

SCIENCE AND BIAS

JOYCE TAIT

Paper presented at the BA Festival of Science, Exeter, 6th Sept., 2004

Are we eroding the evidence base for decisions?

Bias in scientific research has been very much in the news recently, for example relating to GM crops, measles mumps and rubella (MMR) vaccine, and the testing and licensing of drugs. This presumption of bias downgrades the value of research findings as evidence to support decision making about the governance, regulation and uses of science and technology. Those who attempt to take policy decisions on the basis of evidence are finding that science and technology are becoming increasingly ungovernable as the evidence base for decisions is challenged and eroded.

The recognition of bias is nothing new. Thirty years ago there was more emphasis on the bias inherent in the peer review system where an older, established peer group was resistant to the injection of new ideas which might challenge their own theories and received wisdom. In some cases scientific progress had to await the retirement or death of some key figures in a discipline. This now seems less of a problem – a rapid rate of change in received wisdom has become the norm, particularly in the life sciences.

Current concerns are more about the replacement of public by private sources of funding of science. Most of the research leading to the development of GM crops has been funded by industry. As a result there have been claims that there are no public benefits from the technology, that benefits will go entirely to industry and farmers who manage their land intensively, and that insufficient attention has been given to potential damaging effects on health and the environment. Likewise, research done in support of the registration of new drugs is mainly carried out by industry, and even where it is conducted in universities and medical institutions this is done for industry and with industry funding. The results have been shown on several occasions to be biased in the sense that some research outcomes inconvenient to the company concerned are suppressed.

These are legitimate concerns and they need to be addressed, but our search for bias is itself biased. The focus of discussion of bias is almost exclusively directed towards science and industry, without recognising the multiple types and sources of bias, particularly where stakeholders and commentators have diverse and opposing commitments and interests. People are alert to the interests and commitments of private stakeholders but the interests of non-governmental organisations (NGOs) and their need to stay in the limelight to secure continued public contributions is an area that should receive more attention.

I argue, perhaps controversially, that we need to be more alert to the range of commitments and biases that we all may bring as researchers. Among both social and natural scientists are many individuals who have strong personal biases arising, not from a stake in the existing paradigms, but from a career in, membership of, or sympathies with various pressure groups. The work may be funded by an independent research council or charity but the research outcomes may still be biased by the opinions and motivations of the researchers. However, in general, this source of bias is less likely to be remarked on although the research in question often contributes to decision making in the same political arenas as that funded by industry.

Thus, bias is inevitable, whether it arises from career-based motivations, financial considerations or personal value systems, or as is more usual, a combination of all three. These points have been strongly emphasised by social scientists working on the social construction of science and knowledge. The problems we face now in using research as a basis for decision making are related to our failure, having arrived at this basic understanding of the social construction of science, to develop strategies and procedures to help decision makers to reach conclusions on the best available evidence from both social and natural sciences.

How do we avoid retreating into a series of interlocking enclaves of indecision, challenge and counter-challenge?

Fundamental research

For fundamental 'blue skies' research in the social and natural sciences we can probably continue to rely on the academic, methodological safeguards, checks and balances that have been built up to counteract problems of bias and the errors it leads to. They have never worked perfectly but our steadily increasing body of knowledge about the social and natural worlds implies that they do work to some extent. In the long run we are able to discriminate between good and bad quality evidence.

For research funded by governments or charities, the cost of a mistake is the opportunity cost of not spending the money on research that *might* have been more societally useful. For research funded by industry, the cost may be greater if large amounts of development funding are spent on products where the underlying science has been biased and no useful products result from the investment.

Fundamental researchers may be unaware of the biases in their work or, if they are aware of them, may not consider them in any sense reprehensible. For example, it is essential to believe in the quality and value of your ideas if you are going to be motivated to spend several years carrying out research on them.

Research based evidence used to support decision making

Deliberate bias and indeed falsification is much more likely to be found in research that is funded, commercially or otherwise, to support or influence policy or commercial decision making.

For a pressure group, the temptations come from the opportunity to push its agenda forward more effectively, and often thereby to increase its membership. An example of this is the booklet produced by Greenpeace, titled 'GM on Trial' which includes 'scientific evidence presented in the defence of 28 Greenpeace volunteers on trial for their non-violent removal of a GM maize crop'. The authors of different sections were asked to comment on what evidence was in the public domain in July 1999 in relation to issues like wind pollination, hazards to food and animal feed, etc. The articles are biased in the sense that each focuses on evidence, not always scientific, that supports the Greenpeace case and ignores that which does not support it. This is therefore an example of science as advocacy in the service of a particular case, rather than science as impartial evidence.

