QQUIP Quest for Quality and Improved Performance

Estimating health and productivity gains in England from selected interventions

Executive summary

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QQUIP and the Value for Money project

QQUIP (Quest for Quality and Improved Performance) is a five-year research initiative of The Health Foundation. QQUIP provides independent reports on a wide range of data about the quality of healthcare in the UK. It draws on the international evidence base to produce information on where healthcare resources are currently being spent, whether they provide value for money and how interventions in the UK and around the world have been used to improve healthcare quality.

The Value for Money component of the QQUIP initiative provides a series of reports that enable comparisons to be made between the scale of benefits and costs across a number of different disease groups. It also provides a methodological framework for examining the costs and benefits of national policies for treatment of conditions such as coronary heart disease and mental health.

For more information visit www.health.org.uk/QQUIP

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For more information

A print copy of the full report - *Estimating health and productivity gains in England from selected interventions* - is available from:

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Introduction

Over the last decade the British Labour Government has presided over unprecedented increases in levels of spending on the National Health Service (NHS). But Opposition parties now claim that this record growth in NHS expenditure has been misspent, and some commentators are already predicting that the next British general election will be fought over the productivity of public services. In anticipation of this, the Prime Minister Tony Blair has emphasised the urgency with which the NHS must deliver efficiency from its huge extra investment: between 2003/04 and 2007/08, NHS expenditure is planned to increase each year by more than 7 per cent in real terms from about £60bn in 2003/04 to £90bn in 2007/08. Hence, if NHS productivity is to increase, the average annual monetary value of growth in output over this period needs to exceed £6bn.

In response to the Atkinson Review into government output and productivity, the NHS will increasingly be subject to a new way of measuring its productivity to assess whether the 'increased spending on the NHS has been justified in terms of cost-weighted activity and improvements in quality of care (including gains in health). Work so far has put a monetary value of £30k on gains in health, measured in Quality-Adjusted Life Years (QALYs).

Ministers, officials and managers of strategic health authorities and primary care trusts need to understand the impacts of their policies and priorities both on the health of populations and on the new way of measuring NHS productivity. But standard approaches of setting priorities require development to provide such information.

An approach to estimating health and productivity gains

Researchers from The Health Foundation's Quest for Quality and Improved Performance (QQUIP) have developed an approach for analysing the relative scale of benefits of health policies to help assess where money might be spent to greatest effect. Their approach builds on the convergence of recent methodological developments for measuring the impacts of health policy interventions on target populations. The method involves analysing the impacts of a policy intervention in terms of various measures of the current Burden of Disease (BoD) and the BoD that is 'avoidable' from the intervention, measured by:

- deaths
- Years of Life Lost (YLLs): the difference between age at the time of 'avoidable' death and the expected life of someone of that age in England
- Years Lived with a Disability (YLDs)
- Disability-Adjusted Life Years (DALYs): the sum of YLLs and YLDs, with and without discounting.

Using their method it is also possible to estimate:

- gains in Quality-Adjusted Life Years (QALYs), which the researchers assumed to be broadly equal to discounted DALYs
- the monetary values of 'avoidable' deaths and gains in QALYs
- the net costs of an intervention

- the gains or losses in NHS productivity (assuming a QALY gain is worth £30k).

The researchers chose three interventions as a means of testing whether their approach can be generalised:

- improving prescribing statins to reduce high cholesterol: premature mortality from coronary heart disease (CHD) is high in England in comparison to other causes of death, and also in comparison to rates of CHD in other countries. The researchers developed models to estimate the benefits and costs of two policies to improve prescribing: to achieve the guidelines of the National Service Framework (NSF) for CHD, which aims to reduce levels of cholesterol for patients assessed as having a high risk of a CHD event, and simply to reduce levels of high cholesterol.
- utilising intensive glucose control to better manage Type 1 diabetes: levels of control of glycosylated haemoglobin (HbA1c) are poor for over 80 per cent of the population with Type 1 diabetes aged between 6 and 24. Good glycaemic control reduces the risks of long-term consequences of diabetes such as blindness, kidney failure and nerve damage. The researchers developed two models to estimate benefits and costs of implementing intensive glucose control to improve glycaemic control for all Type 1 diabetics under two scenarios: in the short run (up to five years), whatever the stage of disease, and in the long run (in a 'steady state') at the onset of the disease.
- meeting the target of the *National Suicide Prevention Strategy (NSPS) for England* to reduce the number of suicides: suicide is relatively common in young people and accounts for more deaths than traffic accidents. The NSF for Mental Health identified various risk factors for suicide and policies for prevention. The researchers estimated the benefits and costs of achieving the target for reducing suicide as set out in the strategy.

