

The Finance of Medical Research



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Office of Health Economics

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Cover: This early microscope has been taken from a copperplate engraving in *Micrographia*—an important work by Robert Hooke, Secretary of the Royal Society, and published in 1665. Print by courtesy of the Royal College of Physicians' Library.

The Finance of Medical Research

THE explosive progress of medical science during the past twenty-five years has brought about a revolution in the health of the community and in the problems of sickness, disability and premature death. The discovery of new medicines and the development of new medical techniques extensively influence the total and the pattern of National Health Service expenditure, which in turn is a reflection of the changes in the procedures of medical care.¹ "New knowledge has taken surgery into the chest, heart and brain and into the extremes of life; general medicine is concerned with molecular biology, auto-immune disease and human genetics; psychological medicine now offers some understanding of the emotions, and it is possible that new drugs may make mental asylums as obsolete as tuberculosis sanatoria."²

The impact of science on medical care is now wider than ever before, and the indications are that its significance will grow. A key factor determining the speed of medical progress is the financial support for medical and allied research. This paper makes an estimate of annual expenditure on medical research and discusses the problems involved in its finance.

The financial backing of medical research is by no means the only factor determining the pace of medical progress. It operates in a permissive manner rather than as a directly causal stimulus. Inadequate support may certainly limit the speed of medical progress, but expansion of funds does not necessarily lead to an acceleration. There are other conditions for progress which may not directly depend on money. These include the limitations set by the intractable nature of some problems which may require a change in fundamental understanding and the instinctive genius of a Pasteur. The element of chance may enter the picture too; and if, as with Fleming and the original penicillin mould, this is combined with trained observation the pace of discovery may be quickened. In subsequent events finance plays a greater part.

New understanding makes no impact on health until it is translated into new medical procedures. Different financial considerations apply at different stages. The Zuckerman Committee identified five separate categories: pure basic research, objective basic research, applied project research, applied operational research and finally, development.³ The process and the cost of discovery tends to be cumulative. Pasteur's original work gave rise to the study of infections and the processes of immunity leading to the development of vaccines and serum treatment and culminated in the discovery and development of antibacterial drugs. The implications for medicine of molecular biology may be equally as far-reaching as the germ theory. As more is discovered, the task for medical research appears to grow.

Medical Research Expenditure

EXPENDITURE for the conduct of medical research in the United Kingdom during the year 1961-62 amounted to approximately £24m. with a further £3m. spent on the provision of new buildings for research. The build-up of this estimate and the sources are discussed in the Appendix. Over one half of this finance came from government funds, one-third represents research expenditure by the pharmaceutical industry in Britain and the balance is made up by medical research charities and trusts, such as the British Empire Cancer Campaign or the Wellcome Trust (*Fig. 1*).

Medical research accounts for approximately four per cent of the total amount spent on research and development in the United Kingdom (*Table A*). About three and a half per cent of both government's and all British industry's research expenditure is devoted to medical ends: the proportion is brought up to four per cent of total research expenditure by the very high share of charities' and trusts' expenditure on medical research. The amount spent on medical research is little more than one-tenth of the amount spent on research for defence.

The 1950's saw a rapid expansion in expenditure on medical research in Britain. Expenditure by the Medical Research Council and the pharmaceutical industry increased more than three-fold, while expenditure by trusts and foundations probably rose more rapidly. Expenditure by the Medical Research Council has expanded at a faster rate than expenditure on the N.H.S. (*Fig. 2*). The rise in expenditure on research by the pharmaceutical industry has also been more rapid than the growth of the industry's sales to the health services or of total pharmaceutical sales (*Fig. 3*). The rise in research expenditure by the government and by the pharmaceutical industry continued during the early 1960's, but the pace of expansion now appears to be slackening.

International comparisons are complicated by different definitions and by the different scope of medical research

Fig. 1

Sources of finance for medical research. Current and capital. United Kingdom. 1961-62.

Source: Appendix.

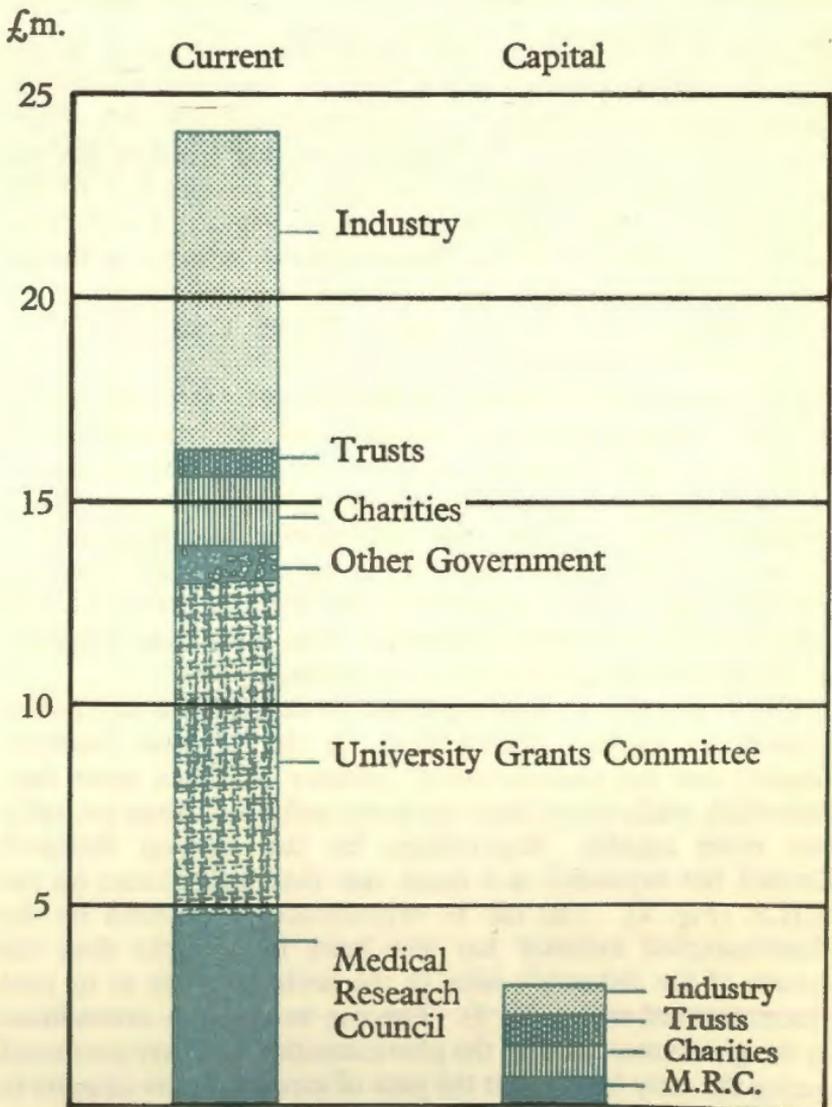


Table A

Total Current and Capital Expenditure on Research and Development and Medical Research Expenditure by sources of finance. United Kingdom 1961-62. £m.

