

Physician Productivity in the UK NHS

by

Alan Maynard¹ and Karen Bloor²

1 Professor of Health Economics, University of York, England and Chair, York NHS Hospitals Trust, York, England

2 Senior Research Fellow, University of York, England and Non-Executive Director, Selby and York Primary Care Trust, York, England

1 Introduction

Conventional workforce planning in the UK NHS has been inflexible and influenced only marginally by economic critiques (e.g. read Maynard and Walker over 25 years).¹ The government has sought to plan the labour market for doctors, forecasting demand and supply, since before the existence of the NHS, but has only recently begun to think more broadly about the overall structure of the NHS workforce. The need for workforce planning results from the assumed association between the total number of clinical staff and the total level of activity of the NHS. The conventional approach is outlined here and forms a background for the discussion of clinical productivity that follows. This discussion, like the inflexible workforce planning model, has been remarkably limited, if not naïve. Generally, it has failed both to incorporate well-established evidence of inefficiency in the delivery of healthy care in the UK and elsewhere and to incentivise remedial change in the productivity of the labour force.

Indeed, instead of focusing on incentivising greater productivity in a workforce characterised by great variation in activity and outcome, the UK Government has responded to waiting times and other political pressures by investing in more doctors rather than shifting the mean of the activity distribution and reducing its variation around the mean. This problem is epitomised by the policies of Prime Minister Blair, who has entreated the NHS as a whole to “act smarter” but failed to focus adequately on the productivity of practitioners.

2 The Conventional Workforce Planning Model

NHS planners have tended to use, implicitly or explicitly, a medical workforce planning model outlined in figure 1. This shows that the workforce supply (stock) is determined by medical school output, immigration, deaths, retirements and changes in labour force participation. In conjunction with estimates of ‘demand’ for health care (largely based on population projections), this type of analysis has resulted in a number of expansions and occasional contractions of medical school intake over the last 60 years.

In 1944 the Goodenough Committee² recommended a modest expansion in numbers, which was exceeded by the government of the time. In the mid-1950s, this led to fears of a ‘surplus’ of doctors, and the Willink Committee in 1957³ proposed a reduction of 10 per cent in the medical school intake. This recommendation was adopted but within a few years this was thought to be the wrong direction, and intake was restored. Expansion continued, following a Royal Commission in 1968⁴ despite concerns in the late 1970s and early 80s about a possible surplus, although the target was only exceeded in 1991.⁵

Reviews of medical education became more regular in the 1980s, and in the 1990s a Standing Committee was created. The forecasts of medical workforce undertaken by the Medical Workforce Standing Advisory Committee (MWSAC) made projections for up to thirty years into the future based on planned medical school intake, with assumptions about migration, death, retirement and non-participation in the workforce, prior to comparison with the projected demand for doctors’ services.⁶⁻⁸ Doctors were still assumed to be able to undertake a fixed amount of NHS activity, which was projected into the future. If the demand for NHS care is projected to increase, this means that an increase in the number of doctors is necessitated, with little consideration given to increasing productivity rates from the existing medical and

clinical workforce. Little weight is given to economic variables such as prices, wages and costs, and technology and productivity are assumed to be relatively fixed.⁹

In the July 1998 expenditure plans for the NHS, funds were earmarked for the expansion of medical and nursing education, including the creation of new medical schools. The NHS Plan promised a further increase in medical school places to nearly 7,500.¹⁰ Unlike previous increases in medical school intake this expansion does not appear to have been planned with regard to formulae of demand and supply, but politically led.

The intake of medical schools, controlled centrally, appears for fifty years to have been guided largely by political forces: essentially whether the political imperative to create more NHS activity, for example at the start of the NHS, and during the implementation of substantial reform programmes such as the introduction of the internal market, exceeds the political imperative to control public expenditure, such as during the 1950s, and the early Thatcher years.

Historically, it appears that there has been an implicit assumption that 'productivity' per doctor is constant, and therefore overall activity can only be affected by increasing the size of the medical (and more recently clinical) workforce. This limits the potential to make any changes without the substantial time lag of training more clinical staff. It also neglects the role of incentive systems, both financial (e.g. payment methods) and non-financial (e.g. regulation) in influencing rates of productivity. There may be potential for improving productivity of this workforce, for example by changing reward systems and incentive structures, or by better regulation and management, challenging the assumption that the only way to increase activity in the NHS is to increase the number of clinical staff.

Complex micro-policy issues arise around the life cycle and relative gender trends in productivity, and the relative performance of early and late retirees. The rigour with which such issues are confronted in an evidence based way in clinical workforce forecasts is generally poor. This facilitates macro planning but ignores the potential efficiency gains that could be derived from analysis. Policy making needs to take better into account inefficiencies in practice, targeting incentives and managing performance to improve overall resource allocation.

3 What is the 'product' of health care investment?

In most manufacturing and service industries, the relationship between inputs (staff time, raw materials) and outputs (goods or services provided) is a key indicator of success or failure. Economic 'productivity' is 'the amount of output per unit of input achieved by a firm, industry or country'.¹¹ In most sectors of the economy, productivity over time and between individuals or teams is monitored routinely. But in UK health care, this relationship between inputs and outputs is neglected.