The stakes may be much higher for a company, for example in getting a potential blockbuster drug onto the market faster, or even avoiding having it rejected by regulators after very large sums of money have been spent on its development. A recent example in this category is the court case being brought in New York against the multinational pharmaceutical company, GlaxoSmithKline (GSK). The company was accused of

fraudulently suppressing research suggesting its anti-depressant drug Paxil was ineffective and unsafe for treating children. A Financial Times article on 3rd June, 2004 quotes a company document stating that the target for GSK was 'to effectively manage the dissemination of these data in order to minimise any potential negative commercial impact'.

Thus, both NGOs and commercial companies have incentives to bias research to suit their own ends. However the disincentives to bias are not symmetrically distributed.

Where a multinational company is shown to have falsified or concealed unfavourable research results the financial penalties arising from a court case can be significant. Major products suddenly withdrawn from the market can also have disastrous effects on share prices and can even transform a successful, stable company into a take-over target. Court actions from consumers who believe they have been harmed by a product can be even more expensive in the long run. And erosion of public trust in a company can spread to an entire industry sector and can have less tangible implications for long term viability. For example the Financial Times, commenting on the above GSK case, noted that shares fell 33p to £11.11 as a result of the action and estimated that the legal penalties arising from the court case could amount to \$330 million. The article also pointed out that the lawsuit reinforces the perception of GSK's 'unerring capacity to attract negative publicity'.

For an NGO, on the other hand, there appear to be few penalties for wrongful or biased interpretations of research data. In the case of the destruction of GM crops, for example, the defendants were acquitted. In another case, the disposal of the Brent Spar oil rig, Greenpeace data on the amount of toxic waste remaining on board the rig was shown to be a serious over-estimate, but the impact on Greenpeace's reputation and credibility seems to have been minimal and there were no negative financial implications for them.

So misdemeanours by companies, the problem that causes most public concern and outrage, should be the easiest to deal with. It is in every company's interests to have strong internal checks and balances to prevent this kind of thing from happening. Environmental groups and activists who operate 'in the public interest', on the other hand attract little comment if the results of their research are demonstrated to be biased or wrong, but such mistakes by them can have very serious financial implications for others.

Should researchers be as objective as possible and how might this be achieved?

To summarise, on the one hand bias is inevitable for a variety of reasons. On the other hand we have new products from information and communications technology, new drugs, pesticides, chemicals, new forms of transport, new feats of engineering, that would have been unthinkable a hundred years ago; and in most areas products and processes are safer than they were fifty years ago. So it looks as if we are, in the long run, able to make decisions on the basis of evidence from the natural and social sciences that contribute to what we, in our western culture, define as progress.

Is the problem of bias more serious than it has been in the past?

In my view this is unlikely. The checks and balances to detect and expose bias are greater than they have ever been before and this may result in a *perception* of a greater problem than there has been in the past rather than an increase in the actual number of cases.

Is the bias in our understanding of the biases a problem?

Increasingly we are seeing the notion of bias used as a weapon of argument in wider debates. Research which was funded by a source perceived as biased is discounted as an input to policy decisions, regardless of the actual quality of the research. In my view, when the proportion of research which is not publicly funded is increasing this is a problem. Also, in an era when ‘the public’ is increasingly being brought into decision making fora as a stakeholder, the fact that most members of the public are selective in their search for and perception of bias could diminish the extent to which decisions are taken on the basis of the best available evidence.

What can we do about it?

It would be premature to claim to have answers to this problem. First we need to spend more time on getting a better understanding of the nature and implications of the biases. Then we need to tap into a wide range of expertise to begin to develop solutions. Hopefully this session at the BA Festival of Science will be a start to the process.

The answers (there will probably be more than one) I predict will lie with the policy makers. At one level, new modes of governance are being developed with the twin aims of greater stakeholder involvement in policy decisions and at the same time a sounder evidence base for such decisions. The above analysis points to some of the reasons why these two aims are currently incompatible.

And yet policy decision makers at other levels are faced daily with the need to make important decisions about science, technology and innovation on a short timescale on the basis of the available evidence, whatever its quality.

Professor Joyce Tait,
ESRC Innogen Centre,
University of Edinburgh
Old Surgeons Hall
High School Yards
Edinburgh EH1 1LZ

joyce.tait@ed.ac.uk; www.innogen.ac.uk