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Economics and Public Policy - NHS Research and Development as a Public Good

A.J. Culyer

DISCUSSION PAPER 163

ECONOMICS AND PUBLIC POLICY - NHS RESEARCH AND DEVELOPMENT AS A PUBLIC GOOD

A J Culyer

December 1998

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ACKNOWLEDGMENTS

I am extremely grateful for their comments on a draft of this paper to Mark Baker, Derek Gardiner, Chris Henshall, Miles Irving, Peter Smith and John Swales. Needless to say, none of them is responsible for the accuracy of my historical accounts, for my interpretation of events or for the analysis.

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ABSTRACT

This paper analyses National Health Service R&D as a Samuelsonian public good. It also identifies other characteristics of NHS R&D: supplier-induced demand; information asymmetries; jointness in production of R&D, medical education and health care; multiplicity in research funding sources; uncertainty about research outcomes; the difficulty of measuring and valuing research outcomes; and the behavioural characteristics of the institutions which produce R&D. The principal conclusion is that a centrally planned approach is unlikely to solve the problems arising from these characteristics, whereas the creation of an appropriate institutional and behavioural framework is more promising. The recent reforms in the arrangements for supporting R&D in the NHS can be seen as a response consistent with this analysis, are outlined and set in their historical context.

INTRODUCTION

The Research and Development (R&D) supported by the NHS (most of which is also carried out within NHS institutions) has several intriguing characteristics. Three were highlighted by Arrow (1962) but may be added to. Attributes of R&D considered here are: it is a public good; it has considerable potential for supplier-induced demand (induced, that is, by the suppliers of R&D rather than the suppliers of health services); there are all-pervading information asymmetries; there are substantial elements of joint production in the delivery of health care and the production of R&D; funding comes from a diversity of sources having a diversity of both complementary and competing objectives; the output and value of R&D is inherently uncertain; the measurement of outcome is in its infancy; R&D is, moreover, largely undertaken within non-profit institutions whose motivation and efficiency is poorly understood and whose behaviour is difficult to predict. Each of these issues merits an essay in its own right. Here, the focus will be on these factors as elements that have helped to shape the recent arrangements established by government for supporting R&D in the NHS.

In the 1990s two major developments have had a dramatic impact on the organisation and character of research in and for the NHS. One was the creation in 1991 of the Research and Development Strategy for the NHS (Department of Health 1991). The other was the Task Force Report on supporting R&D in the NHS (Culyer 1994), which led to a substantial overhaul of the methods by which R&D in and for the NHS is funded at the institutional level. Both these developments grew out of a variety of concerns with the arrangements that preceded them and both provide good illustrations of practical ways in which the demand and supply of a public good (R&D) can operate within a quasi-market structure that is designed *a priori* to optimise output. This paper begins by outlining the particular analytical characteristics of R&D in health care which are common to all systems. It then describes the particular UK arrangements that preceded the new developments and the evidence for their unsatisfactory working. It then describes and discusses the new arrangements. Finally, there is a preliminary assessment of their working - it is as yet too soon to attempt a comprehensive assessment of their cost-effectiveness.

THE SPECIAL CHARACTERISTICS OF R&D IN HEALTH CARE

(i) Publicness

While some R&D undertaken within the NHS is largely private rather than public in character (for example, that supported by pharmaceutical firms) much else has the characteristic of publicness. It has been a longstanding convention in the NHS that "commercial" research (such as that funded by pharmaceutical firms) should cover its full costs and receive no public subsidy. While there are issues concerning the identification of these "full" costs, the role and finance of such R&D is not discussed in this paper, whose focus is on that research which has a public good character.

The classic definition of a public good is that by Samuelson (1954):

Each individual's consumption of such a good leads to no subtraction from any other individual's consumption (p. 387)

A similar definition can be found in Samuelson (1955):

Each man's consumption of it ... is related to the total ... by a condition of equality rather of summation. (Samuelson 1955, p.350)

Thus, a public good, if provided for one, is also provided for all (though each may attach a different utility to it).

This defines the purely public end of what is often a spectrum or degree of 'publicness' and 'privateness', in which intermediate points are characterised by some diminution of others consumption, though by less than the amount consumed by another (as when a public facility become congested) or when there are relatively few who value the good highly enough to want to consume it under any circumstances (as when the public good is essentially local in character). It also makes plain that the character of 'publicness' is a technical characteristic of the good in question rather than an artifact of the particular arrangements in existence for its production and distribution. It is, moreover, the technical character of the demand for the good rather than its production that defines publicness. The idea that a public good can be defined in terms of an exclusion principle (Musgrave 1959) is somewhat different, though also demand-based. It defines publicness (or a social want) in terms of whether a consumer can be excluded from the benefits of a good by not being required to pay a contribution or price towards it (Musgrave, p.9). Later, another (supply-based) definition given by Musgrave is those whose 'inherent quality is such that they cannot be left to private suppliers' (Musgrave p.49). Samuelson's technical definition is that used here. Whether and how the beneficiaries of a public good contribute to its production is a matter separate from the inherent character of the public good. Likewise, whether it is possible for the public good to be efficiently supplied by the private sector is a separate issue.