Sources:

Appendix.

Advisory Committee on Research and Development 1961-62, Cmnd. 1920, Table V, p. 34-35. H.M.S.O. 1962.

<i>Source of Finance</i>	<i>Total Expenditure</i>	<i>Medical Research Expenditure</i>	<i>Medical Research % Total</i>
Government	390.3 (a)	14.45 (d)	3.7
Trusts & Foundations	8.0 (b)	3.94	47.7
Industry	235.7 (c)	8.48	3.6
Totals	634.0	26.87	4.2

Notes:

(a) Includes £5.3m. defence expenditure received from overseas. Not all of this, however, comes from overseas government sources.

(b) Includes £1.3m. university research expenditure from non-exchequer funds.

(c) Includes £22.7 m. research expenditure by public corporations.

(d) Includes U.G.C. finance.

Fig. 2

Expenditure by Medical Research Council and National Health Service. United Kingdom 1949 to 1962. £0m.

Source: Appendix.

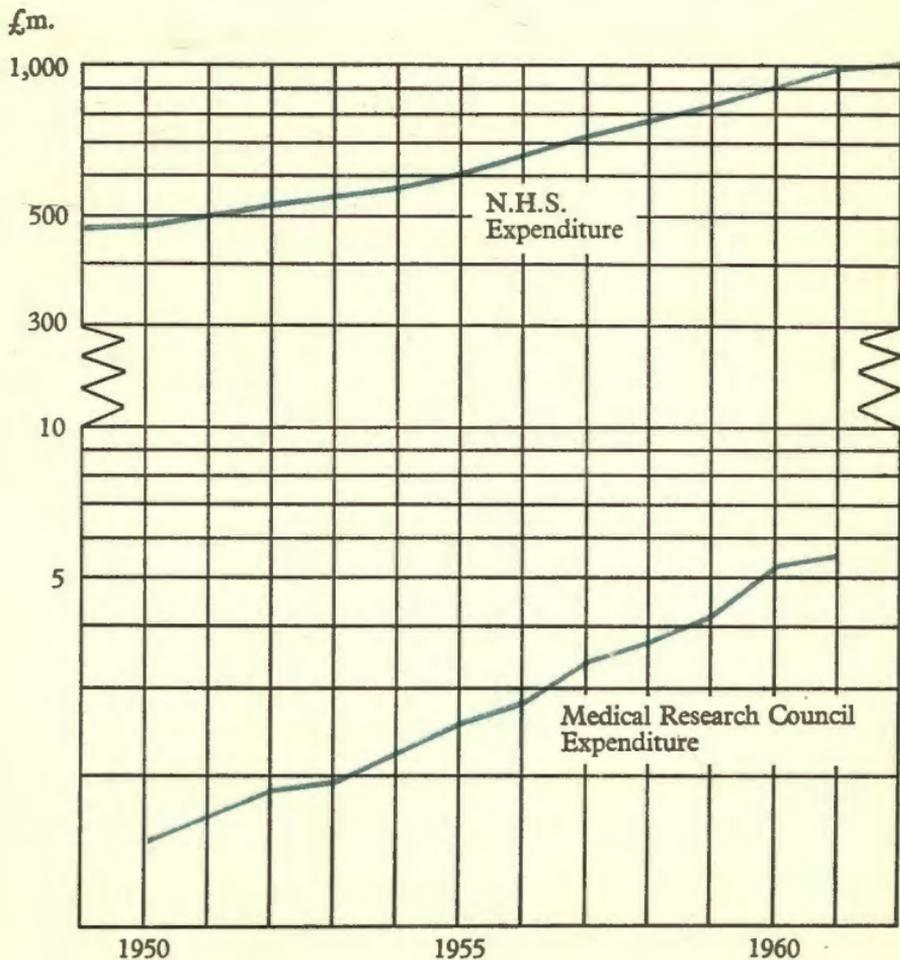
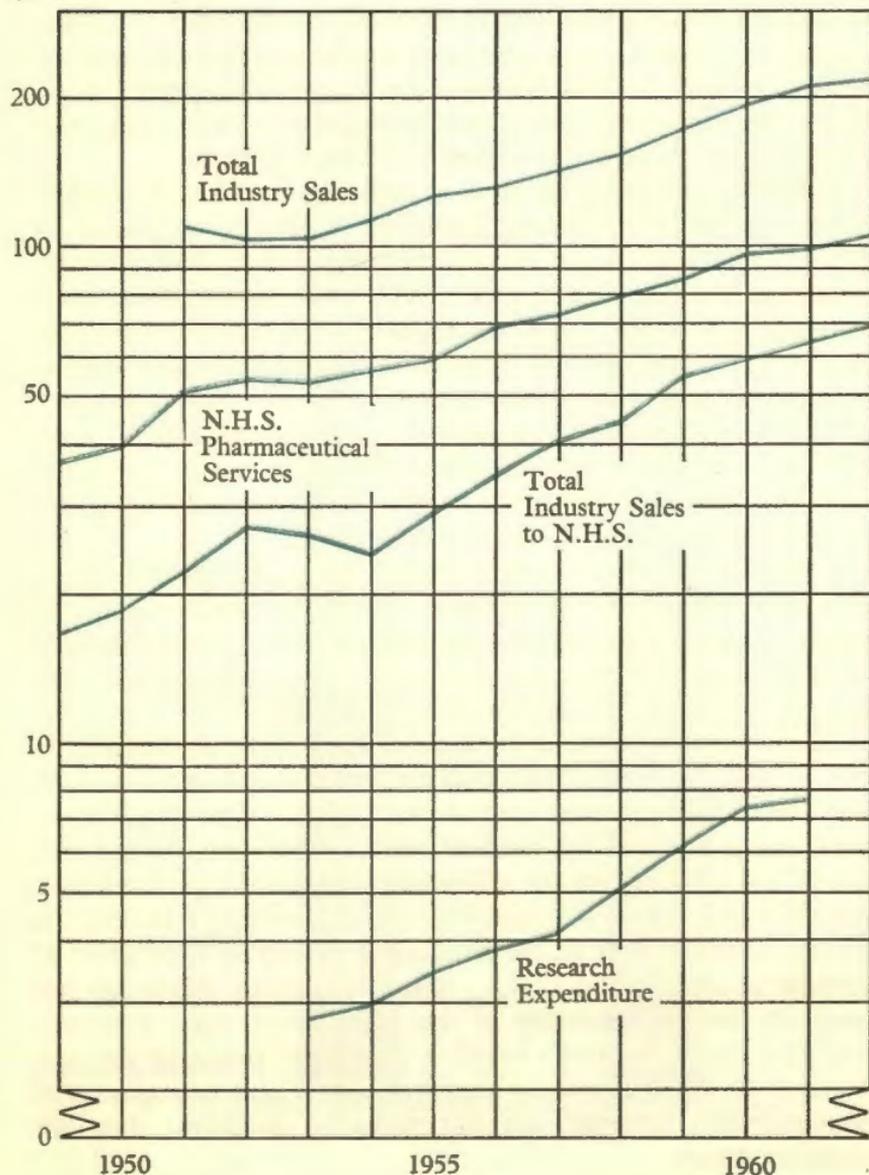


