.
4. Explore and work with the insights
- a workshop

I decided to hold a one-day workshop with two aims:

- To see what the future might hold by exploring how the outcomes from different insights might interact.
- To develop four interlinked scenarios for the future of UK medical research.

I invited everyone who took part in the survey, and few people who had indicated they were interested after the survey closed, to attend the workshop. In total, 10 people took part.

I split the day into four parts:

1. Warm-up
2. Playing with the insights
3. Scenario building
4. Finish.

To set the tone for the day I paid close attention to the layout of the room. I wanted small groups of up to four people per table, and that everyone on every table would be able to see me and the projected slides at the head of the room.

I also had A3 cardboard and other smaller printouts of the insights generated from the Future Agenda project\(^\text{1}\), an open source Foresight project, scattered across the tables and the on the walls.
Workshop exercise one: Why people came

I started with asking why people came and what they wanted out of the day. I made it clear that "Because you asked me to come!" was a perfectly acceptable answer!

Box 3

Why people came to the workshop and what they wanted out of the day

“Start thinking about strategy for my organisation”

“To broaden my horizons”

“Interested in a long-term view”

“[Find out] how to work more closely with other organisations and disciplines”

“Interested in prevention of disease”

“Explore the disconnect between science and the clinic - how can we be better at clinical application in the future?”

“Get the big questions out there to help charities work out how to have an impact”

“[Find out] how things might change for research funders in the future.”

Workshop talk one: Introduction to the day and examples of people predicting the future from the past

I spent some time outlining the idea of Foresight to the workshop attendees as per the introductory sections of this guide.

I also showed some examples of people having attempted to predict the future from the past. The aim of this exercise was to make the point that when considering the future, we probably won’t get the specific details correct, but the act of discussing the future can open up thinking that we might have otherwise missed.

“Must Tomorrow’s Man Look Like This?”

Although some things can appear to be ridiculous, they can still provide insight. The picture below illustrates a mostly satirical idea of what the future holds from the viewpoint of 1963. It anticipates more and more human augmentation and integration with technology. If an organisation had been thinking about human augmentation in 1963, perhaps they would have had a head start in the area.


Sometimes predications can seem scarly accurate: “Communications will become sight-sound and you will see as well as hear the person you telephone. The screen can be used not only to see the people you call but also for studying documents and photographs and reading passages from books.”

Smartphones and tablet computers, anyone? But unfortunately, he doesn’t stop there: “For that matter, you will be able to reach someone at the moon colonies.”
Workshop exercise two: Voting on statements about the future

To generate some discussion and to start people thinking about the future, I put forward some statements about the future and asked people to vote as to whether or not they agreed. The internet is full of inspiration to generate such questions. The point was get people to explain why they voted yes or no: what signals are they looking at today to give them a steer?

Voting on the future:

• By 2020 it will be commonplace for concerts of deceased singers to take place using holographic imaging.16

• By 2030 we will have chips implanted under our skin that replace smartphones and can monitor our blood for biomarkers of disease.17

• A manned trip to Mars will take place by 2035.18

• By 2020 it will be commonplace for wearable tech to send real-time patient data to health care professionals.

• By 2035 supercomputers or artificial intelligence programmes will be treating some patients with complex diseases without human input.19

Workshop exercise three: How the insights might interact

I split people up into three groups; each group had a table to themselves. On each table I placed printouts of the insights from the survey, in a large font, on A4 sheets.

I asked people to select a few of the insights and to start to mix and match them, to create a narrative of how the outcomes of these insights could interact to create an aspect of the future of medical research. Box four shows examples I used to illustrate the point.

Box 4
Examples of the interaction of the insights

Example one
The following insights:

“An interesting shift is occurring in which mobile technology companies are increasingly interested in helping individuals collect health data about themselves. Further, these companies are in a position to collate and analyse this data on a large scale.”

“There is an increasing number of new models of collaboration between academia, industry and the public sector arising alongside an increasing amount of multi-disciplinary research.”

“There is an increasing openness of scientific data for public debate and scrutiny, but there is an increasing public debate about the privacy of personal data.”

Lead to:

The NHS, charities and technology and information companies such as Apple and Google start to collaborate to introduce new medical innovations on a large scale without the need for more traditional medical industry. People are in charge of their own data and can choose to donate or sell it, and either they trust these collaborations or they don’t.

Example two
The following insights:

“Funders are working, at least partly, in isolation in terms of strategic agendas, meaning there is a lack of national strategic oversight of research in some areas.”