R&D in health care, whether biomedical or applied social science, has the typical characteristics of a public good. Once it is done, it is available to society as a whole at effectively zero additional marginal cost of production (though not of accessing and using it) and the use of it by one 'consumer' does not diminish the 'amount' left for others to use. Its benefits accrue to a wide variety of individuals and institutions: most directly to those who manage and deliver health care but, more ultimately, to the consumers of health care themselves. While it is possible to establish exchangeable property rights in the information produced by R&D through intellectual property rights and patents, in general this has not been seen as desirable in the case of NHS supported R&D on the grounds that publication is one of the major mechanisms through which quality control is exercised via peer review and because future research productivity is very dependent upon what has gone before. Even when the outcome of research commissioned by a public body, such as the Department of Health or the NHS, is held privately by the commissioners, it retains its technical demand-

side character as a public good. The fact that some are excluded from its use through secrecy about its existence or through intellectual property right constraints on its dissemination reflects social artifacts that in no way detract from the technical character of the good. R&D approximates, therefore, to the 'pure' end of the spectrum of publicness. Several problems immediately arise out of this publicness of R&D. One is that mechanisms for revealing the (public) demand for R&D are required. A second is the creation of mechanisms for valuing and prioritising the R&D projects and programmes to be supported and to determine the appropriate level of resourcing each should have. A third is the determination of the overall resource commitment to NHS R&D in general. Crossing all of these issues is a more fundamental one: should the broad character of the mechanisms for solving these problems be a central mechanism, or should there be substantial devolution of demand mechanisms in, for example, the form of quasi-markets in which the demand side is revealed by local commissioning agencies such as health authorities or regional offices of the NHS Executive?

(ii) Supplier-induced demand

A second characteristic of health care R&D is the dominant role traditionally played in it by researchers themselves. There can be no question that the suppliers of R&D have an irreplaceable practical role in formulating the demand for R&D, for example by sorting questions into those that are researchable and those that are not, in developing protocols, in commissioning work, and in assessing the quality of what is done. Many may also have a shrewd appreciation of the kind of work that is needed in the NHS, through long acquaintance with its working, through the roles many of them have as board members of trusts, health authorities and research funders. On the other hand, researchers also have their own research agendas and this provides the potential for supplier-induced demand. They tend to have a preference for curiosity-driven research enquiries, have in mind the criteria of their immediate peers in such matters as promotion in universities and hospitals, and most would prefer to set their own standards of excellence (some may prefer none at all) to having others thrust standards upon them. They are also likely always to want 'more' regardless of whether 'more' would be optimal from any wider social perspective. The reasons for these values lie deep within the academic culture, doubtless partly driven by the liberal values of universities forged largely in the nineteenth century and partly because there has never been any systematic way in which the ultimate funders of university research could direct the ways in which generic research funding was used towards, for example, the government's perceptions of what was most needed in social research.

Given the chance, therefore, one may expect the research community, as suppliers of R&D, to induce demand whenever they can and to give it a bias towards the particular agendas they have as curious people and people with careers to promote. It therefore becomes important to ensure that the mechanisms for revealing the NHS demand for R&D, and for supplying it, are not contaminated by factors and interests that are not relevant in determining the optimal supply of this public good - and without prejudice to the wider public interest in having free institutions with a major part of their activity devoted to programmes of work determined by academic priorities.

(iii) Information asymmetries

A third special characteristic of R&D in health care is that information asymmetries are all-pervasive. One - the ability to distinguish between an important question and an important researchable question - has already been mentioned. Managers may be good at the former and researchers bad at it; researchers are usually good at the latter but managers bad. Each possesses specialised information that the other does not. Another important kind of asymmetry is that between commissioners and doers of research. Doers will generally have a better idea of the character of the detailed work they will be doing, and of its quality, than commissioners will. This asymmetry can give rise to inefficiencies arising from both sides. Without mechanisms to overcome the problem, commissioners may commission poor work (and may not even know that the work when it is done is poor!); researchers may use the information gap between them and their commissioners to pursue interests which are contrary to those of the commissioners but nonetheless at their expense.

(iv) Joint production

A fourth special characteristic of R&D in health care is that conditions of joint production frequently apply. This is particularly true of research that uses patients. The patient in a research institution is there to receive care, which is funded as a frontline service. The research will often require that there are additional or specially varied treatment packages offered to patients, which arise solely because of the research in question. The issue then arises: are the costs of treatment costs of research or of patient care? The problem is directly analogous to the classic textbook example of wool and mutton: is the cost of the sheep's fodder the cost of the wool or of the mutton? There is, of course, no analytical answer to this question - though the question may be empirically answerable as to the cost of an additional kilo of meat or an additional kilo of wool. Arbitrary decisions about the appropriateness of R&D cost estimates, like those for service costs, need to be avoided. The solution to this conundrum has to consist in the development of methods of cost accounting that do not distort decisions about either care or research and that do not provide systematic incentives for strategic, self-serving behaviour by the various players in the system. Although direct analytical solutions to this problem may elude us, it ought in principle to be possible to design institutional and behavioural arrangements that produce the desired outcomes. After all, in the case of private goods, the jointness of wool and meat production does not prevent a solution that in most cases probably approximates to the optimum or at least a second best optimum. The question then arises whether a quasi-market arrangement might not achieve something similar for the case we are considering.