Fig. 3

Pharmaceutical Industry research expenditure, total sales and receipts from the National Health Service. 1949 to 1962. United Kingdom. £5m.

Source: Appendix.

£m.



institutes in countries overseas. Precisely comparable estimates are difficult to make, but on published data compared to the U.S.A. expenditure on medical research in this country is small, and is growing less rapidly. In the U.S.A., in 1961 medical research expenditure amounted to approximately £370m.—over fifteen times the amount spent in Britain.⁴ At the beginning of the 1960's, U.S.A. medical research expenditure came to 3·6 per cent of expenditure on health, while in this country it amounted to 2·7 per cent of N.H.S. costs. A total expenditure on medical research during 1961 in the U.K. of the order of £35m. (instead of £27m.) would have been needed to reach the ratio of medical research to all health expenditure prevailing in the U.S.A. Also, merely to match the pace of expansion in the U.S.A., the amount would need to have risen to £52m. by 1963.

Federal contribution to medical research in 1961, channelled mainly through the National Institutes of Health, amounted to £205m.—fourteen times greater than the British government's expenditure on medical research. The pharmaceutical industry in the U.S.A. spent £81m. on research—ten times the amount spent by the industry in Britain. Although the total size of expenditure is so much greater in the U.S.A., the share of support between government and industry is largely similar in the U.S.A. and the U.K. The most important difference in the sources of support is the larger proportion of medical research supported by charities and trusts in the U.S.A. (*Fig. 4*).

The substantial difference between U.S.A. and United Kingdom total expenditure is growing. Since the beginning of the 1960's at least, the Federal government has been expanding medical research expenditure at nearly twice the pace of the government in the United Kingdom (*Table B*).

One indication of the dominance of the U.S.A. in this field is that in 1963 the amount spent on medical research in the U.S.A. was about half the total cost of the N.H.S. The disparity in government support for medical research between Britain and the U.S.A. may reflect the difference between the government's responsibilities in each country for the community's health. In Britain, with the N.H.S., the emphasis is placed on satisfaction of current needs. In the U.S.A., where immediate needs are not generally the responsibility of the government, their responsibility for the community's health is discharged primarily through research aimed at long-term improvement. These two spheres of responsibility, however, are not mutually exclusive: they are complementary.

Fig. 4

Percentage medical research finance from various sources. United Kingdom and United States. 1960-61.

Sources: Appendix. U.S. Department of Health, Education and Welfare. *Resources for Medical Research*. Report No. 4, 1963.

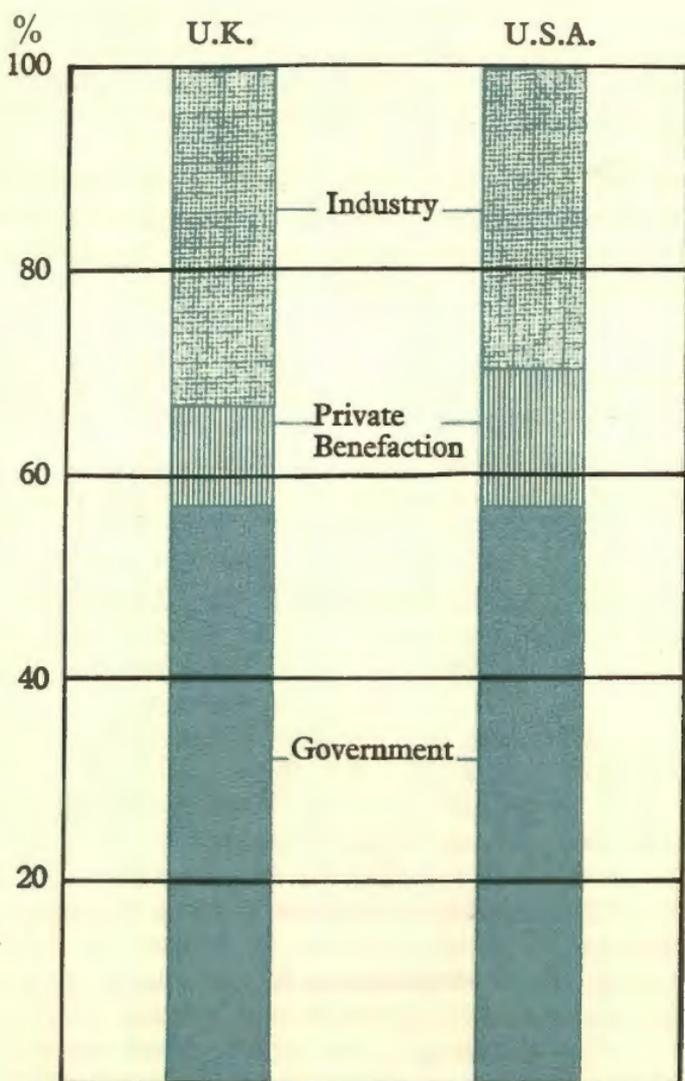


Table B

Government and pharmaceutical industry medical research estimated expenditure and percentage increase year by year. U.S.A. and U.K. 1959 to 1963. £m.

Sources:

Appendix One.

U.S. Department of Health, Education and Welfare. *Resources for Medical Research*. Report No. 4. August 1963.

