Research policy

Medical research: everybody's doing it

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This month the National Science Board in the United States will produce for the President of the United States its eighth biennial publication called *Science Indicators*.¹ This weighty but well produced document contains extensive data on what research is being done in the US, who is doing it, how productive it is, and how it compares with research being done abroad. Much more could be included, and the man responsible for producing the report, Dr Carlos Kruytbosch, head of the science indicators unit at the National Science Foundation, was quick to point out when I spoke to him in Washington that many of the data in his report are sketchy. Nevertheless, the British equivalent, the fifth *Annual Review of Government Funded R & D*, which was published just before Christmas by the Cabinet Office, is generally a much skimpier and less ambitious publication.²

Britain does have, however, a *Medical Research Directory*, which was first published in 1983.³ The directory defines medical research as "any investigation relevant to the understanding and management of human disease," and an enormous amount of work had to be done to assemble the information, which was collected from the British Library, the Medical Research Council, the Department of Health and Social Security, and many other more obscure organisations. The editors had difficulty collecting uniform information on all the projects and acknowledge that there are many omissions in the directory. Nevertheless, the data come from 650 institutions, cover 45 subjects, and have over 100 000 specific entries that list who is doing a piece of research, the title of what he or she is doing, and who is paying for it. The information was updated for a couple of years and is on line. Sadly, however, the information was not kept up to date, and the publishers, John Wiley and Sons, are now having to start almost afresh in assembling a directory that they hope will be on line from the middle of 1989.

The *Medical Research Directory* is intended primarily for those who want to discover whether research is being done on a particular subject. It is of less use to those who want to get an overall picture of the direction, priorities, and standards of British medical research, not only because of its omissions but also because the data are insufficient and too disaggregated. There is no information on how much money researchers have been granted for a project (the best measure of size) and how many people are working on it and there are no data on output—for instance, publications. Furthermore, it is impossible to work out how much research is being done on, say, incontinence in comparison with peptic ulcer or how much is being done in the north of England compared with the south.

Some of the ground work has, however, been done for collecting comprehensive data that might be used by any national management body that wanted to make maximum use of Britain's limited research resources. Something is needed that lies between the *Annual Review of Government Funded R & D* and the *Medical Research Directory*. As Irvine *et al* said in an article on charting the

decline in British science: "Trying to steer publicly funded research using only the mechanism of scientific peer-review (or 'the informed prejudices of wise men,' as it has been aptly described), while totally ignoring quantitative input and output indicators, is somewhat like trying to run the economy using only the judgments of a committee of senior industrialists."⁴

A sketch of where medical research is done

I want here to give an overall sketch of where medical research is done. For this I define medical research as any research that might contribute to improving the health of the people. This definition would include much research that goes on far away from hospitals, stretching from fundamental work in molecular biology, psychology, and sociology through work on nutrition and public health to studies on, for instance, the economic conditions that influence alcohol consumption. Much of the research that will eventually improve the health of the people will not be done with that thought in mind, and much research that sets out to improve health will never do so.

The Medical Research Council has a similar definition of medical research to the one that I have adopted: "The aim of the MRC has been to sponsor research which will improve the health of individuals in the community."⁵ In practical terms the council has to adopt a narrower working definition, although it has at times put money into most of the subjects that I mentioned in the paragraph above. For instance, although it now understandably has a tremendous push towards molecular biology, the MRC also has a medical sociology unit and through its social and applied psychology unit, which is jointly supported by the Economic and Social Research Council, it does research into unemployment and health.

Perhaps the best way to see the MRC's working definition of medical research in action is to look at what it spends its money on (fig 1, taken from the council's 1986-7 annual report⁶). Attempts to categorise research in this way are arbitrary, but they do provide a useful guide. The distribution has changed little in the past few years and is not planned to change much.⁷ (Indeed, with three quarters of its money sunk into its own units, institutes, and staff and much of the rest spent on long term grants, the MRC has little room to manoeuvre.⁶) Just over 30% of the MRC's money is spent on basic science and the rest on applied science.⁶ Table I shows a comparison of how the medical charities and the MRC spend their money in terms of priorities.⁷ As most of the medical charities are related to a particular disease their spending also has to be disease related, whereas the MRC does not have to be so concerned with particular diseases.

Research in institutes of higher education

Much (and probably most) medical research is done in institutes of higher education, particularly in universities with medical schools. Those doing the research are employees of the university or

the National Health Service or they exist on "soft money"—that is, they have no NHS or university salary but are paid from research funds. The research funding of those working in institutes of higher education comes partly from the institutes and partly from outside sources.