(v) Multiplicity of funding sources

A fifth characteristic is that health-related R&D is usually funded by a multiplicity of sources. In the UK, this includes government departments, the Higher Education Funding Councils, the NHS itself, industry, research councils (mainly the Medical Research Council and the Economic and Social Research Council), and a large number of medical research

charities. Each typically has specific objects which differ. For example, some emphasise the 'science' end of research, others more applied health services research; others will not support cancer-related R&D, others only cancer-related R&D. The availability of a wide variety of different sources for funding research is a protection for research institutions having a (wise) policy of diversifying their funding sources. However, there is no automatic mechanism through which complementarities between funders can be addressed (even obtaining information about different funders' plans is a highly costly activity) and no means of identifying overlaps, duplications and gaps in coverage. This is partly a problem of information production and dissemination (itself a public good) and partly a problem of coordinating mechanisms.

(vi) Uncertainty of outcome

A sixth characteristic is the fact that all research is beset by uncertainty as to the outcome. The project may not 'work'. The researchers selected may not be sufficiently skilled to complete their task. On the upside, research projects may also yield useful outcomes that were not anticipated. Again, a mechanism is therefore required that is not excessively risk-averse, nor short-term in the thinking it encourages, and that maximises the chances at reasonable cost of the work achieving its set objectives.

(vii) Measurement of outcome

A seventh characteristic is that the measurement of outcome - especially of ultimate outcome which, in the NHS, is the benefit to patients - is exceedingly hard to characterise and calibrate. It may not always be possible to identify 'success', especially when the research in question is very long term or aims at devising new algorithms for (say) planners and managers. Since NHS R&D is funded for basically utilitarian reasons, mechanisms are therefore required to enable judgements about outcomes to be made as best as is possible under the circumstances - making them as near to the ultimate benefit as possible and using intermediate outcomes that are themselves useful and which may be good indicators of likely final benefit. Ultimately, one expects the value of R&D outcomes to determine (assuming that R&D resources are efficiently allocated) the overall level of resource commitment to NHS R&D, which is currently running at something under 1.5% of the total. One Secretary of State displayed her commitment to R&D by making 1.5% a target though, subsequently, references to this target have been less frequent - not least because it represents a mere stab in the absence of any reliable evidential basis, for example, as to what essential infrastructure is required to nurture and sustain research capacity or encourage bright researchers to make long term commitments to the field.

(viii) Nonprofit institutions

An eighth characteristic of R&D is that it is usually performed under the aegis of nonprofit institutions like hospitals and universities, whose internal mechanisms for supporting research may be quite primitive (even absent) and which certainly vary enormously from

institution to institution. A mechanism is therefore also needed that systematically provides incentives for the effective internal organisation and management of research in institutions. All R&D systems have to confront and resolve these problems.

R&D IN THE NHS PRIOR TO THE CHANGES OF THE 1990S

The NHS Research and Development Programme was the direct result of the House of Lords Select Committee on Science and Technology Report on priorities in medical research (House of Lords 1988) which, despite its title's emphasis on medical research, had advocated the creation of a National Health Research Authority, with a broad brief that included health services research, which was regarded both by the Select Committee and the Government as a Cinderella area but one of importance for the conduct of public policy. Both felt that the NHS lacked mechanisms for identifying and meeting the NHS's needs for R&D and that, while much research ought to continue to be science-led, there had developed an imbalance in the pattern of research taken as a whole. The Select Committee sought a special health authority in order to keep R&D at arm's length from the Department of Health. The Government's response to the Report (Department of Health 1989) was to integrate the R&D function within the Department of Health, the NHS Executive and the (then) regional health authorities. It proposed the creation of a new senior post of Chief of Research and Development with a support staff. The new post of Director of Research and Development was created, to which Michael Peckham was shortly afterwards appointed. The task of the new Director, as described in the Government's *Response*, was to advise the NHS Management Executive (as it was then called) on the priorities for NHS R&D, to manage a programme of R&D to meet identified needs (especially the effectiveness and efficiency of health services) and to disseminate R&D results to managers and clinicians in the NHS. The key parts of the House of Lords recommendations and of the Government's response clearly relate to central issues of the 'publicness' of R&D, in particular the development of mechanisms for revealing the NHS's demand and ensuring that resources for R&D were not hijacked by 'purely' academic and clinical interests.