In health care, monitoring productivity would ideally mean measuring 'health' produced as a result of inputs into health care, particularly staff time but also other resource inputs. The health economics literature emphasises the distinction between:

- (1) Inputs: e.g. expenditure levels, physician nurse and other workforce numbers, hospital bed numbers, and pharmaceutical expenditure and volume.
- (2) Processes and activities: i.e. how inputs are combined to produce “outputs” in terms of GP consultations, outpatient attendances, inpatient stays, which affect other process measures such as waiting times for procedures. These data tend to be used in fragmented ways that separate primary and secondary health care and social care. To the extent that “patient pathways” and “clinical guidelines” join up these processes, they often tend to be disease specific when many elderly and chronically sick patients suffer from multiple morbidities.
- (3) Outcomes: i.e. do the primary and secondary care activities, and process measures (e.g. reductions in waiting time), improve ‘health’, i.e. the length and quality of patients’ lives?

The policy literature and policy makers usually focus on inputs and processes (activities), neglecting the important questions of whether and to what extent spending more and doing more in health care, in particular increasing the workforce, impacts on population health. A rhetoric of concern about “quality” has been interpreted as increasing the level of inputs to improve processes. Sometimes the improved processes have an evidence base which demonstrates a relation to outcomes, but often this is not the case. Interventions such as improving the delivery time of thrombotic therapy are process measures but with a demonstrable link to outcomes. The introduction of specialist stroke units, encouraged by the English National Service Frameworks, with monitoring of practices by the Royal College of Physicians, is also linked to improved outcomes in an evidence based manner. However, some of the “improvements” financed by the Blair Government’s increased funding of the NHS are not so well evidence based. It is often unclear whether the hoped for health gains are produced and to what extent they are attributable to physician rather than other related inputs such as nurses and changes in population behaviour (e.g. reduced tobacco consumption).

One area of research with more of an outcomes focus has been the relationship between workforce and mortality, which has been explored in the UK by Jarman et al,¹² and critiqued on the grounds of case mix and risk adjustment by Black and Bunker¹³. Other authors have analysed cross national data to elicit apparent relationships between physician stock and ‘conventional’ measures of population health such as infant mortality and life expectation¹⁴. This work too has been controversial with disputes about estimation methods and if such relationships exist, how they work in terms of clinical practice.¹⁴ In addition, these studies focus entirely on mortality rates, without attention to quality of life issues.

Despite considerable investment in and application of outcome measures in some aspects of health care, there have been few systematic attempts in the NHS as a whole to use patient reported outcome measures (PROMs) or measures that evaluate physical and mental functioning or quality of life over time. Over the last 30 years, investment in and the use of both generic and specific PROM measures has been considerable.¹⁵ Short form 36 (www.sf36.org), which was derived from the Rand Insurance Experiment in the early 1970s¹⁶ has been translated into dozens of languages and used in thousands of clinical trials. The same is true for EQ5D - also a generic measure, which was devised by European collaborators, led by Kind and Williams from York University, England (www.euroqol.org). Despite the extensive use of such instruments in clinical trials, their use in routine medical practice remains highly unusual.

An exception to this is the work of the UK private insurer, the British United Provident Association (BUPA). Following adverse events associated with the work of one gynaecological surgeon, in 1998 BUPA began to offer patients SF36 before and six months after treatment for common elective procedures (e.g. hernias, hips and hysterectomies). With electronic readers, they were able to chart quality of life (PROM) changes before and after elective interventions, identifying changes in physical and mental functioning. Furthermore, using “six sigma” safety engineering techniques, they are able to plot and feed back individual performance and individual performance relative to peers. BUPA’s estimate of the cost of such measures is £3 per patient episode.¹⁷

If such measures can be shown to be valid and sensitive, they could become useful additions to routine health care management, augmenting measures of process and activity ‘productivity’ with measures of outcome or success in improving patients’ functioning. From the clinical trial literature, there is evidence of validity. However, for example, for sight and hearing procedures there is evidence of insensitivity, leading BUPA to supplement these with use specific measures of changes in visual acuity for cataract procedures.

Measures of productivity in the UK NHS are inadequate. The usual method of measuring productivity in secondary care is to use activity rates, in particular ‘finished consultant episodes (FCEs) from an administrative dataset known as the Hospital Episode Statistics. Although these process/activity data have been collected since 1987, clinicians have tended to ignore them (often dismissing them as ‘inaccurate’) and the focus of management has been not on these measures but on the financial balance of their organisations and the reduction of waiting times. Sadly, in pursuing the latter objective, neither Government nor local managers have perceived that better quantitative management of activity data is relevant for managing waiting times, despite persistent attempts to raise awareness.¹⁸⁻²⁰ The data available to measure ‘productivity’ over time focus on inputs and activity, not outcome: the English Department of Health decided only in 1999 to publish even crude mortality data by hospital. Such data have been available for decades²¹ but have not been routinely published or used. Measures available in primary care are even less useful. Few measures of outcome, activity or even inputs in the ‘black box’ of NHS primary care have historically been collected centrally, although recent reforms of the remuneration system (described below) have created some limited and largely self-reported data collection systems relating to processes and occasionally outcomes.