Table II shows the number of research publications coming from the various medical schools in 1973-81.⁵ This is an extremely crude measure of the amount of research done in the various medical schools, yet it is all that is available. The measure pays no attention to the quality of the papers and is not adjusted for the size or the funding of the medical schools; the numbers were derived from counting publications mentioned in *Excerpta Medica*, which include, for instance, *Weed Research* but not *Health Trends* or *Health Bulletin*; and publications emanating from research units within the various cities are lumped in with the medical schools, thus producing a substantial bias towards Cambridge, Oxford, and Edinburgh.⁷ Nevertheless, what the figures do suggest is that there is wide variation in the amount of research done in different medical

FIG 1—How the Medical Research Council spent its money in 1986-7.⁷

TABLE I—Relative priorities of the Medical Research Council and the medical charities (in terms of expenditure). (Reproduced with the permission of Dr David Evered and the Association of Medical Research Centres.⁵)

Charities	Medical Research Council
Cancer, including leukaemia	1 General*
General*	2 Neuropsychiatric disease (nervous and mental disorders)
Cardiovascular disease (heart and blood vessels)	3 Cancer
Locomotor disorders (muscles and joints)	4 Cardiovascular disease
Neuropsychiatric disease	5 Locomotor disease
Endocrine disease (diabetes and glandular disorders)	6 Endocrine disease
Respiratory disease (lungs)	7 Gastrointestinal disease (digestive system)
Renal disease (kidney)	8 Renal disease
Gastrointestinal disease	9 Respiratory disease
Aging	10 Aging

*Includes science basic to medicine and disease categories not specifically identified elsewhere.

schools. The Advisory Board for the Research Councils thinks that this variation applies through all universities in all subjects, which has led it to suggest that research resources should be concentrated into a handful of universities.¹⁰

Research units and institutes

Some of Britain's most important medical research takes place in units supported by the various bodies that fund research. These units are usually sited in universities or hospitals but are financially and administratively independent. Their staff are usually employees of the funding body rather than of the university.

TABLE II—Research output of centres, 1973-81, showing trends. Centres listed in overall rank order separately for London and rest of United Kingdom⁹

Centres	Total publications 1973-81	% Of total in each group	Overall rank in group	% Of papers 1973-6 in each group	Rank 1973-6	% Of papers 1978-81 in each group	Rank 1978-81	Changes		
								Proportion 1978-81		Change in rank
								Proportion 1973-6 (%)		
London medical schools										
UCL/UCHMS	3369	15.4	1	17.0	1	13.9	1	82	0	
King's	2494	11.4	2	11.1	3	11.4	2	102	+1	
St Bartholomew's	2434	11.1	3	11.5	2	10.9	3	95	-1	
Guy's	2163	9.9	4	9.3	5	10.4	4	112	+1	
The Middlesex	2090	9.5	5	9.9	4	9.5	5	96	-1	
St Thomas's	1726	7.9	6	7.2	8	8.2	6	113	+2	
The London	1712	7.8	7	8.3	6	7.3	8	88	-2	
St Mary's	1591	7.2	8	8.1	7	6.3	10	78	-3	
Royal Free	1494	6.8	9	6.0	9	7.4	7	124	+2	
St George's	1131	5.2	10	3.8	11	6.5	9	168	+2	
Charing Cross	965	4.4	11	3.8	12	4.9	11	131	+1	
Westminster	778	3.5	12	4.0	10	3.3	12	82	-2	
Rest of United Kingdom										
Cambridge	6862	10.2	1	10.5	1	10.0	1	95	0	
Glasgow	6582	9.8	2	10.0	3	9.4	3	94	0	
Edinburgh	6553	9.7	3	10.5	2	9.2	4	87	-2	
Oxford	6298	9.3	4	9.1	4	9.4	2	104	+2	
Manchester	5048	7.5	5	7.2	6	7.8	5	108	+1	
Birmingham	4972	7.4	6	7.8	5	7.0	6	89	-1	
Bristol	3924	5.8	7	6.4	7	5.4	7	69	0	
Newcastle	3274	4.9	8	4.9	9	4.6	9	94	0	
Leeds	3252	4.8	9	4.6	10	5.1	8	112	+2	
Liverpool	3220	4.8	10	5.1	8	4.5	11	89	-3	
Wales	3123	4.6	11	4.6	11	4.6	10	100	+1	
Sheffield	2913	4.3	12	4.4	12	4.3	13	96	-1	
Nottingham	2355	3.5	13	2.5	16	4.4	12	177	+4	
Southampton	2183	3.2	14	2.8	15	3.7	14	134	+1	
Aberdeen	2116	3.1	15	3.2	13	3.0	16	95	-3	
Belfast	2090	3.1	16	3.2	14	3.2	15	101	-1	
Dundee	1682	2.5	17	2.3	17	2.6	17	117	0	
Leicester	959	1.4	18	1.1	18	1.7	18	158	0	