By 1993, the main elements of the NHS R&D Strategy had become clear. It had six clear objectives, of which the first was 'to contribute to the health and well-being of the population through the conduct and application of relevant and high quality research', and had established six structural features of its way of working:

- national and regional infrastructures for identifying and prioritising NHS R&D requirements;
- the initiation of major programmes of work on priorities identified by the Central R&D Committee as being important to the NHS (these naturally coincided with government priorities for health, since both reflected issues such as the burden of disease and the scope for improving health and reducing inequalities);
- a quasi-market mechanism for commissioning R&D via contracts between the Department of Health and research institutions;
- the development of strategic alliances with other health research funders;

- a dissemination strategy;
- a strategy for research training and career development.

The Director of R&D had established a Central R&D Committee, with representatives from the research community, the NHS and (later) consumers of NHS services. Regional programmes attuned to the perceived R&D needs of the regions had been developed from the previous regional arrangements, under Regional Directors of R&D. The central programme had two basic elements: a set of national priority areas, each time-limited, on a dozen or so topics (such as mental health, cardiovascular disease and stroke, and cancer) and a Standing Group on Health Technology Assessment, which was, as its name implied, a permanent group operating a programme that, more than any other, directly addressed the central concerns of effectiveness and cost-effectiveness. It was hoped that this would be an engine for generating a major culture change in the NHS by promoting a more critically aware pattern of professional service delivery based, wherever possible, on reliable evidence about 'what worked' and at what cost. To begin the task of disseminating this work and other relevant research, the Cochrane Centre at Oxford and the NHS Centre for Reviews and Dissemination at York were established, a process now being taken much further under the new government's policies for the NHS. A National Project Register, containing information on all R&D of interest to the NHS, was begun (though its subsequent development has been painfully slow). Similarly slow has been the development of mechanisms addressing the training implications of the R&D programme and the capacity requirements of the research community if the needs identified by the programme are to be met (Baker 1998).

The Central Committee had had several discussions on the definition of R&D but, apart from determining that 'development' ought not to include the service development work conducted by hospitals and others as a part of their normal processes (and which was not, therefore, 'public') agreed to go no further than define some criteria for funding NHS R&D. These criteria were that funded work should: be designed to provide new knowledge considered necessary to improve the performance of the NHS in enhancing the nation's health (a dimension of publicness); be designed so that the results will be of value to those in the NHS facing similar problems outside the particular locality or context of the project (publicness); follow a clear, well-defined protocol (quality control); have clearly defined arrangements for project management (quality control); have the clear intention to report the findings so that they are open to critical appraisal and generally accessible (publicness and quality control) (Department of Health 1993).

It was also agreed early on that the character of R&D in the NHS was such that final decisions about priorities and commissioning could not be substantially devolved (eg to health authorities). This was partly on grounds of their skill to do the job, partly because of the limited national availability of skills, their highly unequal geographical spread, and the likely demands that would be placed on the people possessing them, and partly because NHS R&D was seen as a public good whose benefits flowed primarily to the entire country.

The commissioning mechanisms used by the R&D Strategy are well-illustrated by the work of the Standing Group on Health Technology (Department of Health 1997d). This supervises the work of six advisory panels, covering the acute sector, diagnostics and imaging,

pharmaceuticals, population screening, primary and community care, and methodology. Each panel has academic and NHS membership, observers from the Medical Research Council, Department of Health and the NHS Executive, and each is in the process of acquiring 'consumer' members (which were trialed successfully in the Methodology Panel!). The potential for consumer participation is discussed in Department of Health (1998). The presence of the Methodology Panel, and its success in getting a large number of projects funded, is testimony to the breadth of view taken as to the implications of NHS R&D as a public good. The work of this Panel is explicitly addressed to methodological issues across the entire gamut of the programme, whose solution is seen as beneficial to the rest of the programme. It might be seen as a kind of meta-public good devoted to the production of public goods needed in the production of public goods!

Each panel conducts an annual consultation exercise within the department of Health, the NHS Executive, NHS management, NHS clinicians (including nurses and professions allied to medicine), and the academic community to elicit proposals (1,800 in 1997). They are then further sifted by the secretariat in discussion with Panel Chairs into a total of about 100 topics. These researchable proposals are then further developed, through an iterative process, into 'vignettes' by the Secretariat describing the nature of the work required, its likely results, its likely benefits to the NHS and its likely costs. These are then reviewed by each Panel, scored into three categories (A, top priority for which pro-active methods will be used to commission the work if public calls for bids are not adequate; B, middle priority for which pro-active methods will not be used; and C, priority but not to be funded out of the current year's budget). At this stage, the possibility of external or joint support is explored (eg, with the Medical Research Council) and bids for the work are then sought through an open public bidding process.