There is considerable scope for additional research in clinical productivity to assist the development of workforce policies. Investment in additional research into augmenting activity/process data with measures of outcomes would be useful. There has been advocacy of such measures e.g. Kind and Williams²², Appleby and Devlin²³. Furthermore, Black and colleagues at the London School of Hygiene and Tropical Medicine have reported on such measures to the Department of Health and have been commissioned to evaluate their routine use in NHS Diagnostic and Treatment Centres, which specialise in elective procedures required to reduce waiting times. It is believed that similar reporting is in place for Independent Sector Treatment Centres, i.e. private facilities commissioned by Government to provide elective care for NHS patients. In addition, more research on the causes of existing levels of variation in physician productivity (between individuals and between hospitals and other units) could inform dramatically the development of workforce policy in the UK.

4 What policy and secular drivers are affecting physician productivity in England?

4.1 Policy drivers: expenditure change

During the last five years, the British Government has made considerable increases in NHS funding, seeking to raise the share of GDP spent on health care to the average of the European Union. This has involved funding increases of around seven per cent annually, adjusted for inflation, and will double spending by 2008, the year in which the “Blair bonanza” is scheduled to cease.

The risk emphasised at the outset of this “reform” programme was that of rent seeking, i.e. professional groups pursuing and acquiring pay increases with little or no impact on productivity, measured in terms of activity or outcomes.²⁴ Unfortunately, these predictions have been borne out with the Government sanctioning large pay increases for hospital specialists (consultants) and GPs, with pay rising by 20 per cent for some practitioners, and with little in terms of either increased activity or observable changes in quality.

4.2 Policy drivers: contract reform - paying more, getting less?

The 2004 GP contract introduced a “Quality and Outcomes Framework (QOF), with associated generous rewards. There are 10 health care quality target areas (Table 1) and each target involves identification of patients on the practice’s list who are at risk, the delivery of interventions and monitoring of success in stabilising the patient’s condition. Depending on the degree of performance, points for achievement are awarded, with each point being worth £120 in 2005/6. These rewards are not paid to the individual practitioner but to the group practice, to incentivise group achievement of QOF targets.

To the surprise of the Department of Health, who are slow to learn about GP-money reaction times (as epitomised by practice change after the 1990 contract), the level of achievement has been impressively high. However, this success has to be tempered with some caution, e.g.

- i. to the extent that many practices were meeting these targets, practices are being paid for what they were already doing (and given the inadequacy of Department data and monitoring, it is not known what practice performance levels were before the new contract!)
- ii. to the extent that practices’ QOF delivery is improved, what is the opportunity cost? e.g. does the QOF induce substitution or complementarity in care, e.g. does the practice use the QOF money to fund additional nurses to meet the targets or do they reduce other services? What is happening to the services that were omitted from the QOF?
- iii. with high levels of achievement after one year, how can the QOF “goalposts” be altered and at what price?

The new GP contract in its initial form (2004-2006) appears to contain a large element of rent, i.e. increased payment without accurate evidence of improvements in productivity.

The consultant contract has also become an example of a rent acquisition: more pay with no quid pro quo in terms of productivity improvement. The reformed contract for

hospital consultants is now for 10 programmed activities (PAs) of 4 hours each, with payments available for up to an additional 2 PAs. The basic 10 PAs are divided into clinical and non clinical and some items that were previously non-clinical (e.g. discharge letters to GPs) are now part of “clinical” work. Acceptance of the new contract was voluntary and most consultants have taken it, as the pay rise it brought was considerable, e.g. circa 20 per cent. Furthermore, the Department of Health capitulated to trade union (BMA) pressure, giving concessions on a proposed obligation for NHS overtime, evening and overtime work.

Despite evidence of considerable variation in consultant performance, the Department failed to exploit the potential of the contract negotiations, to either shift the mean of the distribution or alter variation around the mean.

Figure 2 illustrates variation in one specialty, general surgery, demonstrating that individual activity rates (vertical lines on the chart, with those in one anonymous hospital highlighted) are extremely variable. In 2002 the department distributed these data to all NHS acute hospitals in England.²⁰ The Department then took its eye off the ball and negotiated an inefficient contract despite internal and external economic advice about incentivising change to increase activity from the existing consultant doctor stock.

British doctors are now amongst the best paid in Europe with both GPs and consultants achieving six figure remuneration levels plus other inefficient uses of “incentives” such as “excellence awards”. The weakness of targeting of payments to achieve activity and outcome results is unfortunate. Indeed, high levels of remuneration are making it financially reasonable for physicians in hospital and primary care, and of both genders, to opt for part time practice. This effect is not well evidence-based, and is sometimes put forward as a means of moderating the stress by waiting time targets and other demands of the Blair agenda, but it could result in the perverse consequence of paying more and getting less from the existing stock of trained doctors in the UK.

4.3 Policy drivers: Europe

The European working time directive is putting significant downward pressure on the working hours, particularly of junior staff, but this is beyond the scope of this paper.

4.4. Secular trends and other drivers of changes in physician productivity

- i. There are continually increasing numbers of women in the medical workforce. It is possible that the activity levels of male and female practitioners differ. Research in Australia and Canada, and early stage research in England, has found that female practitioners appear to have lower activity rates than male peers. This is illustrated using cross sectional fee data from Canada in Figure 3. Figure 4 illustrates a similar pattern in activity using patient episodes per year per consultant (full-time only), for combined specialties in England, although this must be viewed as indicative at this stage, as it results from early stage research (Bloor 2005, work in progress). With the increasing feminisation of the medical labour supply, activity could decline due to gender effects. The nature and cause of this alleged effect is unknown, e.g. females may be slower but more thorough, and may achieve better outcomes for patients.
- ii. there are high levels of reported stress and unhappiness amongst medical practitioners in the NHS²⁵. This may be the product of change in professional

practice (e.g. increased focus on medical errors and revalidation) and the effects of NHS reforms, which are radical, fast moving and lack strategic coherence. The effect is likely to engender earlier retirement, but once again the evidence about intentions and actual decisions is limited.