“Technological advances have allowed the development of new cell and gene therapies and biopharmaceutical formats.”

Lead to:

Many different and competing new technologies, each needing specific set-ups in the NHS.
I asked people to note down the insights they used and the story they created from them. I also asked people to think about whether the outcomes of the story could end up going in opposite directions.

I then asked each group to distil down their story to a sentence or two and asked them to outline two opposite ways the story could go. We generated quite a few ideas, some of which are shown in box five below. It is interesting to note that the two opposite ways the story could go focus on seemingly positive and negative outcomes.

**Box 5**

**Examples of the stories generated in the workshop**

**Using health data:** There is an increased culture of open data, which is being collected by technology companies.

*Could go this way:* Large datasets allow detection of patterns that could lead to new insights about disease. *Or this way:* Public lose all trust in data companies because of security concerns and the data becomes unusable.

**Personalised medicine:** New technologies and a better understanding of the disease environment lead to more opportunities to develop and profit from new therapies.

*Could go this way:* Drugs are effective, cost effective and affordable. *Or this way:* The target population becomes so small that there is no incentive for companies to develop new drugs.

**Where will the money come from?:** There are huge financial pressures on both universities and health care providers.

*Could go this way:* The public decide not to give to charities because they don’t want to subsidise the UK education sector. Further, they don’t see the point of funding research that will never be implemented in the NHS.

*Or this way:* Charities recognise the challenge and merge, aiming to bring the benefit of localism to the economies of scale and the increased influence of a large organisation.

**CFDA usurps FDA:** China becomes the leading developer of new treatments.

*Could go this way:* The West responds by becoming less risk adverse and less bureaucratic, and clinical research becomes more efficient, allowing personalised medicine to become a reality.

*Or this way:* If the West doesn’t adapt, health care becomes unaffordable in the West and individualised care is not possible.

**Forget anatomy, follow the pathway:** Research focuses on a pathway approach, using common risk factors rather than ‘simple’ disease classifications.

*Could go this way:* Funders work together. Scientists collaborate to resolve issues and understand diseases. More money for interdisciplinary and international collaborations.

*Or this way:* The approach misses important areas of research unique to specific diseases.

**Patient-driven research in a global environment:** In a networked world with pharmaceutical domination from the East, who decides which research we do?

*Could go this way:* New treatments reach patients faster, with better research into rare disease and subtypes.

*Or this way:* Errors in the data lead regulators to refuse to accept it. Inequality of care increases.

**How might you generate stories?**

Some food for thought:

- Do you want to single specific ideas and ask participants to work with just those?
- Are you looking for a wide range of stories could you ask participants to randomly pick insights and see how they interact?
- How might the participants want to work? Will they want to prioritise some insights over others?
Workshop exercise four: Scenario building

The aim of the final part of the workshop was to see if we could build four interlinked scenarios of the future from two of the stories generated in the previous exercise.

I asked the groups to consider whether the stories they had created are very likely to go one way or the other, in which case there is not a lot of uncertainty around that issue.

We then focused on the stories for which both of the identified outcomes are equally likely, meaning there is a lot of uncertainty about the future.

I then asked everyone to vote on which two stories we would use for our scenario building. I did this by giving people five sticky dots to place against the stories they wished vote for, allowing them to vote for as many or as few as they wished.

The participants were in agreement about the two stories they wanted to explore, which concerned the role of Asia and the impact of how we deal with data in the future. They did not want to explore personalised medicine, as there is already a lot of thinking about that.

We identified two simple questions in relation to Asia and data. These could be aligned on two axes to generate a grid of four interconnected and equally likely worlds that could exist in the future.

Axis one: Our ability to use data is either good or poor:
- good meaning we have good quality and open data
- poor meaning we either have poor-quality data or that the data is not open.

Axis two: Does Asia or the West lead the way in terms of setting research priorities?

We then spent time exploring the following questions in relation to each of these four worlds.
- What are the key issues?
- Who are the winners and losers?
- What are different sectors doing?
- NHS
- Academia
- Industry
- Government
- How are the different sectors interacting?
- What is the situation for patients? How do they experience research and health care?
- What is happening in the UK and Asia?

Unfortunately, we did not have sufficient expertise in the room to usefully explore the questions around Asia and Asian medical research or health agendas and so I have not presented our discussions in this guide.

If this had been a commissioned piece of work, I would not have looked at Asia in the workshop. At a later stage I would have identified who could have helped us understand which aspects of Asia we need to consider and who could help us think about them.