Findings

Improving prescribing statins

Estimated annual benefits from achieving CHD NSF guidelines include:

- 13,000 fewer deaths
- 490,000 fewer YLLs
- 470,000 fewer undiscounted DALYs (with an increase of 20,000 YLDs)
- 210,000 more QALYs (or discounted DALYs)
- £15 billion from 'avoidable' deaths
- £6bn from QALYs gained.

Achieving the CHD NSF guidelines would cost an estimated £500 million (direct costs) and £55m (net costs) annually. The estimates of the benefits of prescribing statins simply to reduce levels of high cholesterol are less reliable but are about double those of achieving the CHD NSF guidelines. Improving prescribing for cholesterol therefore looks alone to have potential to deliver the scale of gains in output to match the massive increases in NHS expenditure and have a significant impact on the productivity of the NHS.

Utilising intensive glucose control

Estimated annual benefits include:

First five years	Steady state
• 10 fewer deaths	400 fewer deaths
• 400 fewer YLLs	13,000 fewer YLLs
• 1,400 fewer YLDs	10,000 fewer YLDs
• 1,800 fewer undiscounted DALYs	23,000 fewer undiscounted DALYs
• 1,400 more QALYs (or discounted DALYs)	17,000 more QALYs
• £10m from 'avoidable' deaths	£400m from 'avoidable' deaths
• £40m from QALYs gained	£500m from QALYs gained

The direct annual costs of intensive glucose control for Type 1 diabetes are estimated to be about £370m. In the first five years the net annual costs are estimated to be about £340m, which would exceed the monetary value of the benefits. In the steady state, the estimated net annual costs are about £250m, which is less than the monetary value of the benefits. Therefore, intensive glucose control is likely to worsen NHS productivity if introduced to all diabetic patients in the short run (with net annual loss of £300m), but improve NHS productivity if introduced at the age of onset in the long run (with net annual gain of £250m). However, neither would have a significant impact on the productivity of the NHS.

Meeting the target of the NSPS

Estimated annual benefits include:

- 600 fewer deaths
- 23,000 fewer YLLs (and undiscounted DALYs)
- 10,000 more QALYs (or discounted DALYs)
- £700m from 'avoidable' deaths
- £300m from QALYs gained.

The annual costs of implementing the strategy are approximately £20m, which has a minimal impact on the estimated monetary value of QALYs gained (£300m): however, while this would improve NHS productivity, it would not have a significant impact.

Overall findings

This approach has been designed to enable those responsible for the formulation of health policies to understand the impacts of these policies on both the health of national/local populations and the new measures of NHS productivity. Our approach allows comparisons both across and within disease groups.

Research implications

Conducting this research has revealed three issues that need to be taken into account when examining the impact of health policies.

First, the research has shown that estimating impacts of interventions on the new measures of NHS productivity reveals inadequacies in the data that are routinely collected and in the evidence that is reported. These difficulties do not invalidate the principal findings of this research but they do point to the kinds of improvements that are required for better estimates to be made.

Second, assessing interventions in terms of their impacts on NHS productivity will tend to prioritise interventions for common diseases where prevalence is high and there are significant benefits from treatment (as is the case for statins). However, there are often other reasons than productivity for investing in a disease area, and this should not be the only criterion used.

Third, the two ways of giving monetary values of benefits of policies in measuring gains in NHS productivity – the value of a statistical life (at over £1m) and by QALYs (at £30,000/QALY) – can lead to very different results.

References

Adam T, Lim SS, Mehta S, Bhutta ZA, Fogstad H, Mathai M, Zupan J and Darmstadt GL (2005). 'Cost effectiveness analysis of strategies for maternal and neonatal health in developing countries'. *British Medical Journal*, vol 331, p 1107.

Airoldi M, Bevan G, Morton A, Oliveira M and Smith J (2006). *Estimating Health and Productivity Gains in England from Intensive Glucose Control in Type 1 Diabetes*. London School of Economics.

Andrews G, Issakidis C, Sanderson K, Corry J and Lapsley H (2004). 'Utilising survey data to inform public policy: comparison of the cost-effectiveness of treatment of ten mental disorders'. *British Journal of Psychiatry*, vol 184, pp 526–33.

Atkinson AB (2005). *The Atkinson Review: Final report*. Palgrave Macmillan.