- iii. trends and variations in activity over time. The UK literature on medical practice variations is less substantive than in the US where Wennberg and his Dartmouth colleagues have maintained a focus on this problem. Even so, the UK evidence about practice variation amongst hospital consultants is considerable and as in the US and other health care systems, largely ignored by policy makers focused on investing in 'more' physicians rather than also managing better the practices of the existing workforce stock.^{18-20,26}

Over time, it appears that the NHS productivity is falling (see Figure 5 from the Office of National Statistics)²⁷. This has been poorly charted, let alone explained. The usual medical response is that case mix is more complex and/or 'quality' is improving. However, systematic exploration of these explanations is absent.

4.5. *Overview: less productivity, greater expenditure*

Internationally, health policy making is characterised by an implicit assumption that to provide more health care, you need a larger health workforce, and in particular more physicians. This assertion ignores the scope both for substitution of nurses and others for doctors, a vigorous but largely evidence free approach as demonstrated in Lankshear et al²⁸, and for improved management of practice variation to yield more activity and better outcomes for the existing physician stock. The UK-NHS is paying more and getting less from its physicians and such profligacy is possible because of the Blair spending increases, poor policy making and NHS management that is not incentivised to obtain the best return from workforce assets.

5 Time to remedy inefficiency?

The UK data about the practice activity of general practitioners is improving after over 50 years of gross neglect. As noted in a recent Office of National Statistics report on productivity in the public sector,²⁷ there are no national data on, for instance, the number of GP consultations. The ONS report authors, like generations of researchers before them, have estimated consultation rates by grossing up data in the General Household Survey. Where data are available (e.g. prescribing statistics are held by the Prescription Pricing Authority), there is evidence both of variation and only superficial analysis. The latter is the product of an absence of patient identifiers, which would facilitate long term analysis of consumption by groups such as the elderly. Requests for patient identifiers and diagnostic coding to be added to prescriptions have been made for over a decade (by AM) but Departmental inertia has not facilitated reform and currently a 'Nirvana' of change is forecast for when prescriptions are nationally electronic some time in the future!

Whilst there are national data²⁹ for consultant activity, these are used all too rarely to inform central policy making and in local NHS management. Primary care data on practice variation is poor but indicative. The data now being yielded by the QOF is affording some insight in to variation, but this has some nice issues around it, in particular, its accuracy when self-reported and no pre-policy comparators.

Her Majesty's Treasury is now joining the growing chorus of questioners of the efficiency of recent workforce policy and beginning to focus on the effects of reduced activity and a great variation in consultant activity (and perhaps GP activity too, if we had the data!). A number of policy responses are being discussed:

- i. the intake to medical schools has been increased by 30 per cent and further increases are being planned by the Department of Health. The importation of physicians has been augmented by increased remuneration rates and the Blair reforms. With the addition of 10 Eastern European states to the European Union, migration from these and outside the Union has increased. Thirty percent of practitioners are now foreign trained, with considerable numbers coming from middle income countries – i.e. reverse foreign aid.
- ii. radical reform in the roles of the workforce other than physicians is taking place. Pharmacists and nurse prescribers are to be given the right to prescribe the full formulae, although medical groups (e.g. the Committee on the Safety of Medicines) are now questioning the safety of such policy. Nurses are being trained to carry out endoscopy, anaesthetics and minor surgery.

These reforms are part of Blair's frustration with the slow rate of change in NHS service delivery. At the outset, he offered more funding in exchange for the NHS 'acting smarter'. This exchange, he believes, has not been met by providers. More expenditure has not been accompanied by improved service delivery. Consequently, he is seeking to undermine the monopoly power of physicians with investment in other skill groups with enhanced roles. This bold policy is largely evidence free; many assert that nurses may be retrained to take over medical roles cost effectively but the quantity and quality of trials are poor.²⁸ Such issues have yet to inhibit the Government!

- iii. It is unclear whether investing in capital (e.g. technology) is a complement or a substitute for physician services. Technological developments in pharmaceuticals extend the armoury of the physician, and are often encouraged by the National Institute for Clinical Excellence (NICE). However as is shown by researchers (e.g. Garattini and Bertele³⁰) some of these developments are of marginal cost effectiveness.³¹ The Blair reforms are investing large sums in scanners and other diagnostic equipment. Such investments may improve diagnosis, but it is unclear whether they always improve processes and outcomes in a cost economising way.
- iv. The restructuring of clinical systems is also affected by NICE, with its production of clinical guidelines that now take account both of clinical and cost effectiveness. Whilst NICE's work is moving guideline production on to an economic basis at long last, the take up of its 'advice' is uneven.³² Furthermore, many guidelines being for patients with one disease may be inappropriate when many elderly patients have multiple morbidities where overlapping therapies may interact with adverse effects.
- v. Payment systems:

"there are many mechanisms for paying physicians: some are good and some are bad. The three worst are fee for service, capitation and salary"
Robinson (2001)³³

During the negotiation of the consultant contract there were discussions in the Department of Health about the pros and cons of capped fee for service (FFS) payments to practitioners. Whilst this has permitted some low profile piloting of FFS and some limited evaluation of its use,³⁴ the system of remuneration remains salary based for hospital consultants.