Regarding the issues around data, we did generate some interesting and hopeful visions of the future, but also some undesirable ones. None of the visions had anything to do with whether Asia or the West was leading the way in terms of research priorities.

As discussions about data and its use become more commonplace, creating narratives about what the future can hold if we get things right - and what might happen if we don't - could be a powerful way to motivate ourselves and wider society to get things right!
I ended the workshop by asking people what they would take away from the day. As you can see from these few comments, the idea and methodology of Foresight isn’t for everyone.

Box 6
What people took away from the day

"Interesting to see commonalities of interest across the group emerge."

"Data issues quality concerns, confidentiality concerns (know it’s important, but thinking about future worlds really brought home how things could go if we don’t get this right now)."

"Read more horizon scanning."

"Facts versus opinion. Found it hard to work on opinion rather than facts set myself some thought experiments."

"The future if difficult to predict not sure why we need to do it, we can’t control it. Research is resistant, like a super tanker, it takes a lot to shift it."

"Nothing we can do about the future how useful is this?"

"China going to get some Mandarin lessons."

"Good to lift head up read up on research in other areas."

"Difficult when can’t be right how to use this when it is not academic?"

We had an interesting discussion at the end of the workshop about issues with the process. We also discussed how Foresight could only be of limited usefulness. This is in part due to the sector and audience I work with.

Research and academia are concerned with asking a question and finding an answer via hypothesis, experimentation and evidence.

This is not how Foresight works, nor is its aim to accurately predict the future. Perhaps that means it will not be useful for those immersed in research.

However, science can often be an art of the imagination - perhaps Foresight could help to stimulate new thinking directly in research and academia.
Summary

Summary of my learning from running a Foresight process

I ran this piece of research as part of my Clore Fellowship, the principal aim being for me to learn a new skill. It was not a commissioned piece of work for a specific organisation.

The following lists the lessons I learned from my experience of running a Foresight process. It presents both my recommendations for anybody considering a similar exercise and how I would tackle any future research for my own organisation.

1. Be clear on how you intend to use the Foresight generated. What does the organisation want to achieve and why? There may be other tools more suited to your requirements.

2. Ensure the question is as relevant as possible to the organisation the work is for. In my case, I would narrow the question to issues around breast cancer research.

3. Conduct face-to-face interviews. I have no doubt there would more be insight to uncover through face to face interviews by listening to what participants were saying and asking follow-up questions.

4. Have a wide and varied set of people involved in generating the insight. For this study I made use of my personal networks, but these are predominately cancer focused, with neurological research close behind. To uncover a comprehensive set of insights requires listening to the views of as many people as possible.

5. Incorporate horizon scanning. I did not have time to do this as part of this research, but a great deal of insight can be generated from scanning the horizon for emerging trends.

6. Spend more time exploring the insights. A one-day workshop is not enough time to explore the insights. I would spend time identifying the key underlying drivers of change with smaller groups of interested people before any workshops.

7. Ask for help. Various people gave me advice and guidance. I am happy to be contacted and to offer my help and thoughts.
I decided to run a ‘condensed’ Foresight process because, although medical research is a long process, I don’t often come across medical research funders considering what the future may hold and applying that to their strategies. Perhaps that is simply because organisations don’t widely discuss how they generate their strategies. I was interested to see if the Foresight process would generate useful insights to share and discuss.

The answer is that it did. The insights generated through the process were interesting and will, I hope, be of use to others as well as to me. Some of them are not new to me, but some of them are. The idea that phase III trials might not be needed if we can collect, and regulators would accept, real-world data from patients is an example of something I had not considered before. Further, while I knew the NHS is changing, I had not really considered the fact that should the Five Year Forward View be successful, there will be fewer district general hospitals from which to run large trials.

On a more practical note, the insights around university funding and research funding models and how things have changed and may continue to change could prove very timely for my organisation, Breast Cancer Now. As a newly merged charity, we are starting the process of developing our future strategy. The insights will prompt me to encourage Breast Cancer Now to consider the following issues:

1. How do we engage with local agenda setting? As devolution increases - not just in the four nations, but also in the regions, such as Greater Manchester - we may want to have different research strategies in areas with devolved powers so that we can make the most of local strengths and interests.

2. How can we ensure blue skies or pure academic research continues to take place in a context of outcome-driven research agendas? After all, we need a pool of knowledge to draw from before we can start to aim for specific outcomes. Is this a job for disease-specific funders or for the government or other non-specific funders?