The other major departure from what had gone before resulted from the acceptance by the Government of the recommendations of the Task Force Report (Culyer 1994), which addressed the question of how best to fund the 'infrastructure' for research in institutions. In 1993, the principal sources by which the R&D of teaching hospitals was funded were diverse and problematic. The largest single source of specific project funding was industry - though there was considerable variance in the quality of this work. There was also the Department of Health's Service Increment for Teaching and Research (SIFTR) - the main source of R&D infrastructure support for teaching hospitals but oddly a function of undergraduate student numbers rather than research students or research. This is the principal means through which the Secretary of State's statutory obligation to support research in the NHS was fulfilled, a task which has usually been interpreted as an obligation to support Medical Research Council projects in the NHS, and was based on earlier attempts to estimate the cost of teaching in hospitals (Culyer *et al*. 1978)); non-SIFTR - the appropriately named support for a few teaching hospitals with no medical undergraduates; the specially negotiated annual research support for the London postgraduate hospitals (which, at the time, were Special Health Authorities); some specifically 'tasked'(earmarked) money for academic general practice research; and the 'own account' research undertaken by hospitals from within the resources provided for them for patient care - research whose quality was often unknown and whose total size of funding was quite unknown. This system had 'growed' like Topsy, mostly as a consequence of problems as they arose. It was medically dominated; it was institution-

focussed (to the neglect of community-based NHS practice); it was largely arbitrary (eg the tie-in of funding to undergraduate numbers); it could not be used as an instrument for enhancing quality or encouraging a focus on the needs of the NHS; there were complaints from researchers in hospitals that the funding was not actually supporting research; it was impossible to account for it - or to hold anyone to account for it; the quality of much of the work it was supporting was alleged to be poor; and it amounted, for the most part, to a general subsidy to institutions (Culyer 1994). The subsidy had virtually no strings attached and, in particular, no means for assessing (or encouraging) quality. Moreover, SIFTR, non-SIFTR and the special arrangements for the London postgraduate hospitals were all very institutionally focussed streams of funding. Not only did they exclude all community-based R&D, which was odd since the community has become increasingly the location of health care, but they provided no means of support for partnerships between institutions. For a comprehensive account of the perceived faults of the previous systems, see Culyer (1995, 1998).

Following the introduction of the internal market for patient services, a further problem had arisen for secondary care providers which engaged in 'own account' non-commercially funded research. This was that, since their prices incorporated the costs of such research, they were increasingly at a competitive disadvantage as health authorities and fund-holding GPs sought the least cost packages from their service contracts. This led to fears of a substantial squeeze on R&D and that 'own account' research funding (though its quality was largely unassessed) would be driven out. The research community in such institutions had made very public its concerns at the one-sided way in which the newly established market was prejudicing R&D in the absence of any corresponding quasi-market structure for R&D. However, and conversely, there were also indications that institutions whose research was relatively well supported were subsidising patient care prices. The mechanisms then extant afforded little protection against either hazard.

What replaced this miscellaneous assemblage of *ad hoc* measures was radical (see Department of Health 1996a,b, 1997a,b,c). First, the general source of all funding for both the R&D programme itself and the 'infrastructure' support became a Levy (along with several others such as that for Non-Medical Education and Training) on health authorities. Since this was a stream of funding that they had never received before, this step alone left them in a financially neutral state. However, it did make clear the opportunity cost of R&D within the system and gave the health authorities, for the first time, a direct stake in the R&D spend. Since the principal function of health authorities is to assess the need of their communities for health care, from now on they had an incentive to identify their R&D needs in pursuit of this prime function (and others too).

Second, a new National Forum was created at which all the principal players in the R&D system (the universities, the High Education Funding Council for England, the NHS Executive, the relevant research councils, the medical charities and industry) were represented and which could address common issues on both the demand and the supply sides and offer advice both to the NHS Director of R&D and their own constituencies.

Third, a new bidding system was introduced to replace SIFTR, non-SIFTR and the special arrangements for the London postgraduate hospitals. Not only institutions could bid for this

stream of funding but also consortia - the latter opportunity being particularly directed at community-based service providers with R&D capability to enable them to collaborate both with other similar groups to achieve scale economies and with established centres of excellence to enhance quality. Two types of time-limited contract were introduced, called Portfolio and Task-Linked, the first of which was designed for large institutions with predictable need for Medical Research Council and other non-commercial research support and which has the general form of a block grant with relatively little specific monitoring of specific components or outcomes, thus minimising contracting costs; the second format was designed for institutions or consortia of community-based practices whose quality and track record was more difficult to ascertain and whose R&D objectives were more tightly negotiated. Over time, institutions may be expected to move between these two types of support, depending on performance and scale of activity. A set of ten criteria was established (Department of Health 1997a, 4-7) for evaluating bids relating to expected flows of non-commercial external support, the quality of research management and the relevance of the bidders' plans to the needs of the NHS. The assessments (where available and relevant) of clinical departments in medical schools collaborating with trusts in the Higher Education Funding Council for England's Research Assessment Exercises were also borne in mind. The bidding guidance also made clear the public good nature of the activity which it was intended the Levy should support. An elaborate system of regional evaluation followed by central arbitration to ensure consistency in the application of the criteria and to make marginal adjustments in the light of expected productivity was developed and applied. The Task Force had recommended that the changes be introduced without serious destabilisation of existing recipients of previous streams of funding. Final allocations were agreed with NHS Regional Directors. Had this pledge not been honoured, the shifts of funding between institutions would have been larger than turned out to be the case in the first round of the new system in 1997/98. Doubtless greater shifts of funding will occur in the future as the responses of institutions and consortia to the advice of Regional Directors of R&D can be assessed, in the light of institutions' achievement of their own stated R&D goals, and as the amount and quality of information about the uses to which the funding is put is accumulated over time. The mechanism thus placed the articulation and quantification of demand clearly in the hands of the NHS Executive on behalf of the NHS, created a national competition between R&D suppliers for the resources, and instituted a set of incentives for institutions to manage their R&D work more efficiently.