	1959	1960	1961	1962	1963
<i>U.S.A.</i>					
Federal Support	125.5	160.0	205.0	276.0	347.0*
Increase per annum	+26%	+27%	+28%	+35%	+26%
Pharmaceutical Industry	70.5	73.5	81.0	85.0	92.5*
Increase per annum	+16%	+5%	+10%	+6%	+9%
<i>U.K.</i>					
Government Support	10.5	12.5	14.5	15.5	n.a.
Increase per annum	n.a.	+19%	+16%	+7%	n.a.
Pharmaceutical Industry	6.5	7.5	8.0	n.a.	n.a.
Increase per annum	+24%	+19%	+4%	n.a.	n.a.

Notes:

Figures rounded to nearest £0.5m. n.a.=not available. *Estimates. U.K. government expenditure includes costs of new research building. The other figures exclude this item.

Medical Research Finance

PUBLIC funds are the principal source of medical research finance in the U.K. and in most countries throughout the world. Official financial support for medical research in this country has a long history whose dominating theme has been the attempt to combine the conflicting interests of independent scientific initiative and freedom from official control with the need to account for the expenditure of public money. The progress of the Medical Research Council embodies this theme.

The Medical Research Council

Official participation in medical research dates from the time Sir John Simon held office as Medical Officer to the Privy Council (1858–1871). In 1870, Parliament approved the subsidy of £2,000 a year for the Auxiliary Scientific Investigations as a separate item in the Privy Council's estimates. Lloyd George's National Health Insurance scheme of 1911 provided for a Medical Research Fund, calculated on the basis of one penny a year for each insured person. A special Medical Research Committee was established in 1914 to administer the fund whose annual income then amounted to £55,000.

The Committee rapidly established its reputation during the First World War. The repute and status it gained did much to ensure its separate existence when the Ministry of Health was created in 1919. Although it might have seemed logical to attach the Committee to the new Ministry, the Haldane Report on the Machinery of Government had established the principle that any central research organisation should be separate from the executive departments of government. It was argued with success that the Ministry must necessarily become deeply committed in particular health policies and programmes. The research organisation would find itself similarly committed instead of being at liberty to work in any areas it regarded as most promising. Its scope might be limited to those problems which appeared

to be most important in relation to the Ministry's executive functions, resulting in the detriment of more fundamental work and the loss of opportunity to exploit new advances.

In 1916, an Advisory Council on scientific policy had been established under the Privy Council to direct the work of the Department of Scientific and Industrial Research. The medical Research Committee with a new title, the Medical Research Council, and a Royal Charter of Incorporation, was given a similar constitutional position in 1920.

The Medical Research Council is in effect an autonomous scientific body maintained by the Government. During the inter-war period the Parliamentary grant-in-aid was fixed on a quinquennial basis, and within this limit the Council were allowed almost complete freedom in allocating the money. In the years after the Second World War, it was found necessary to review the grant from year to year and make special provision for major non-recurrent expenditure on buildings and equipment. The Committee of Public Accounts pointed out in 1950 that this procedure called for closer Treasury control of expenditure, and arrangements were made for the Council to seek specific authority before embarking on new major projects or incurring fresh long-term commitments. Once a grant-in-aid is approved, the Medical Research Council is free, within broad limits, to spend the money according to its own scientific judgment.

The Universities

The government also finances medical research through the University Grants Committee. The Committee makes block grants to universities on a quinquennial basis to cover the broad scope of university activities. The university authorities decide how this sum should be spent, what proportions should go to teaching and research and how much should be given to the sciences, the arts and the humanities. Since in universities teaching and research are closely linked and undertaken often by the same staff using the same equipment and buildings, an estimate of research expenditure in universities cannot be closely accurate. Also, as the division between one scientific discipline and another are becoming less marked and as much work carried out in pure science departments have important implications for medicine, it is even more difficult to give a precise figure for the University Grants Committee's support for medical research. The most recent estimate suggests that it exceeds £8m. a year,

and this is of the same order as the expenditure by the Medical Research Council.

In many ways the University Grants Committee enjoys a similar semi-autonomous position to the Medical Research Council. Its status avoids official control of research and maintains academic freedom. The existence of two semi-autonomous bodies financing medical research with public funds is itself a further safeguard to independent research, avoiding the dangers inherent in a single official source of research finance.

The dual source of official finance may, however, give rise to a different problem. The principal difference between the two official agencies is that the Medical Research Council is concerned solely with medical research, while the University Grants Committee must take into account the needs of the whole field of academic work. The needs of medical research in universities are in competition with many other claims on the block grant. The level of provision in grants from the university might, therefore, fall below that of the Medical Research Council, which does not have to resolve these conflicting claims on resources, and two standards of support for medical research may emerge. Essentially, however, the roles of the Medical Research Council and the universities are complementary to each other, both often financing the same university research workers.

Charities and Trusts

Medical research by non-industrial scientists does not rely entirely on official support. An alternative source of finance is private benefaction. Its existence is a further safeguard to academic freedom. There are two forms of institution operating in this field; the charities which obtain their funds from the general public and the trusts founded by wealthy benefactors.

The charities can be divided between organisations concerned mainly with welfare and those who devote their efforts largely or entirely to the promotion of research. Among the bodies primarily concerned with welfare are the Royal National Institute for the Blind, the Royal National Institute for the Deaf, the National Association of Mental Health, the British Polio Fellowship, the Society for Mentally Handicapped Children, the Spastics Society and many others. A number of these bodies contribute funds for research; the Spastics Society, for example, support medical research by as much as £165,000 a year, but this is not its most important field of work.

The charities concerned entirely or principally with research include the British Empire Cancer Campaign, the Imperial Cancer Research Fund, the National Fund for Research into Poliomyelitis and other Crippling Diseases, the Arthritis and Rheumatism Research Council (formerly the Empire Rheumatism Council), the Mental Health Research Fund, the Muscular Dystrophy Society, the Multiple Sclerosis Society and the Asthma Research Council.

Although these bodies are part of the long tradition of philanthropic societies, the growth of charities devoted mainly to medical research is comparatively recent. Half the medical research charities were founded or reconstituted for research purposes during the 1950's. The inauguration of the British Heart Foundation in 1962 suggests that the trend is continuing. The trend indicates a growing public demand for the expansion of medical research and for the benefits it promises.

Just over one half the income of these charities comes from the regular subscription and donations of the general public. One quarter is derived from legacies. Special fund raising activities, such as Christmas card sales, contribute a further tenth of their revenue and income from investments about the same. Between 1961 and 1962, these fund raising activities represented the fastest growing item of income. Research grants account for three-quarters of the amount received and the costs of administration and appeals just over one-tenth. Because commitments for supporting research are usually made on a long-term basis—particularly by the large charities—the balance of revenue is apportioned to reserves* (*Fig. 5*).