The target-based QOF for general practitioners has achieved high levels of service delivery although with no prior comparative data available to evaluate change. Negotiations are now under way to move the goalposts in the QOF. There is a risk that interventions such as 'patient choice' will be incentivised in the absence of an evidence base about cost, activity and patient outcome effects. Hopefully the QOF will be used to incentivise the adoption of patient reported outcome measures such as EQ5D and SF36.

The challenge always with fee for service and target payment systems is to ensure that the activity incentivised is cost effective. Use of FFS in parts of the health care system (e.g. ambulatory care in Germany and France) if poorly designed can produce duplication and waste. Furthermore, whatever the system of fees adopted, an expenditure cap is essential. Then if activity increases, the value of service units delivered can be reduced as in Germany and Japan.^{35;36}

6 Summary

In the UK NHS, policy making and management has been fixated by staying within budget (expenditure control) and reducing waiting lists. Measurement and management of levels and variation of activity and outcomes has been feeble as clinicians and managers have focused, because of reward systems, on expenditure control and waiting times.

Proposals to increase consultant and GP numbers through medical school expansion and productivity through other interventions such as changes in remuneration are currently seen as pressing because of:

- i. changes in working practice (more part time activity)
- ii. changes in gender mix
- iii. possible earlier retirements
- iv. ignoring the practice and the evidence of changes in skill mix
- v. the continuing failure to measure and manage the level and variation of physician activity and patient outcomes in primary and secondary care.

The grand tradition of myopic decision making about workforce numbers in the UK-NHS is unlikely to change until policy makers begin to use the evidence available but underutilised in routine administrative data and other sources. Hopefully, Treasury 'value for money' pressure, together with economic pressures associated with fiscal imbalance and the impending slowdown in the growth of NHS funding (from 2008) will induce greater rigour in measuring and managing clinical productivity in terms of activity and outcome and in doing this, gain better returns on increased NHS investment.

Figure 1: The Conventional Workforce Planning Model

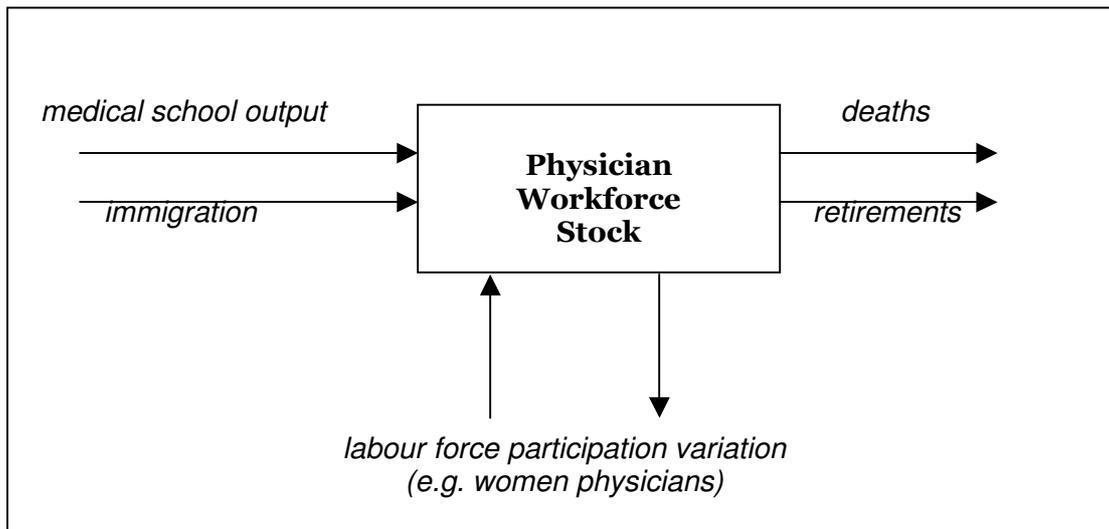


Figure 2: Variations in activity rates per hospital consultant, England, 2001/2
(Source: Bloor 2005, work in progress)