The introduction of the new system replacing SIFTR etc. had been preceded by an important accounting exercise in which all recipients had been asked to declare all their non-commercial sources of R&D income and to account as far as possible (and with some fairly heroic assumptions in the case of joint costs) for existing R&D expenditures. This exercise was successfully accomplished with a minimum of (detected) gamesmanship and served as the benchmark against which to judge the subsequent movement of funds. While such an exercise had inherently arbitrary aspects, perhaps the most important feature of the new system is that it does not rely on central judgements about the costs of research against the costs of teaching or the costs of patient care. Instead it requires bidders both to set out what they intend to achieve, with measurable outcomes, and their own estimates of what it will cost. Instead of a system requiring central judgements as to what R&D actually cost and without any indication of the outcomes and their value that the resources will enable, the new

system attempts to establish a well-designed quasi market, with the ultimate judgements about the value of public good outputs being made by the Director of R&D advised by the Central R&D Committee, the reasonableness of the costs being judged by central and regional experts, and plenty of scope for individual institutions to display their own initiative and set their own priorities in the light of what they know to be the broad priorities set by ministers.

The new system also provides the protection from the service commissioning processes that R&D requires, as health service commissioners seek to minimise their contract costs. The protection is not, of course, absolute but is dependent on the quality and relevance of their R&D work. However, the new mechanisms no longer require hospitals in particular to fund their own R&D out of service contract income as had for some previously been the case. For the first time there was an opportunity for institutions to increase their infrastructural funding - and, indeed, some succeeded in doing just that.