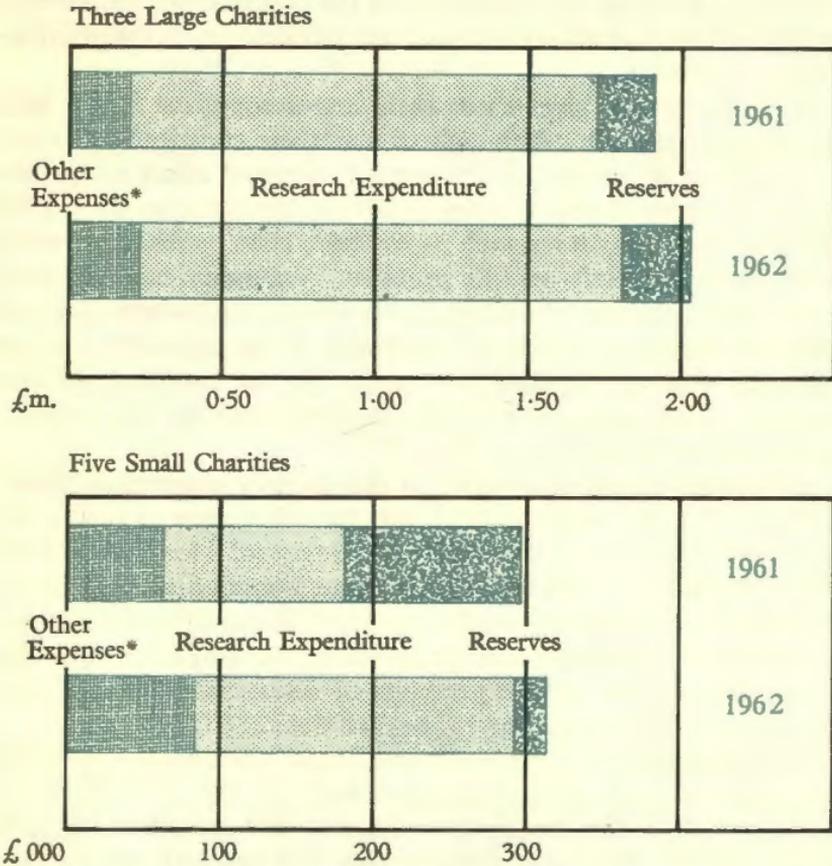
Total expenditure on research by these eight charities—both at home and overseas—amounted to £1.6m. in 1961 and £1.8m. in 1962. The British Empire Cancer Campaign is by far the largest charity accounting for £1.1m. of the 1961 and £1.2m. of the 1962 totals. The Imperial Cancer Research Fund and the National Fund for Research into Poliomyelitis, accounted for £0.4m. in each year. Although the amount of research by the remaining charities is small in comparison, its growth between 1961 and 1962 was rapid, increasing from £128,000 to £208,000. In the same period, their income rose by only six per cent and as a result of the expansion of research, the amount transferred to reserves in 1962 fell sharply. The Mental Health Research Fund

* These figures exclude funds raised and expenditure incurred by the Imperial Cancer Research Fund on the extension of their Lincoln's Inn Research Centre.

Fig. 5

Medical Research Charities. Apportionment of revenue. 1961 and 1962.

Source: Appendix.



*Including Welfare Grants

suffered a fall in income and as, despite this, it increased its research grants, the fund incurred a deficit. The calls on this charity have risen rapidly and an increasing number of worthwhile research projects were refused grants (*Fig. 6*).

The distinguishing feature of these charities is that they approach the medical research problem in terms of diseases rather than along disciplinary lines such as endocrinology or pathology as in the universities or by the pharmacological investigation of chemical substances as in the laboratories of the pharmaceutical industry.

It is this which gives them their important place in the field of medical research. Although in size their contribution is not great, they can provide an important marginal effort in specific fields. In research into multiple sclerosis, for example, since 1956 no fewer than 12,000 research papers have been published bearing directly or indirectly on this problem. Voluntary societies have supported only one per cent of this effort. But where this one per cent effort has been so profitable is in permitting a few research workers to work intensively on the problems of this disease. They have been enabled to draw together the research associated with multiple sclerosis.⁵

The major trusts established in this country concerning themselves with the medical field are the Wellcome Trust*, the Nuffield Foundation, the Nuffield Provincial Hospitals Trust, the Leverhulme Trust and the Wolfson Foundation. The latter two tend to concentrate on the provision of buildings for general medical purposes rather than on financing the conduct of research. All of these trusts are the products of industrial fortunes made for the most part since the 1914–1918 war.

Grants allocated by the Wellcome Trust in the years 1960–1962 amounted to over £2m. compared with £1.2m. in 1958–1960. Almost half their allocation concerned the provision of new buildings for established departments with research reputations.

Grants made by the Nuffield Foundation for medical research amounted to £647,000 in 1961–62 (£450,000 of which represented funds for buildings) and £225,000 in 1962–63.

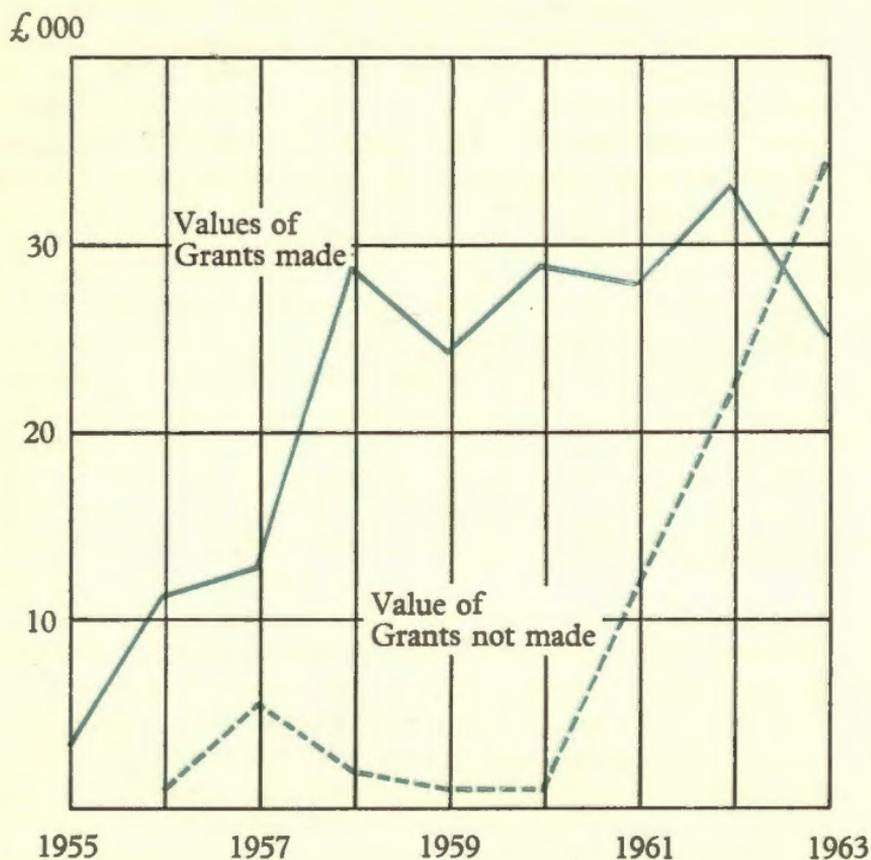
The estimated total amount granted or allocated for the conduct of research in this country by all Trusts supporting medical research amounted to approximately £564,000 in 1961, bringing the total financial support for medical research from