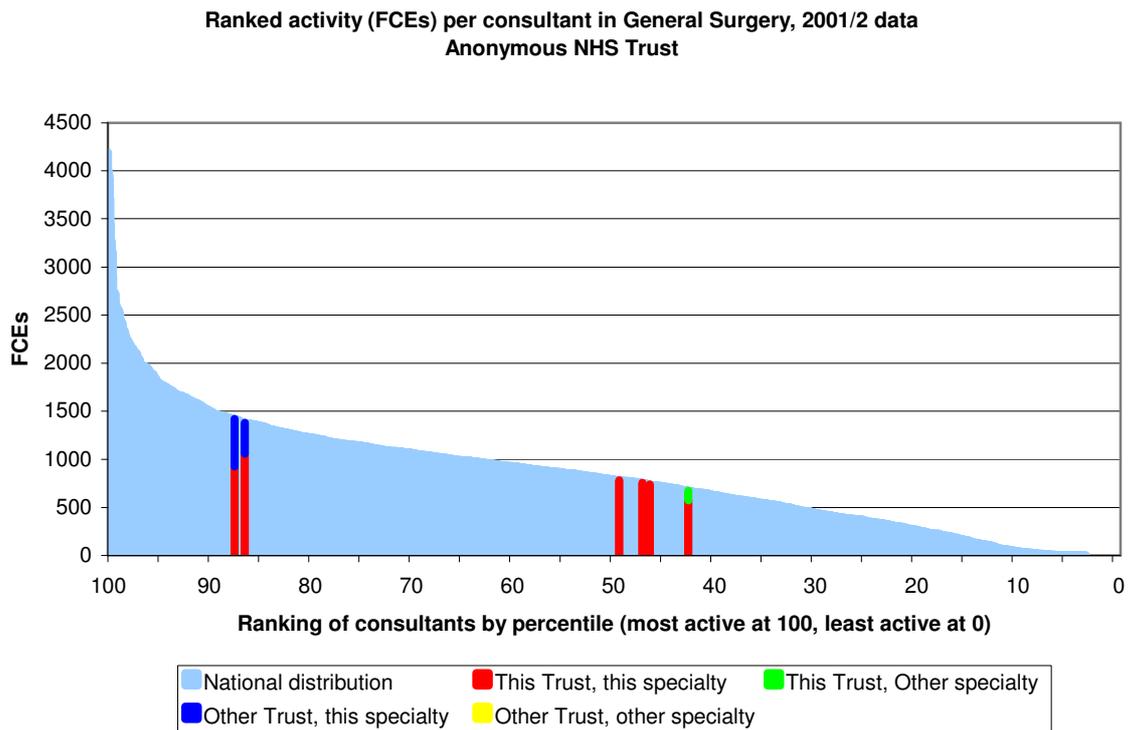
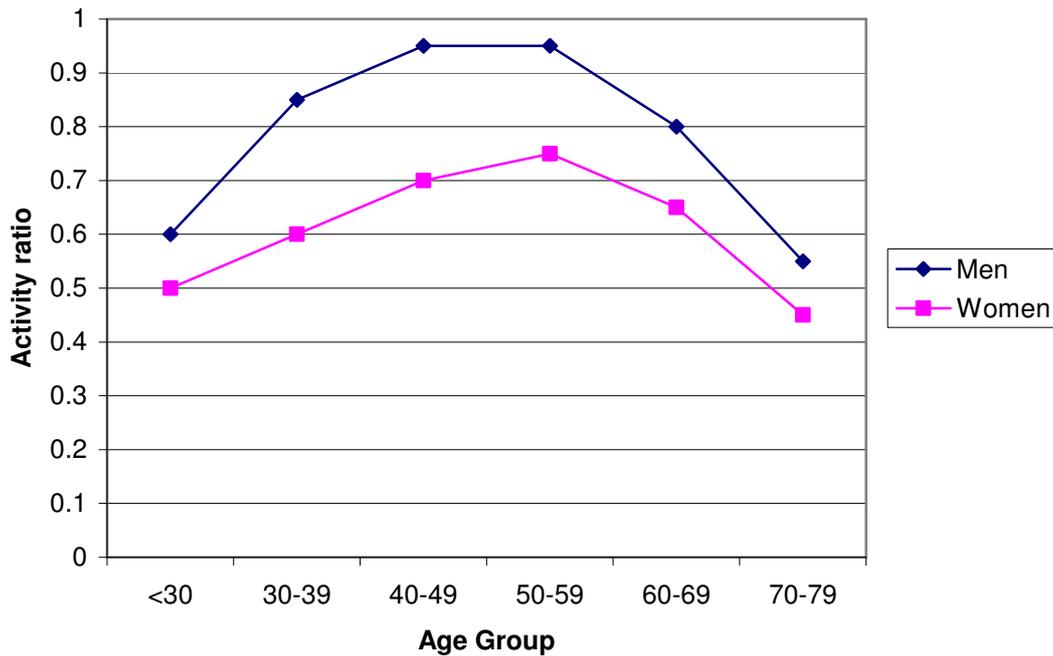


Figure 3: Activity ratios* by age and gender, Canada, 2002/3 (source: Canadian Institute for Health Information 2005)³⁷



**"Activity ratios" compare the relative amount of work two groups of physicians do, as measured by fee-for-service activity, taking into account which provinces they practise in and which specialties they practise. A ratio of 1.0 represents a "typical" full-time physician in fee-for-service practice.

Figure 4: Activity rates (Finished Consultant Episodes per year) by age and gender, England, all specialties, full-time practitioners only, 2001/2 (source: Bloor 2005, work in progress)