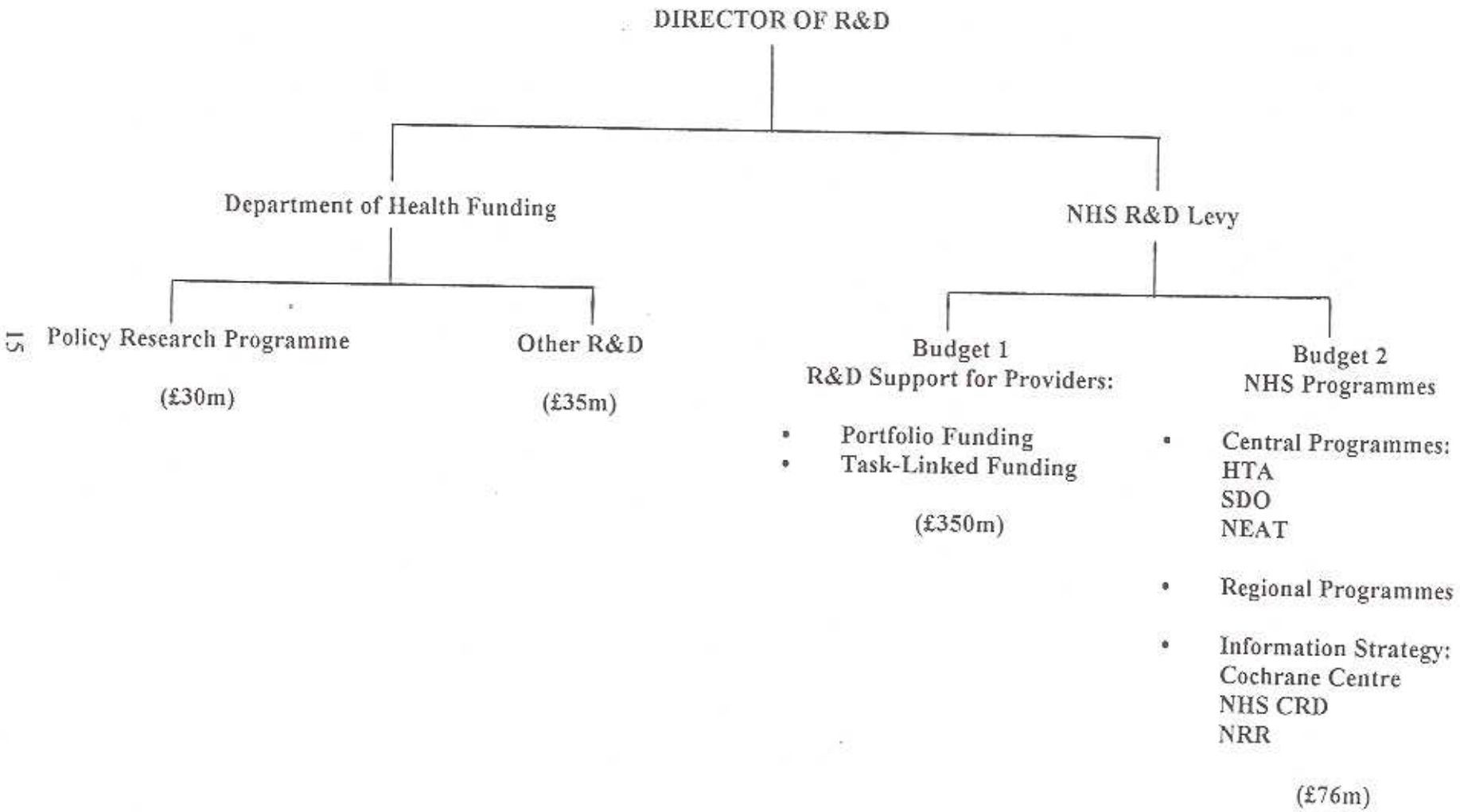
THE NEW R&D STRUCTURE - OVERVIEW

Overall funding for medical and health-related research in England amounts currently to about £3,299 million per year. Of this, industry (primarily pharmaceuticals) contributes about £2 billion, research charities £340 million, the Medical Research Council £278 million and the Higher Education Funding Council for England £190 million (medical schools). The Department of Health and the NHS contribute £491 million, of which £65 million comes from the Department of Health and £426 million from the NHS.

The new arrangements for NHS R&D (both NHS funded R&D and NHS support for the non-commercial R&D funded by others) are shown in Figure 1. R&D in the NHS is now comprehensively managed by the Director of R&D on the advice of the Central R&D Committee. There are two broad divisions into which the work is divided: that funded directly by the Department of Health and that funded out of the R&D Levy.

Figure 1

DEPARTMENT OF HEALTH R&D AND NHS R&D STRATEGY



On the left of the Figure, directly funded R&D falls into two categories: work commissioned by the Department of Health as a part of its policy development activity (usually determined by ministerial priorities and directly related to political judgements of the public good need for relevant R&D). This is the Policy Research Programme, which includes social care research as well as health and health services research. Second from the left are a miscellany of other centrally funded R&D activities such as the specific programme managed by the High Security Psychiatric Hospitals Commissioning Board. On the right are the activities supported by the R&D Levy. "Budget 1" is the new form of support for NHS providers - the new single stream that replaces SIFTR, non-SIFTR, etc., which is available through the processes described in the form either of Portfolio or Task-Linked Funding. "Budget 2" funds the NHS R&D Programme, which now consists of three central programmes where the scope of publicness is NHS-wide: the Health Technology Assessment Programme (HTA) under the Standing Group, two new programmes also with standing groups in Service Delivery and Organisation (SDO), and New and Emerging Applications of Technology (NEAT), the Regional Programmes of support for work that is also national in its publicness but of lower general priority while being of particular regional concern, and the Information Strategy consisting of the Cochrane Centre, the NHS Centre for Reviews and Dissemination (CRD), and the National Research Register (NRR), formerly the National Project Register. Yet to be determined are the way in which workforce capacity development will proceed and the manner of the integration of the whole of this activity with the proposed National Institute for Clinical Excellence.

INTERACTION BETWEEN THE DEMAND AND SUPPLY OF THE PUBLIC GOOD

The essential character of a (Samuelsonian) public good like R&D is defined in terms of its demand-side character. The publicness of R&D is, however, compounded by supply-side matters which policy needs also to address if the amount produced is to be optimised.

A major characteristic of health-related R&D production is that it is located principally in universities and hospitals or practices associated with universities. Universities are independent nonprofit private organisations in the UK (though heavily dominated by their principal funder - the state) which pursue agendas that are their own and, in the case of research, are largely determined by the preferences (values) of researchers themselves. Unfortunately, the economic theory of institutions such as universities is poorly developed and offers little in the way of guidance (for an early contribution to this still thin field see Culyer (1970)). 'Academic freedom' is (rightly) jealously guarded and, even when research projects are commissioned by external bodies, researchers typically seek to promote their own priorities as far as possible on the backs of such sponsorship. This plainly creates tensions that require appropriate trading off in the commissioning process and, for the most part, the Department of Health and the NHS R&D Programme have seen their own interest as also being served by helping to ensure the continuation of a vibrant research community that is not entirely and exclusively driven by the needs (whether short or long term) of the NHS. There is thus not only scope for bargaining as to the terms under which research projects are undertaken (for example, many have included training components) but also a degree of long term mutual interest.

More difficult is the issue of the efficiency with which universities manage their research activity. Most universities (rightly) adopt a 'bottom-up' approach in which the research priorities of the institutions are derived from the preferences of the researchers themselves and the resource and support structures provided are those preferred by the same group. Until the advent of the Research Assessment Exercises of the Higher Education Funding Councils, however, there was typically little thought given to the management and support of research within institutions, little sharing of good practice, and remarkably little attention given to the career interests of an increasing proportion of staff who were funded by external research support grants with a limited life (most, for example, have taken the view that the life of the employment contract should be the same as the life of the support grant). Research management and support in hospitals was substantially worse and many claiming a serious commitment to R&D lacked a senior manager and support staff to develop strategies through which it could be made to flourish.