Babad H, Sanderson C, Naidoo B, White I and Wang D (2002). 'The development of a simulation model of primary prevention strategies for coronary heart disease'. *Health Care Management Science*, vol 5, pp 269–74.

Baltussen R, Floyd K and Dye C (2005). 'Cost effectiveness analysis of strategies for tuberculosis control in developing countries'. *British Medical Journal*, vol 331, p 1364.

Beaglehole R and Dobson A (2005). 'Contributions to change: major risk prevention factors and the potential for prevention' in Marmot M and Elliott P eds, *Coronary Heart Disease Epidemiology: From aetiology to public health*. Oxford University Press.

Bevan G, Hollinghurst S, Raftery J, Gold L, Stevens A, Smithies A, Spurgeon R and Bowie C (1998). *The South and West DALYs Project: Developing a powerful tool for health care planning*. Somerset Health Authority.

Bevan G and Hood C (2006a). 'Have targets improved performance in the English NHS?'. *British Medical Journal*, vol 332, pp 419–22.

Bevan G and Hood C (2006b). 'What's measured is what matters: targets and gaming in the English public health care system'. *Public Administration*, vol 84, pp 517–38.

Black N, Browne J and Cairns J (2006). 'Health care productivity'. *British Medical Journal,* vol 333, pp 312–13.

Borch-Johnsen K, Andersen PK and Deckert T (1985). 'The effect of proteinuria on relative mortality in Type 1 (insulin-dependent) diabetes mellitus'. *Diabetologia*, vol 28, pp 590–96.

Boyle R (2004). 'Meeting the challenge of cardiovascular care in the new National Health Service'. *Heart*, vol 90, pp iv3–iv5.

Cavanagh JTO, Carson AJ, Sharpe M and Lawrie SM (2003). 'Psychological autopsy studies of suicide: a systematic review'. *Psychological Medicine*. vol 33, pp 395–405.

Cooper K, Davies R, Roderick P, Chase D and Raftery J (2002). 'The development of a simulation model of the treatment of coronary heart disease'. *Health Care Management Science*, vol 5, pp 259–67.

Dawson D, Gravelle H, O'Mahony M, Street A, Weale M, Castelli A, Jacobs R, Kind P, Loveridge O, Martin S, Stevens P and Stokes L (2005). *Developing New Approaches to Measuring NHS Output and Productivity.* York University and the National Institute of Economic and Social Research. www.niesr.ac.uk/pdf/nhsoutputsprod.pdf

de Leo D and Evans R (2004). *International Suicide Rates and Prevention Strategies*. Hogrefe and Huber.

Department of Health (2005a). *Healthcare Output and Productivity: Accounting for quality change*. Department of Health. www.dh.gov.uk/PublicationsAndStatistics/Publications/PublicationsPolicyAndGuidance/PublicationsPolicyAndGuidanceArticle/fs/en?CONTENT_ID=4124266&chk=5QmbY7

Department of Health (2005b). *Measurement of Healthcare Output and Productivity: Use of statins and calculation of value*. Department of Health. www.dh.gov.uk/PublicationsAndStatistics/Publications/PublicationsPolicyAndGuidance/PublicationsPolicyAndGuidanceArticle/fs/en?CONTENT_ID=4124266&chk=5QmbY7

Department of Health (2002). *National Suicide Prevention Strategy for England*. Department of Health.

Department of Health (2000a), *NHS expenditure Plans 2002-03*, HMSO, 2002 (pp30-32)

Department of Health (2000b). *National Service Framework for Coronary Heart Disease: Modern standards and service models.* Department of Health.

Department of Health (1999). *National Service Framework for Mental Health: Modern standards and service models*. Department of Health.

Diabetes Control and Complications Trial (1996). 'Diabetes Control and Complications Trial, 1996. Lifetime benefits and costs of intensive glucose control as practised in the Diabetes Control and Complications Trial'. *Journal of the American Medical Association,* vol 276, pp 1409–15.

Diabetes Control and Complications Trial (1993). 'The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus', *New England Journal of Medicine*, vol 329, pp 977–86.

Diabetes Control and Complications Trial (1990). 'Diabetes Control and Complications Trial update', *Diabetes Care*, vol 13, pp 427–33.

Diabetes UK (2004a). *Diabetes in the UK 2004: A report from Diabetes UK.* Diabetes UK.

Diabetes UK (2004b). *The National Paediatric Diabetes Audit*. Diabetes UK.

Drummond MF, O'Brien B, Stoddart G and Torrance G (1997). *Methods for the Economic Evaluation of Health Care.* Oxford University Press.