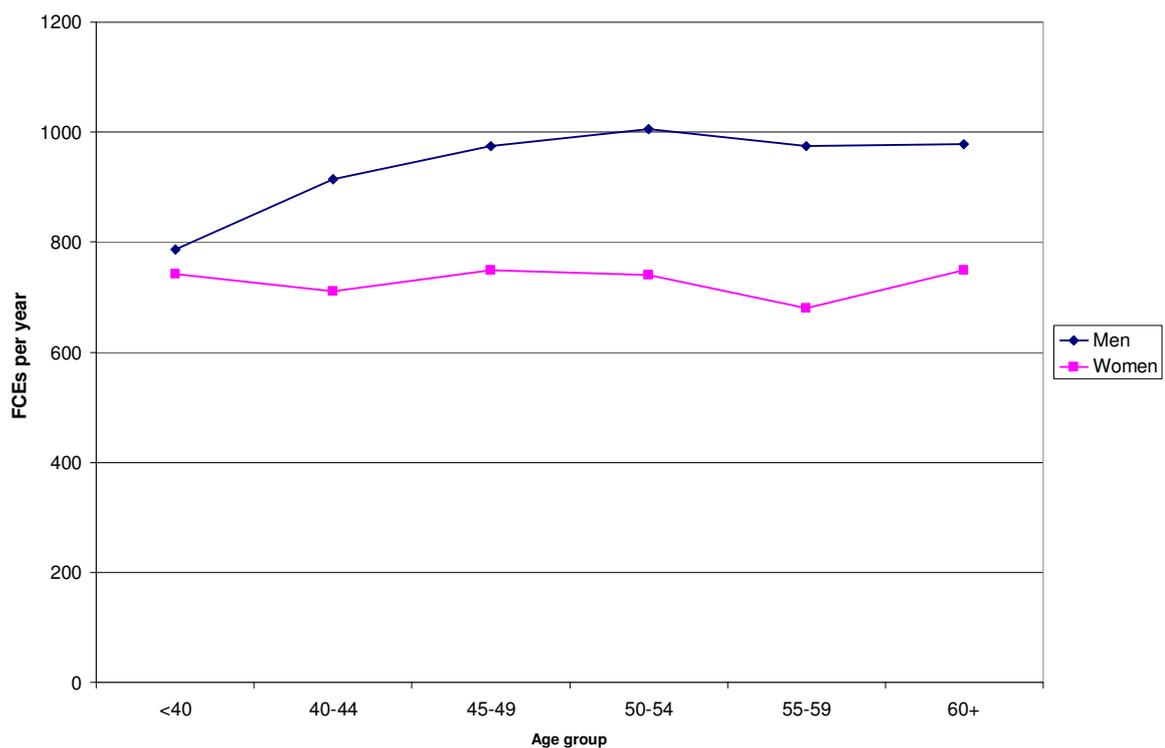


Figure 5: NHS Productivity, not allowing for quality change (source: ONS 2004)

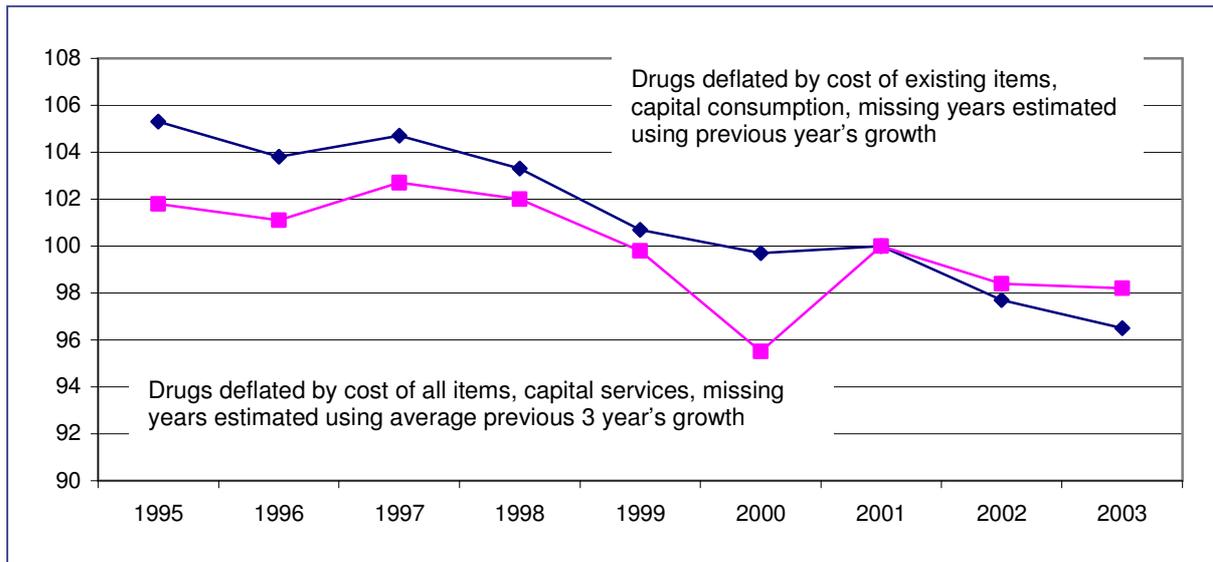


Table 1: The New GP Contract's Quality Framework

A.	Clinical indicators, categories and points	
1)	Coronary heart disease including left ventricular dysfunction	121
2)	Stroke or transient ischaemic attack	31
3)	Cancer	12
4)	Hypothyroidism	8
5)	Diabetes	99
6)	Hypertension	105
7)	Mental health	41
8)	Asthma	72
9)	COPD	45
10)	Epilepsy	16
		550
B.	Organisational indicators	
	records	85
	patient communication	8
	education and training	29
	practice management	20
	medicines managed	42
		184
C.	Additional services	
	cervical screening	22
	child health surveillance	6
	maternity services	6
	contraceptive services	2
		36
D.	Patient experience	
	patient survey	70
	consultation length	30
		100
E.	Holistic payments	100
F.	Quality practice payments	30
	Sub total	1000
G.	Access bonus	50
	Overall total	1050