Figure 2 shows the units supported by the MRC. The most famous of the units is the Laboratory of Molecular Biology, which has just enjoyed its 40th anniversary.¹¹ In its corporate plan the MRC makes it clear that the laboratory will have its funding protected whichever other units might have to suffer cuts.⁵ The MRC's units vary greatly in size and in the way they are organised—some are like small military dictatorships, whereas others are *laissez faire*. It has been put to the MRC that a study comparing the effectiveness of the various units might give insights into the optimum size of units and the best way to run them. The MRC has never taken up the suggestion, but the new push towards direction, management, exploitation, and evaluation might now encourage it to do so. The MRC also takes on to its staff some researchers who work in university departments, and the units and the external staff among them absorb almost 40% of the MRC's total expenditure.

Through the Chief Scientist's department the Department of Health and Social Security supports some 39 units in England and Wales,¹² while the Scottish Home and Health Department supports eight units. These units are mostly concerned with health services research. The larger charities also have units within universities. The Cancer Research Campaign supports seven endowed academic departments and has 18 groups in universities and hospitals.⁷ The Imperial Cancer Research Fund spends most of its money on its own laboratories in London, but it also has eight units in universities and hospitals.¹³

The MRC also supports two research institutions—the National Institute for Medical Research at Mill Hill and the Clinical Research

Centre at Northwick Park. The national institute is the oldest of the MRC's establishments and its emphasis is on fundamental non-clinical studies. After a large review of the institute in 1981 it was reorganised into four main groups: the genes and cellular controls group; the infections and immunity group; the physiological and neural mechanisms group; and the technology and management group. The institute absorbs just under 10% of the MRC's expenditure, and extra funds have been necessary for the restructuring. The previous director, Dr D A Rees (who is now the secretary of the MRC), said in his annual report for 1985-6 that the direction of the institute is "towards larger and more multi-disciplinary efforts."¹⁴ These moves are very much in fashion, but it remains to be seen how effective they will be.

Alongside the National Institute for Medical Research the MRC has set up a Centre for Collaborative Research. This centre is intended to offer a problem solving service for industry and others and to undertake collaborative projects with industry and others. Some joint projects have already begun. The centre is also intended to act as a focus for work of commercial importance that may arise from any of the MRC's teams; it is eventually intended to be self supporting.

The Clinical Research Centre also absorbs almost 10% of the MRC's budget and was set up 15 years ago to develop clinical research, particularly research into common conditions. The centre was thus placed in a district general hospital, Northwick Park Hospital. A recent review of the centre found it wanting and advocated fusion of the centre with the Royal Postgraduate School

FIG 2—Medical Research Council units in Britain. Outstations of the Institute of Hearing Research (HR) and the Cyclotron Unit (CU) are shown in brackets. (The council also has laboratories in Jamaica and the Gambia.)⁷

to create a single centre for postgraduate medical education and research.¹⁵ The MRC has accepted this recommendation. The committee that reviewed the Clinical Research Centre also thought that it should be sited together with the National Institute for Medical Research. This is not likely to happen for some time, not least because the institute is still going through one restructuring. So many upheavals are not, many scientists find, conducive to creative research.

Other government funded institutions also support research institutes that do medical research. For instance, the Public Health Laboratory Service contains the Centre for Applied Microbiology and Research at Porton Down.¹⁶ It is divided into eight divisions or laboratories, including, for instance, a vaccine research and production laboratory. One of the most important aims of the centre is to maximise its income, and it has links with Porton Products Limited. This clear commercial bias has led to "value for money reviews" of each laboratory. The Health and Safety Commission is another government funded body that supports medical research.

Some of the larger charities also support research institutes. The Imperial Cancer Research Fund's headquarters contain about 50 laboratories,¹¹ while the Cancer Research Campaign spent over £7m in 1984 on its four maintained institutes. One of its institutes, the Institute of Cancer Research, has been jointly supported by the MRC,¹⁷ but the MRC is to pull out over 10 years. This will mean that all five of the major cancer institutes in Britain will be supported entirely by the cancer charities.¹⁵ In Britain cancer research has effectively been privatised; in 1951-2, the MRC supported almost three quarters of cancer research, whereas in 1985-6 it supported around 15%. This pattern of support makes Britain almost unique among other leading industrial countries.¹⁵ The National Cancer Institute in the United States, for instance, had a budget of \$1.25 billion in 1986, more than a fifth of the total expenditure of the National Institutes of Health.¹⁷