Even since the advent of the Research Assessment Exercises, many institutions have been slow to improve their internal support strategies. There has been a plethora of voices decrying the invasive and distortive character of Research Assessment Exercises (notwithstanding that the principal distorting characteristic for research in universities is typically the promotion policies internally generated by the institutions themselves, which relate particularly to the need for continuous publication). Much of the specific reaction has been tactical rather than strategic (for example, finding ways of excluding research inactive staff, or tactically playing with the Units of Assessment in which staff are reported). So one set of issues for a major public programme of R&D concerns the efficiency and quality of the management of R&D management in institutions. There are few levers to be pulled to affect the supply side in this respect, though the financial incentives built into the way in which Research Assessment Exercise results are used by the Funding Councils provide a mechanism for promoting and rewarding quality at the general level, and the operation of the Portfolio and Task-Linked allocation mechanisms in the case of Budget 1 allocations (or future transfers between Budget 1 and Budget 2) will doubtless provide similar levers for the NHS in the future.

More intractable in the short term is the issue of research workforce capacity. Universities seem to be able to change their practices only slowly in response to changes in the ways in which demand is revealed. Despite the widespread recognition of specific skill shortages and notwithstanding the availability of funding for research that depends upon these skills, the system has been slow to respond. The NHS's own financial support for education and training has largely ignored these problems and policy towards education and training, including continuing professional development, has been developed in an almost entirely separate way from R&D, despite their manifest interdependence. The effective use of R&D results in actual clinical and managerial practice depends upon there being a service workforce that is capable of assimilating new information and interpreting it in relevant ways in the daily context of people's work, and the production of the R&D itself is dependent upon there being a sufficiently well-trained R&D workforce capable of meeting the demand for R&D and on the scale at which it is demanded. There are many complex issues involved here concerning, for example, ensuring that, in general, NHS staff have a good appreciation of relevant R&D outcomes and how they may be best utilised in the service, that NHS staff

are able to articulate the ways in which prospective R&D might further their own work, that clinicians' roles in R&D are enhanced (these roles cover a range from the provision of patient 'material' for research, through collaborative work with other researchers, to managing their own research programmes).

Doubtless, 'in the long term' some sort of equilibrium will be established. Unfortunately, the R&D agenda for the NHS is large, growing, and is demanding of a high order of professional skill. Left to the 'market', that is, left for institutions to respond to their perceptions of the changing nature of demand, adaptation to change is likely to be slower than it need be. A higher priority is required to be given to the development of mechanisms that might speed the process up. This would have to include the better identification of R&D workforce capacities centrally and regionally, the collaborative funding of both the training and the jobs, and changes in university cultures regarding the employment status and career development of limited term research staff.

In research-oriented hospitals there is some evidence of a major culture change in the way that R&D is perceived and supported, almost entirely in response to the economic incentives provided by the new funding system in the form of ½Budget 1". It has also been facilitated through the agency of NHS Executive Regional Directors of R&D and, perhaps more importantly, through the establishment of Directors of R&D in hospitals (largely as a result of the creation of the new system). Such highly personal connections that facilitate supply responses to the demand for a public good should not be underestimated for their potential impact, especially when coupled with powerful financial incentives and performance monitoring against openly stated criteria. These methods used for the research-orientated hospitals could be applied with better effect to the universities.

CONCLUSIONS

This paper has sought to analyse NHS R&D as a Samuelsonian public good, whose demand ought to be revealed by those with the technical competencies to do so (for example to distinguish the researchable from the unresearchable) and those with political legitimacy (that is, representing the public interest - the need of the NHS for knowledge). It has identified other characteristics of R&D that further compound the problems in securing appropriate and timely delivery: the fact that supplier-induced demand may distort the optimal pattern; the presence of important information asymmetries; the jointness in production between research, education and patient service delivery; the multiplicity of research funders; the inherent riskiness of research; the subtlety of the output of research and its lack of amenability to sensible measurement and valuation; and the fact that it is typically produced by private nonprofit organisations called 'universities'.

The structure developed in England for dealing with these problems has been described. Its principal character is that it has a strong demand-side focus and it has yet to develop truly effective means of ensuring a short to medium term supply-side responsiveness. This may be partly due to our imperfect understanding of the way in which university 'firms' respond to changes in their environment (or can be encouraged to respond) and partly due to inherent characteristics of universities as self-governing communities of scholars. The new

mechanisms have the character of a quasi-market, in which the demand is determined through various public agencies and through widespread consultation and contracts are placed with research supplying institutions (universities and hospitals). This mechanism has replaced a more centrally planned, but actually quite chaotic, model which had grown Topsy-like over several decades and which, even if it had been simplified and better coordinated, was inherently incapable of addressing key issues such as the "cost" of R&D in hospitals, the value of research output, and the marginal value of the overall programme - which ought to have determined the overall public budgetary commitment to R&D in the NHS.

The exploration of the supply side, and of the interaction between demand and supply, remain as two key research issues for the future.

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