Reference List

1. Maynard A and Walker A. Managing the medical workforce: time for improvements? *Health Policy*. 1995;31(1):1-16.
2. Goodenough W.. Report of the interdepartmental committee on medical schools. London: HMSO, 1944.
3. Willink H, Baldwin JT, and Boldeo H et al. Report of the committee to consider the future numbers of medical practitioners and the appropriate intake of medical students. London: HMSO, 1957.
4. Todd AR B. Royal Commission on Medical Education 1965-68: report presented to Parliament by Command of Her Majesty. London: HMSO, 1968.
5. Maynard A and Walker A. Planning the medical workforce: struggling out of the time warp. University of York, UK.: Centre for Health Economics, 1993. (Discussion paper 105).
6. Medical Workforce Standing Advisory Committee. Planning the Medical Workforce. London: Department of Health, 1992. (Report No 1).
7. Medical Workforce Standing Advisory Committee. Planning the Medical Workforce: 2nd report. Department of Health, 1995.
8. Medical Workforce Standing Advisory Committee. Planning the Medical Workforce: 3rd report. Department of Health, 1997.
9. Maynard A and Walker A. *The physician workforce in the United Kingdom: issues, prospects and policies*. London: Nuffield Trust. 1997.
10. Department of Health. The NHS Plan: a plan for investment; a plan for reform. London: Department of Health, 2000.
11. Black J. *Oxford Dictionary of Economics*. Oxford: Oxford University Press. 1997.
12. Jarman B, Gault S, Alves B, Hider A, Dolan S, Cook A, Hurwitz B, and Iezzoni LI. Explaining differences in English hospital death rates using routinely collected data. *British Medical Journal*. 1999;318:1515-1520.
13. Bunker JP and Black N. Differences in death rates in English hospitals. Data are inadequate basis for drawing conclusion of paper. *BMJ*. 1999;319(7213):854-855.
14. St Leger AS, Cochrane AL, and Moore F. Factors associated with cardiac mortality in developed countries with particular reference to the consumption of wine. *Lancet*. 1979;1(8124):1017-1020.
15. Drummond MF, Sculpher MJ, Torrance GW, O'Brien BJ, and Stoddart GL. *Methods for the Economic Evaluation of Health Care*. Oxford: Oxford University Press (UK). 2005.

16. Newhouse JP. *Free for all? Lessons from the RAND health insurance experiment*. Cambridge, MA: Harvard University Press. 1993.
17. Vallance-Owen A and Cubbin S. Monitoring national clinical outcomes: a challenging programme. *British Journal of Health Care Management*. 2002;8(11):412-417.
18. Yates J. *Why are we waiting?* Oxford: Oxford University Press. 1987.
19. Yates J. *Private eye, heart and hip: surgical consultants, the National Health Service and private medicine*. London: Churchill Livingstone. 1995.
20. Bloor K and Maynard A. Consultants: managing them means measuring them. *Health Service Journal*. 2002;112:10-11.
21. Kind P. Hospital deaths - the missing link: measuring outcome in hospital activity data. University of York: Centre for Health Economics, 1988. (Discussion Paper No 44).
22. Kind P and Williams A. Measuring success in healthcare - the time has come to do it properly. *Health Policy Matters*. 2004;(9)
23. Appleby J and Devlin N. Measuring Success in the NHS: Using patient-assessed health outcomes to manage the performance of health care providers. London: King's Fund/Dr Foster, 2004.
24. Maynard A and Bloor K. Do Those Who Pay the Piper Call the Tune? *Health Policy Matters*. 2003;October 2003(8)
25. Jeffcoate W. Care and despair in the UK National Health Service. *The Lancet*. 366(9487):694-695.
26. McPherson K, Wennberg JE, Hovind OB, and Clifford P. Small-area variations in the use of common surgical procedures: an international comparison of New England, England, and Norway. *N Engl J Med*. 1982;307(21):1310-1314.
27. Office of National Statistics. Public service productivity: health. London: Office of National Statistics, 2004.
28. Lankshear A, Sheldon T, Maynard A, and Smith K. Nursing challenges: are changes in the nursing role and skill mix improving patient care? *Health Policy Matters*. 2005;(10)
29. Department of Health Statistics Division. Hospital Episode Statistics. IBM Global Services UK., 2000.
30. Garattini S and Bertele V. Adjusting Europe's drug regulation to public health needs. *Lancet*. 2001;358(9275):64-67.
31. Maynard A, Bloor K, and Freemantle N. Challenges for the National Institute for Clinical Excellence. *BMJ*. 2004;329(7459):227-229.
32. Sheldon TA, Cullum N, Dawson D, Lankshear A, Lowson K, Watt I, West P, Wright D, and Wright J. What's the evidence that NICE guidance has been

implemented? Results from a national evaluation using time series analysis, audit of patients' notes, and interviews. *BMJ*. 2004;329:999.

33. Robinson JC. Theory and practice in the design of physician payment incentives. *Milbank Quarterly*. 2001;79(2)
34. Department of Health. Serco Health. Review of National Health Service "Fee for Service" Pilot Programme. Available at <http://www.dh.gov.uk/assetRoot/04/10/34/20/04103420.pdf>.
35. Ikegami N and Campbell JC. Japan's health care system: containing costs and attempting reform. *Health Aff (Millwood)*. 2004;23(3):26-36.
36. Maynard A (ed). *The Public-Private Mix for Health*. London: Radcliffe Medical Press. 2005.
37. Canadian Institute for Health Information. Canada's health providers: 2005 chartbook. Ottawa: Canadian Institute for Health Information, 2005.