Research in industry

Neither the *Annual Review of Government Funded R & D* nor the *Medical Research Directory* gives much information on medical research sponsored by industry, yet much medical research is done in laboratories supported by drug companies. The Association of the British Pharmaceutical Industry estimates that the drug industry in Britain now spends about £650m a year on research and development, about £500m of which is for research on human prescription medicines.²⁰ The total expenditure has increased dramatically—from about £227m in 1982.²¹ Figure 3 shows how the money is spent¹⁷; most of it is spent on directly developing and screening new drugs, but Dr John Griffin, director of the association, told me that the association estimates that drug companies spend about £50m a year in Britain on "blue sky research." Some of this is spent in house, but some (and he did not know how much) is spent in universities, hospitals, and research institutions. And at this basic level there is much interchange between groups inside and outside the companies—normal academic rules apply. It is only when companies see "a route to a molecule that might produce a drug" that the shutters go up and information is not freely exchanged. If Dr Griffin's figures are correct (and there is no reason to doubt them) then the drug industry in Britain is spending a similar amount on basic research to the MRC.

Conclusion

It is not easy to get a clear view of what is happening in medical research in Britain, not even of where it is being done. This is partly because a wide range of research activities can be classified as medical research, partly because a great many bodies fund medical research, and partly because no statutory body has the responsibility of collecting the information. The data given in the *Annual Review of Government Funded R and D* are too aggregated and those given in the *Medical Research Directory* are too disaggregated and

FIG 3—Pattern of expenditure by drug companies on research and development in Britain in 1982, 1983, and 1984. The figures at the top of the columns are estimates by Dr John Griffin, director of the Association of the British Pharmaceutical Industry, of the percentage of the money in those categories spent in universities, hospitals, and medical schools. (Reproduced by permission of C E Lumley, R A Prentis, S R Walker, and the editor of *Pharmaceutical Medicine*.²¹)

incomplete. It is time that more data were collected regularly on where medical research is done, who does it, how much they are doing, how much they produce, and what the results are. Such data might be built on the base of the *Medical Research Directory*.

The next three articles will look at the funding of scientific research in general and medical research in particular, illustrating the declining importance of the MRC, and make some international comparisons.

References

- 1 National Science Board. *Science indicators: the 1987 report*. Washington: National Science Board, 1988.
- 2 Cabinet Office. *Annual review of government funded R and D*. London: HMSO, 1987.
- 3 Levy JE. *Medical research directory*. Chichester, Sussex: Wiley, 1983.
- 4 Irvine J, Martin B, Peacock T, Turner R. Charting the decline in British science. *Nature* 1985;316:587-90.
- 5 Medical Research Council. *Corporate plan*. London: MRC, 1986.
- 6 Medical Research Council. *Annual report 1986-7*. London: MRC, 1987.
- 7 Association of Medical Research Charities. *Medical research today: what the charities are doing*. London: AMRC, 1986.
- 8 Wakeford R, Adams R. Medical research output 1973-81: a romp around the United Kingdom research centres. *Br Med J* 1984;288:297-9.
- 9 Clarke M. A romp around the United Kingdom research centres. *Br Med J* 1984;288:1310.
- 10 Advisory Board for the Research Councils. *A strategy for the science base*. London: ABRC, 1987.
- 11 Perutz M. The birth of molecular biology. *New Scientist* 1987 May 21:38-41.
- 12 Department of Health and Social Security. *DHSS handbook of research and development 1986*. London: DHSS, 1987.
- 13 Imperial Cancer Research Fund. *Annual report and accounts 1985-6*. London: ICRF, 1987.
- 14 National Institute for Medical Research. *Report for 1985-6*. London: MRC, 1986.
- 15 Committee to examine the remit of the Clinical Research Centre. *Report*. London: MRC, 1986.
- 16 Public Health Laboratory Service. *Annual report 1985-6*. London: PHLS, 1987.
- 17 Medical Research Council. *Medical Research Council handbook 1986-7*. London: MRC, 1987.
- 18 Austoker J. Cancer research left to charity. *New Scientist* 1987 October 15:28-9.
- 19 United States Department of Health and Human Services. *NIH data book*. Washington: USDHHS, 1986.
- 20 Association of the British Pharmaceutical Industry. *Submission of evidence to the House of Lords science and technology committee (subcommittee 2—medical research)*. London: ABPI, 1987.
- 21 Lumley CE, Prentis RA, Walker SR. Trends in research and development expenditure by the UK pharmaceutical industry 1982-84. *Pharmaceutical Medicine* 1987;2:137-49.