3. How can we continue to support and build good UK bioinformatics capabilities to make the best use of data?

4. Should we be starting to engage with mobile technology companies? What happens if we ignore the signs that they are becoming increasingly important in medical research?

5. How do we ensure we have a sustainable talent pool for breast cancer researchers, when early career researchers are under pressure to produce results quickly and become ‘Research Excellence Framework returnable’ and are losing out in grant funding to more established scientists?

6. Will our research funding models work in the NHS described in the Five Year Forward View?

7. Should we be finding research partners in Asia?

8. Finally, and most importantly in many respects, how can we build on our previous patient involvement to best involve our beneficiaries in our work - particularly as we do not fund a large amount of clinical research?

We would have come across some of these issues quite independently of a Foresight process. I don’t care about what tool is used to highlight the issues; if another tool can do so then I am glad there is more than one way to find them.

Many tools consider the future, but I think the Foresight process uncovers insights that would not be uncovered with other strategy models. For example, SWOT and PEST are often used to think about maximising opportunities and heading off threats but, in my experience, they don’t cast the net as wide and as far forward as a Foresight process would. They could and perhaps should be used as part of a Foresight process however. Scenario planning is another common strategic tool, and the best scenario planning will have a wide and varied input, the type Foresight generates.

In conclusion, while we may know what we want for the future, the world might have other ideas. I can see a role for Foresight in helping us ensure that we achieve the best for our beneficiaries, rather than being caught out by a very uncertain world!

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The Foresight allows me to develop future scenarios that I can use to test the strategies we develop. I can explore whether the strategies might come unstuck in any of those future worlds and if so to work out how to make them robust enough to work in any scenario.

In conclusion, while we may know what we want for the future, the world might have other ideas. I can see a role for Foresight in helping us ensure that we achieve the best for our beneficiaries, rather than being caught out by a very uncertain world!
The following insights were generated from the online survey regarding the future of medical research in the UK.

The survey asked three questions:

• Looking back over the last 10 years what have been the biggest changes you have noticed affecting UK medical research and what has been the impact?

• What is happening now that is affecting UK medical research?

• What can you see changing in the next 20 years that will affect UK medical research?

I used a ‘pseudo-qualitative’ approach to summarising the information from the survey. As such, I did take some licence to elaborate on issues I thought were interesting when distilling and interpreting the information from the survey. Note that the people who took part in the survey might not necessarily agree with the insights presented here.

I have deliberately not grouped the comments in terms of past, present or future, but into thematic areas. The themes are in no particular order.

Strategy

Interest in, and pressure to prove, how research leads to changes for people has resulted in many funders following a more directive- and outcomes-driven approach to research investment. This is to the detriment of blue skies or pure academic research.

Only large charities are able to focus on clinical work, which arguably has the largest immediate impact, leaving smaller charitable funders to invest in basic research.

Funders are working, at least partly, in isolation in terms of strategic agendas, meaning there is a lack of national strategic oversight of research in some areas.

Within the UK, there have been some shifts to local, rather than national, agenda setting, with power being devolved to local organisations, such as Clinical Commissioning Groups, and local authorities being given a mandate for public health. This may affect how research priorities are set in the future.

Technology and data

Advances in technology continue at pace, the price of technology continues to fall and we are seeing more powerful and user-friendly technology across society, particularly in regard to mobile technology. This has allowed large amounts of data generation or collection, from genomic data to observable health data of individuals.

Technological advances have allowed the development of new cell and gene therapies and biopharmaceutical formats.

The field of bioinformatics continues to rise in importance and we are seeing more sophisticated data analysis techniques. We are probably not getting the most from the data we currently have due to a lack of expertise in handling big medical datasets.

The NHS allows data capture in a way that is not possible in other fragmented systems. However, the NHS does not have the bioinformatics resources or the systems in place for making captured data available to researchers.

There is an increased openness of scientific data for public debate and scrutiny, but there is an increasing public debate about the privacy of personal data. This is in the context of data collection, real or perceived, in the name of national security by governments and in the context of data use for profit-driven marketing motives, charities buying and selling data for fundraising purposes and, of course, identity theft.

An interesting shift is occurring in which mobile technology companies are increasingly interested in helping individuals collect health data about themselves. These companies are in a position to collate and analyse this data on a large scale. However, this data collection is not research focused; bias will emerge in the data if only a self-selected and resourceful group of people engage with the data collection.

New technologies and drug types will reduce the patent cliff for industry, allowing investment in more complicated disease and treatment areas.