Eddy D (1991). ‘Oregon’s methods: did cost-effectiveness analysis fail?’. *Journal of the American Medical Association*, vol 266, pp 2135–41.

Edejer TT-T, Aikins M, Black R, Wolfson L, Hutubessy R and Evans DB (2005). ‘Cost effectiveness analysis of strategies for child health in developing countries’. *British Medical Journal*, vol 331, p 1177.

Edwards N (2006). ‘A pound wasted is one not spent on NHS values’. *Health Service Journal,* 15 June, pp 22–25.

Evans DB, Adam T, Edejer TT-T, Lim SS, Cassels A and Evans TG (2005a). ‘Time to reassess strategies for improving health in developing countries’. *British Medical Journal*, vol 331, pp 1133–36.

Evans DB, Edejer TT-T, Adam T and Lim SS (2005b). ‘Methods to assess the costs and health effects of interventions for improving health in developing countries’. *British Medical Journal*, vol 331, pp 1137–40.

Evans DB, Lim SS, Adam T and Edejer TT-T. (2005c). ‘Evaluation of current strategies and future priorities for improving health in developing countries.’ *British Medical Journal*, vol 331, pp 1457–61.

Forouhi NG, Merrick D, Goyder E, Ferguson BA, Abbas J, Lachowycz K and Wild SH (2006). ‘Diabetes prevalence in England, 2001: estimates from an epidemiological model’. *Diabetic Medicine,* vol 23, pp 189–97.

Franco OH, Peeters A, Looman CWN and Bonneux L (2005). ‘Cost effectiveness of statins in coronary heart disease’. *Journal of Epidemiology and Community Health,* vol 59, pp 927–33.

Hadorn DC (1991). ‘Setting health care priorities in Oregon: cost-effectiveness meets the rule of rescue’. *Journal of the American Medical Association*, vol 265, pp 2218–25.

Hawton K (1998). ‘A national target for reducing suicide’. *British Medical Journal*, vol 317, pp 156–57.

Hawton K and Fagg J (1988). ‘Suicide, and other causes of death, following attempted suicide’. *British Journal of Psychiatry*, vol 152, pp 359–66.

Hawton K and Van Heeringen K (2002). *The International Handbook of Suicide and Attempted Suicide.* Wiley.

Healthcare Commission (2005). *National Service Framework Report: Getting to the heart of it. Coronary Heart Disease in England: A review of progress towards national standards* (Summary report). Healthcare Commission.

Heart Protection Study Collaborative Group (2005). ‘Cost-effectiveness of simvastatin in people at different levels of vascular disease risk: economic analysis of a randomised trial in 20,536 individuals’. *Lancet,* vol 365, pp 1779–85.

HM Treasury (2003). *The Green Book: Appraisal and evaluation in central government*. The Stationery Office.

Hogan DR, Baltussen R, Hayashi C, Lauer JA and Salomon JA (2005). 'Cost effectiveness analysis of strategies to combat HIV/AIDS in developing countries'. *British Medical Journal,* vol 331, pp 1431–37.

Hollinghurst S, Bevan G and Bowie C (2000). 'Estimating the "avoidable" burden of disease by Disability Adjusted Life Years (DALYs)'. *Health Care Management Science*, vol 3, pp 9–21.

Hollinghurst S and Bevan G (2003). 'A scientific revolution to resolve the incomplete paradigms of Cost per Quality Adjusted Life Year and Disability-Adjusted Life-Years?' *Expert Review of Pharmacoeconomics & Outcomes Research*, vol 3, pp 469–77.

Hutubessy R, Chisholm D, Edejer T-T and WHO-CHOICE (2003). 'Generalized cost-effectiveness analysis for national-level priority-setting in the health sector'. *Cost Effectiveness and Resource Allocation*, vol 1, p 8.

Iqbal Z, Pryce A and Afza MJ (2006). 'Rationalizing rationing in health care: experience of two primary care trusts'. *Journal of Public Health*, vol 28, pp 125–32.

Kruijshaar M (2003). *Data Consistency in Summary Measures of Population Health*. Rotterdam University Medical Centre.

Laing SP, Swerdlow AJ, Slater SD, Botha JL, Burden AC, Waugh NR, Smith AW, Hill RD, Bingley PJ, Patterson CC, Qiao Z and Keen H (1999a). 'The British Diabetic Association Cohort Study, I: all-cause mortality in patients with insulin-treated diabetes mellitus'. *Diabetic Medicine*, vol 16, pp 459–65.