* The Wellcome Trust has a unique link with the field of medicine. Its income is derived solely from the earnings of the pharmaceutical firm established by Sir Henry Wellcome.

Fig. 6

Mental Health Research Fund. Value of grants made and value of worthwhile grants not made through lack of funds. 1955 to 1963. £000.

Source: Mental Health Research Fund. *Annual Report and Accounts, 1962-63, p. 7.*



private sources to just over £2.3m. together with £1.6m. for buildings.* This amount, however, does not include donations made directly by the public to universities or other medical research units.

These trusts and the charities have a crucial advantage in supporting medical research that government agencies lack. The forms and directions of their support are completely flexible, subject only to the limitations of their trust. They are not subject to arbitrary distinctions between direct and capital costs which government agencies take into account. The support they can give to medical research units gives these units a significant asset in negotiating terms and conditions of support with agencies administering official funds. Total reliance on a single source of funds can be dangerous in any field, but it creates special difficulties in medical research. The volume of private benefaction in the United States may have been an important factor in their medical research.

* The totals exclude grants for research carried out overseas.

Methods of Finance

ALL the agencies which finance non-industrial research face a basic problem in deciding what means should be adopted to finance research. In general, they provide finance through any of four ways, project grants, block grants, research units or research institutes. Broadly speaking, the former two involve support to workers or institutes outside the control of the financing agency: the latter two involve the employment of staff or the financing of institutes by the agency itself.⁶

A project grant represents finance for a specific investigation. The initiative may come from the research worker or, alternatively, both the project and the finance may be supplied by the financing agency—a form of contract research. In medical research, contract research is uncommon because from its very nature it is prescribed research. If too large a proportion of research depended on contract research, the effect would be highly undesirable as research workers would be directed into fields outside their primary interest. It is acceptable only where there are other means of support so that research workers may be free to accept or to reject proposals.

Project grants to individuals for investigations they suggest themselves are more common. Their merit lies in their flexibility and the ease by which they can be adapted to new lines of investigation. But project grants suffer from two disabilities which if the major part of a research programme is financed in this way could seriously hamper research. The first concerns the duration of a grant and the second concerns the latitude allowed to the individual research worker. On the whole project grants are given for limited periods. Short-term grants, when they are the main source of support, orientate investigators towards short-term objectives. When a research worker is continually in a position of having to seek his next year's income, he is apt to adjust his research to yield results within the period allowed him. More important research may suffer and unexpected developments which may produce more valuable results cannot be

pursued. Project grants can thus limit the research worker's latitude, particularly if they are combined with the practice, virtually inescapable where public money is involved, of requiring periodic reports on progress to the financing body.

Block grants to academic or research bodies to some extent overcome these difficulties, but have their own drawbacks. They represent finance for a unit which is left free to formulate its own plans or for devising its own facilities to achieve an end in view. Their main value often lies in "pump-priming" a new development, enabling a new investigation to obtain basic facilities and to set up an establishment. However, a financing agency may fear that block grants will become long-term subsidies. If it wishes to keep its finances flexible, it would find it inappropriate to take on long-term commitments of this general nature.

Research units are teams of investigators led by a person of proven ability established and financed by the agency, but housed in universities, hospitals or other research institutes. They have proved a useful and flexible instrument for the support of medical research.

"In some cases, the sole reason for the formation of a unit is to make an opportunity for an outstanding research worker and to provide him with effective means to give expression to his inspiration wherever this may lead. In other cases, units are formed to meet needs in the research field. They may be created to develop a new subject for which a place has not yet been found within the structure of the university. They may be created to develop an existing subject on a scale greater than is justified by the requirements of institutions with academic commitments. They may be created to deal with problems of special relevance or urgency in contemporary society. According to their purpose, their terms of reference will vary but rarely should they extend beyond stating the broad objective. The principle underlying the creation of units should be to find a man of proven ability, to agree with him the general aim of his research, and to leave it to him to devise, according to his judgment, the best methods of achieving this aim."⁶

The final means which can be adopted in supporting medical research is the creation by the financing agency of research institutes. These institutes may be needed where an investigation requires the use of very elaborate and expensive equipment or where it is necessary to bring together investigators from several fields to facilitate the type of planned collaborative work which is increasingly required today.

In the decade 1950-51 to 1960-61 research support by these means through the Medical Research Council increased. The number of individual projects supported rose from 220 to 453, the number of research units increased from forty-seven to seventy-four, while five new bodies received block grants. The number of research institutes remained at one.

Self-financing Medical Research

The problems of finding the right means of financing a research project do not arise in an acute form where medical research is aimed at the production of new medicaments and medical apparatus, rather than the growth of fundamental knowledge or the development of new medical techniques. For the most part, research leading to the discovery of new medical goods is an integral part of the industrial process of research, production and marketing. The problems in this field differ. As research is linked to industry, the financing of research tends to be self-sustaining with previous successes forming the basis of future discoveries.

The Pharmaceutical Industry

In the past fifty years, the pattern of scientific research has undergone a marked change and the pace of this change is becoming increasingly rapid. "Industrial research laboratories, many of which are much larger and better equipped than university laboratories, have come into being in many countries and play an increasing role in scientific research, often surpassing that of the universities." This applies particularly to pharmaceutical research leading to the development of new medicines. "University laboratories hold by no means the monopoly in the field of drug research; both university and industrial laboratories have made equally important contributions, each in its own specific manner, and the best results are likely to be obtained by closest collaboration between academic and industrial laboratories."