Financial issues

Recent UK governments have been consistent in wishing to promote and prioritise medical research policy and funding, but research spend has been cut in real terms. This could change in the face of any further financial problems. We have yet to see the impact of the Chinese economy slowing down, for example.

There are concerns about how we pay for future medical innovations, particularly drugs, especially as an increasing amount of resource is required for each new research or health gain (all the easy stuff has been done!) and, in the case of rare diseases, there are only small markets, making development of, and payment for, new innovations very difficult.

Funding and organisation of research

The scale of research projects is increasing due to the need for larger data sets and the complexity of diseases. This is leading to two, and at first glance opposite, outcomes. First, the need to collaborate widely and internationally and, second, the need to have large multi-disciplinary research centres, which concentrate large numbers of researchers into the same organisation and physical space. The pressure for outcome-driven research may also be contributing to the increasing use of the research centres model due to the long-term and multi-disciplinary nature of the research required to focus on specific outcomes.

There is an increasing number of new models of collaboration between academia, industry and the public sector arising alongside an increasing amount of multi-disciplinary research.

There are problems in building a critical mass of research in disease areas that are not already established.

Talent pool and academia

There are many effects of the drive to fund impactful research, but a stark one is the effect on young scientists. Early career researchers are under pressure to produce results quickly and to become ‘Research Excellence Framework returnable’ and are losing out in grant funding to more established scientists with a proven track record.

When this is combined with the impact of potentially poor science education, tuition fees and the reducing number of non-centre-based research grants, the talent pool at the early stage researcher level is contracting, which could be a real concern for the future.
Universities are becoming increasingly motivated by financial income and are valuing government funding over charitable funding.

Generally, it is suggested that UK academics are more aware of intellectual property than academics in other countries.

Clinical research
The need for and the requirements of clinical academics are well understood. Coordinated clinical efforts, particularly through the National Institute for Health Research (which has also brought more funding opportunities), have generated large rewards.

The increasing understanding of the complexity of many diseases, and the associated subtyping, is continuing to enable the development of targeted treatments.

Clinical research infrastructure is helping to embed research into clinical practice.

The UK is still thought of as a leader in biotechnology and medical research, but it has declined in terms of being a market for pharmaceutical companies, which could lead to less pharmaceutical research taking place in the UK.

There has been a move to reduce surgery and to increase the use of drug therapies. However, for some diseases the relative efficacy is often the inverse, surgery can be more effective than drugs.

There are signs that adaptive licensing of new innovations relying on real world data via patient monitoring could become more acceptable. This could lead to a reduction in the costs of development, and also to quicker and cheaper access to those innovations.

The NHS model is changing and large-scale clinical trials may become more difficult to do. We need to think now about designing medical innovations that will work in the new NHS: the NHS of embedding care in the community, not in large district general hospitals.

Implementing medical innovations in the NHS
The NHS is struggling to implement, and to ensure equality of access to, new medical innovations.

Multi-disciplinary research between medicine and engineering is starting to bear fruit, but there has been little impact in the clinic as of yet. The complexities of new medical innovations are outpacing regulatory frameworks, but new models of regulation for accelerating access to medicines are being discussed and tested, such as adaptive licensing.

Treatment and understanding of disease
We understand many conditions in great detail and are starting to understand just how complex many of them are. While we have not yet developed the tools to therapeutically intervene with the same level of sophistication as our understanding of the molecular details of the disease, we are identifying more therapeutic targets.

In the area of cancer research in particular, understanding the complexity of disease has helped to identify a healthy individual's risk of contracting it. Options are being developed to prevent illness arising in the first place, with efforts starting with those at high risk of developing the disease.

The age of single blockbuster drugs is coming to an end, if it hasn't ended already. Treatments are becoming increasingly multi-modal, personalised and targeted, as a result of understanding the complexity of diseases and identifying disease subtypes, and the idea of personalised medicine continues to become a reality. This brings many challenges in treatment development and implementation in the health system. For example, large clinical trials become difficult when a new treatment will only work for a particular subset of patients, and there needs to be an assessment of which other treatments it may complement. Indeed, thought needs to be given to which treatments may work well together, even when none of them work individually. The need to identify biomarkers of response to treatments and to link up diagnostics and treatment in order to avoid over treating patients also continues to be challenging.

The understanding of host factors and the roles they play in the development or hindrance of diseases, particularly in cancer, is leading to entirely new therapeutic innovations, such as immunotherapy.

There are new disease challenges facing us, such as drug resistance, and the increasing threat that infectious diseases may take priority over diseases of old age, despite our aging population. Climate change may also bring with it new and unexpected health challenges.

We are starting to face the question of how to ensure people have good quality of life during and following treatment as we expect more and more people to survive diseases. Furthermore, we will have to face the fact that we all have to die of something; the questions of how long is long enough to live and how good a quality of life is required for that time have yet to have an impact on medical research. Medical research aims tend to focus on eliminating individual diseases, rather than face the bigger questions.

East and West
The quality of scientific output from Asia has increased over the years and is set to continue to do so, and the influence of Asia on global research is starting to increase. This may lead to the East dominating global research priorities in the future.

The UK academic base is world class, but continued investment from the government is required to keep it that way in order to continue to leverage investment from industry. There are signs of industry moving away from the Eurozone, leading to a talent and economic drain away from the UK.

Patient and public influence
In line with other social justice issues, there has been a movement towards ensuring that the beneficiaries are at the heart of the work we do. Patient and public involvement is increasingly seen as not only the right thing to do, but as a key component in ensuring that medical research benefits those who need it. It helps us to design research that asks the right questions to ensure patients will benefit from it.

Furthermore, patients and the public have become increasingly active in designing health care services and in lobbying for access to medical innovations.
Useful resources
I have listed a few of the resources I found very helpful when undertaking this project. I highly recommend taking a look at the Foresight projects and useful insights resources - they are fascinating!

**Foresight projects and useful insights:**

- **Future Agenda**
  futureagenda.org/about/future-agenda-2-0

- **Government Office for Science (UK)**
  gov.uk/government/collections/foresight-project

- **National Intelligence Council (USA)**
  dni.gov/nic/globaltrends

- **FutureTimeline.net**
  futuretimeline.net

**Other how to and workshop resources:**

- **Thoughtengine**
  thoughtengine.co.uk

- **Foresight toolkit for policy-makers and analysts: Government Office for Science (UK)**
  gov.uk/government/publications/Foresight-toolkit-for-policy-makers-and-analysts

- **Gamestorming: A toolkit for innovators, rule-breakers and change makers**
  gamestorming.com

- **Getting on Brilliantly: Recipes for managing successful meetings**
  static1.squarespace.com/static/53b6be96e4b087906dfe503c/t/53dfb464e4b072d4eb2eb6a6/6f/1407169636553/Getting_on_brilliantly.pdf
Acknowledgements

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I am very grateful for the time and thoughts of the following people, who took part in the online survey about the future of UK medical research.

Please note the people who took part in the survey may not necessarily agree with the insights distilled from the survey responses as presented in this guide.

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- Dr Helen Rippon
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- Dr Elizabeth Robertson
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- Dr Liz Philpots
  Association of Medical Research Charities (AMRC)
- Dr John Solly
  Myrology Trust
- Dr Lynn Turner
  Worldwide Cancer Research
- Dr Simon Vincent
  Breast Cancer Now

The Foresight method

I learned the Foresight method on which this guide is based from Patrick Harris and Rebecca Nash during a two-day training course as part of my Clore Fellowship. A lot of the methods and techniques I used are based on their teaching.

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And finally thank you to Katy Feek and Nick Wakefield at Breast Cancer Now for designing this guide!
Footnotes

1Site under development at the time of submission to the Clore Social Leadership Programme.


3www.dni.gov/nic/globaltrends


5https://www.gov.uk/government/collections/foresight-projects

6http://www.futureagenda.org/about/future-agenda-2-0/

7http://thoughtengine.co.uk

8Site under development at the time of submission to the Clore Social Leadership Programme.

9Figure based on an original by Patrick Harris and Rebecca Nash.

10Note that I have used the word insights to describe the information gathered. In fact, a better word to use might be trends – further work would be required to distil down the key drivers of change behind the trends to generate the key insights. However, this was outside the scope of this project.


12Site under development at the time of submission to the Clore Social Leadership Programme.

13https://www.flickr.com/photos/131046472@N07/sets/with/72157650209743397


15www.nytimes.com/books/97/03/23/lifetimes/asi-v-fair.html

16Question inspired by http://www.futuretimeline.net/blog/2015/09/15.htm#.VgwNJTVViko

17Question inspired by http://www.wired.co.uk/news/archive/2013-03/20/implantable-chip-doctor

18Question inspired by http://www.futuretimeline.net/21stcentury/2033.html#mars

19Question inspired by http://scienceroll.com/2014/01/03/2014-predictions/

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