In Britain, the pharmaceutical industry accounts for approximately one-third of medical research. Figures are available for research expenditure by the industry in Britain since 1953. In that year expenditure amounted to £2.8m. or equivalent to approximately 7.6 per cent. of manufacturers' sales to the National Health Service. By 1961, research expenditure had risen

over threefold to £7·8m. or almost one-ninth of manufacturers' sales to the N.H.S.*

A significant feature of the industry's research expenditure, is the slowing down in the expansion of research expenditure in the 1960s. This falling away has been attributed to the greater economic risks the industry faces as a result of the erosion of patents and the general discouragement of the prescribing of branded products which contribute a large part of the revenue of the pharmaceutical firms undertaking medical research.⁸

The economic problem of industrial research is relatively simple to state although the working out of its implications is complex and involved. The problem represents in microcosm the broader question of research and economic growth. Scientific knowledge, research and innovation have yet to find a place in the framework of economic analysis. The Keynesian revolution focused attention on short-term variations in the supply and demand for goods and services in a market economy. It provided governments with tools for maintaining full employment and economic stability. But the theory is static in the sense that the technological framework within which fluctuations take place is taken for granted or treated as a constant. The effect of technological change is eliminated in theoretical models by the traditional assumption of *ceteris paribus*—other things being equal.

This screening-off of "other things" was maintained even when economists turned their attention to economic growth. However, these changes, left out as a residual, may well explain a large if not a major part of economic growth.⁹

So far as this is true of the wider field of economic analysis, it is equally true of the analysis of the firm. The economic model of the firm based on marginal costs and returns has little relevance in the understanding of the problems and the growth of science-based industry. The present pharmaceutical industry is principally a creation of research, but research expenditure is not a direct cost of production: it is an overhead cost. The marginal analysis tends to ignore the implications of overhead expenditure. It is treated as an unavoidable necessity, and the efficiency of a company is often measured by the smallness of overhead expenditure. However, research may be the key factor in the operation of a firm—

* These figures exclude grants made to outside bodies for research from which no direct benefit to the firm is expected. In 1961, such donations amounted to £280,000. As these are often channelled through medical research charities, the figure has been excluded from total estimate of medical research finance. Also in 1961, a total of £4·9m. pharmaceutical industry research carried out by overseas parents was attributed to subsidiary firms in Britain. This too has been excluded from total U.K. medical research expenditure.

the one that determines its production characteristics. It is, therefore, hardly surprising that difficulties arise in considering science-based industry in the light of the traditional economic framework of marginal returns and costs and of prices derived from these vectors. This appraisal pays little attention to the impact and place of research.

The difficulties are further increased when the nature of research overheads is investigated. In commercial terms, research represents a high risk capital investment. The risks are high in two main respects. There is no guarantee that research will be productive of new discoveries. Second, where research is successful, the asset created, new knowledge, is intangible and thus potentially open to use by either the discoverer or his competitors.

The patent system to some extent reduces the second of the risks. The Swan Committee in 1946, summarised its functions: "The theory upon which the patent system is based is that the opportunity of acquiring exclusive rights in an invention stimulates technical progress, mainly in four ways; first, that it encourages research and invention; second, that it induces an inventor to disclose his discoveries, instead of keeping them as a trade secret; third, that it offers a reward for the expense of developing inventions to the stage at which they are commercially practicable; and fourth, that it provides an inducement to invest capital in new lines of production which might not appear profitable if many competing producers embarked on them simultaneously."⁹

The original intention of the patent system was to reward the inventor by giving him proprietary rights in the intangible property of knowledge. The period of patent protection, sixteen years, reflects this. Until 1909, patents ran for fourteen years—this was considered sufficient time for the inventor to train two generations of apprentices, and this was believed to give him sufficient lead over his competitors to enjoy the rewards of his research. With the growth of modern large-scale industrial research, the significance in the patent system has shifted away from retrospective rewards for one specific invention, towards becoming one part of the market mechanism which sustains a firm's growth and income. The patent system in modern industry provides funds for the next, rather than for the previous, discovery. Industrial research depends upon teams of workers; they cannot be dispersed after each discovery. The function of the patent system is to enable industry to carry the high overhead cost of a continuous research programme.

Patent protection for products of medical research is, however, weaker than for other products. The general safeguard against monopolistic abuse of patents is the granting of compulsory licences. For all products, except medicinal and food products, abuse of monopoly or excessive restraint of trade must be proved before a compulsory licence is ordered. With medicinal and food patents, the patent holder can be ordered to grant a compulsory licence unless he can show that there are good grounds for refusal. The holder of a patent originating from pharmaceutical research thus faces greater risks of losing the advantages the patent system affords as a support for research.

The original intention of this safeguard was to ensure the public was not deprived for economic reasons of the benefits of medical research. Under the National Health Service, this danger does not arise. The question now is how much should be spent by the Health Service on medical goods, or where the balance of public advantage lies. Does it lie in stimulating medical research or in obtaining short-term economies in N.H.S. expenditure?

The question forms the basis of the whole range of issues concerning the relations between the research-based industries supplying medical goods and the Health Service. Public accountability for expenditure has tended to place greater emphasis on the government's current responsibility at the expense of their long-term commitments. The problem is aggravated by appraising the economics of these industries in traditional terms with too great an emphasis on costs of production and a failure to bring into account the relationship between research and production.

In addition to the patent system, industrial firms also rely on trade marks or brand names to protect their discoveries. These, like patents, are intangible industrial assets which are protected by law. To the inventor they are part of the means of financing future research, and approximately 95 per cent of branded medicines prescribed under the National Health Service are manufactured by companies undertaking major research programmes. By no means all these products are the results of current research, but they all carry their share of its cost.

The Problems of Medical Research Expenditure

A MAJOR feature of medical research expenditure which needs greater recognition is its substantial growth during recent years. Financial support for medical research by the government and research expenditure by the pharmaceutical industry have both more than trebled within a decade. The foundation of many new medical research charities and increasing receipts by long-established societies suggests that donations from the general public for medical research have risen even faster.

But this in itself should not be accepted as evidence that present levels of expenditure are adequate nor should it obscure the current problems involved in financing medical research.

There is no simple way to judge whether or not the £27m. spent on medical research is either too low or too high or approximately right. The expenditure can be evaluated in a variety of ways. It represents, for example, little more than 10s. a year per head of the population—or just over 2d. per week. It is less than half the amount spent by the public on 'seeds, plants and flowers'. It is small compared to medical research in the U.S.A., even allowing for differences of population and prices. The £27m. spent in 1961 was 2.7 per cent of National Health Service expenditure—or little more than 6d. for every £1.

Yet none of these comparisons are meaningful in the sense that they indicate what the right level should be, although they do suggest that expenditure is low. The problem is far more intricate and cannot be solved by comparisons. There can be no objective standard for the right level for medical research expenditure. This arises from the nature of research. The tasks of research tend to be cumulative: as more is discovered, the scope and opportunities for further research grow. Expenditure on medical research grows endogenously. Is there, therefore, a regulator affecting the total amounts spent?

In this respect the ratio of medical research to total N.H.S. expenditure is the most interesting. Over one sector of medical research, the two are interdependent; there is a cycle of cause and

effect between them. A dominant feature affecting expenditure on the N.H.S. is the progress of medical science. The motive force of this progress is not economic and its affect on expenditure is consequently a side-issue. Improvements in medical procedures resulting from medical research may lower, increase or leave the amount spent unchanged. The impact on expenditure is incidental, unrelated to the decision to proceed.¹ But where the product of research has led to increase in expenditure on specific services, as with the pharmaceutical services, there has been an understandable reaction by those responsible for public money to curb or limit the rise. Where research is financed through revenue from these services the search for economies in turn impedes further research. Where responsibility for medical research and health expenditure are clearly separated, this cycle is broken. In recent years, finance for medical research which does not come from sales to the N.H.S. has risen faster than that which does.

There is, therefore, some degree of economic regulation over certain sectors of total expenditure on medical research. Its operation is, however, partial, affecting only one sector of the amount spent on medical research. It represents a conflict between the claims of current responsibility for health expenditure and long-term responsibility for the community's health. However, the depression of one sector of medical research may produce false economies. Where the question of the costs of medical care predominate, there is a strong argument for encouraging lines of research which combine lower costs with more effective care. One field affording greatest opportunity in this respect is that which makes domiciliary rather than hospital treatment feasible.

The final assessment of the right level and direction of medical research, however, cannot depend on a narrow consideration of economics. There are the far broader issues of the health and welfare of the community. Although medical research expenditure has risen, there are areas which on any of a variety of criteria are still neglected. This may indicate an inadequate level of support but also it might reflect a poor allocation of resources. The problem of allocation is tied closely into the system of finance supporting medical research. Would some of the funds at present spent on cancer or poliomyelitis research return greater benefit if directed to the field of mental health? Also, as much research is pursued along lines of medical disciplines, is there not a danger of too great a concentration on the therapeutic rather than the preventive aspects of medicine?

There appears to be little in the financial mechanisms support-

ing medical research which could provide this guide. However adequate or inadequate the level of expenditure of medical research, the question remains whether the right opportunities are being taken.

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Appendix

Sources and Methods

THE estimate of total expenditure on medical research was built-up from an estimate given in the House of Commons of total government financial support, from surveys of research expenditure among the members of the Association of the British Pharmaceutical Industry and from the annual reports and accounts for various charities and trusts. This data does not make it possible to lay down a standard definition of medical research and thus items included by different bodies may vary. Generally, grants made to bodies outside the United Kingdom conducting medical research have been excluded. Also, finance for medical research buildings has been separately identified. The estimate refers to the year 1961 or the nearest corresponding financial year.

An estimate of government financial support for medical research was given by Mr. Denzil Freeth on 30th April, 1963 (*Hansard* Vol. 676, No. 103, W.A. Col. 91). The figure was given as an approximate estimate. It included expenditure by the N.H.S., the Medical Research Council, the General Register Office and the Air Ministry (*Annual Report of the Advisory Council on Scientific Policy*, Cmnd. 1920, Appendix F). It included in addition estimated expenditure on medical research supported by the University Grants Committee. This figure is necessarily more approximate than others, as both research and teaching at universities are carried out in varying degrees by the same staff, using the same buildings and equipment for both activities. The supply of research workers is closely linked with teaching. A division can be made only on the broadest assumptions. The estimated figure includes an apportionment of overhead expenses to research.

Expenditure for the conduct of research by the pharmaceutical industry is based on a survey made by the Association of the British Pharmaceutical Industry of member companies. It includes only research undertaken in the United Kingdom, expenditure by overseas parents or subsidiaries is excluded. Also excluded are donations to outside bodies undertaking research and the payment of royalties. The figures refer to financial years ending during the period from the start of 1961 to mid-1962. (*A.P.B.I. Annual Report* 1963, Statistical Appendix). The estimate of expenditure for new buildings for research purposes was obtained from the Manufacturing Chemists' third annual survey of British pharmaceutical industry capital expenditure projects (*Manufacturing Chemist*, May 1961, Vol. 32, No. 5, pp. 201-204).

The estimate of research expenditure by charities and trusts was derived from the reports and accounts of the following bodies: British Empire Cancer Campaign, Imperial Cancer Research Fund, National Fund for Research into Poliomyelitis and Other Crippling Diseases, Arthritis and Rheumatism Council for Research, Mental Health Research Fund, Muscular Dystrophy Society, Multiple Sclerosis Society, Asthma Research Council, Spastics Society, Society for Mentally Handicapped Children, Royal National Institute for the Blind, the British Epilepsy

Association, the Nuffield Foundation, the Wellcome Trust, the Wolfson Foundation, the Leverhulme Trust and the Biet Memorial Trust. The estimate also includes donations by the general public to the Medical Research Council.

A number of adjustments to the accounts were needed to standardise revenue and expenditure. The principal adjustments concerned research expenditure from special accounts or from 'earmarked' legacies which, in many cases, were shown in balance sheets. Also, in some cases, accounts referred only to part of the year and expenditure was proportionately increased. Certain of the trusts do not publish annual accounts. In these cases the support for medical research was based on the amount allocated rather than on the expenditure actually incurred. So far as possible grants made between the research charities and trusts were excluded to avoid double counting.

The principal omissions from the estimate are generally funds donated directly to bodies undertaking medical research and any drawing these bodies may have made from funds they hold on trust as a result of past benefactions.

Office of Health Economics

THE Office of Health Economics was founded in 1962 by the Association of the British Pharmaceutical Industry with the following terms of reference:

1. To undertake research to evaluate the economic aspects of medical care.
2. To investigate, from time to time, other health and social problems.
3. To collect data on experience in other countries.
4. To publish results, data and conclusions relevant to the above.

The Office of Health Economics welcomes financial support and discussions of research problems with any persons or bodies interested in its work.