Laing SP, Swerdlow AJ, Slater SD, Botha JL, Burden AC, Waugh NR, Smith AW, Hill RD, Bingley PJ, Patterson CC, Qiao Z and Keen H (1999b). 'The British Diabetic Association Cohort Study, II: cause-specific mortality in patients with insulin-treated diabetes mellitus'. *Diabetic Medicine*, vol 16, pp 466–71.

Law MR, Rodgers A. (2005). 'Lipids and cholesterol'. In Marmot M and Elliot P. eds *Coronary Heart Disease Epidemiology. Fom Aetiology to Public Health* Oxford, Oxford University Press: 174-186.

Leatherman S and Sutherland K (2005). *The Quest for Quality in the NHS: A chartbook on quality of care in the UK*. Radcliffe Publishing.

Leatherman S and Sutherland K (2004). 'Quality of care in the NHS of England'. *British Medical Journal USA*, vol 4, p 144.

Leatherman S and Sutherland K (2003). *The Quest for Quality in the NHS: A mid-term evaluation of the ten-year quality agenda.* The Stationery Office.

Lopez AD, Mathers CD, Ezzati M, Jamison DT and Murray CJL eds (2006). *Global Burden of Disease and Risk Factors.* Oxford University Press and The World Bank.

Majeed A, Moser K, Maxwell R (2000). 'Age, sex and practice variations in the use of statins in general practice in England and Wales'. *Journal of Public Health Medicine*, vol 22, pp 275–79.

Manuel DG, Kwong K, Tanuseputro P, Lim J, Mustard CA, Anderson GM, Ardal S, Alter DA and Laupacis A (2006). 'Effectiveness and efficiency of different guidelines on statin treatment for preventing deaths from coronary heart disease: modelling'. *British Medical Journal*, vol 332, pp 1419–23.

Manuel D G, Lim P, et al. (2006). 'Revisiting Rose: Strategies for reducing coronary heart disease.' *British Medical Journal*, vol 332(18): 659-662.

Martin S and Smith PC (2006). *Value for Money in the NHS: A summary of the evidence*. York Centre for Health Economics.

Mathers CD, Bernard C, Moesgaard Iburg K, Inoue M, Ma Fat D, Shibuya K, Stein C, Tomijima N and Xu H (2004). *Global Burden of Disease in 2002: Data sources, methods and results*. Global Programme on Evidence for Health Policy Discussion Paper. World Health Organization.

Maynard A and Street A (2006). 'Seven years of feast, seven years of famine: boom to bust in the NHS?'. *British Medical Journal*, vol 332, pp 906–8.

Morel CM, Lauer JA and Evans DB (2005). 'Cost effectiveness analysis of strategies to combat malaria in developing countries'. *British Medical Journal*, vol 331, p 1299.

Morton A (2007). '*Health vs disability: stylistic difference or substantive disagreement?*'. Paper presented at the 70th meeting of the Health Economists' Study Group, University of Birmingham, January 2006.

Morton A, Bevan G, Airoldi M, Oliveira M and Smith J (2006). *Estimating Health and Productivity Gains in England from the National Suicide Prevention Strategy*. London School of Economics.

Moss SE, Klein R, Klein BEK (1992) 'The Prevalence and Incidence of Lower Extremity Amputation in a Diabetic Population', *Archives of Internal Medicine*; 152, 610-616.

Murray CJL and Evans DB eds (2003). *Health Systems Performance Assessment: Debates, methods and empiricism.* World Health Organization.

Murray CJL and Lopez AD eds (1996). *The Global Burden of Disease,* Harvard University Press.

Murray CJL, Salomon JA, Mathers C and Lopez A, eds (2002). *Summary Measures of Population Health: Concepts, ethics, measurement and applications*. World Health Organization.

National Audit Office (2005). *Reducing Brain Damage: Faster access to better stroke care*. The Stationery Office.

National Centre for Social Research (2003). *Health Survey for England 2003*. Department of Health.

National Clinical Audit Support Programme (2005). *National Diabetes Audit: Key findings about the quality of care for people with diabetes in England. Report for the audit period 2003/04*. Health and Social Care Information Centre. www.icservices.nhs.uk/ncasp/pages/audit_topics/diabetes/default-new.asp

National Institute for Health and Clinical Excellence. (2006). *Costing template and costing report: Statins for the prevention of cardiovascular events*. Retrieved 12.11.2006.

Oliveira M, Bevan G, Airoldi M, Morton A and Smith J (2006). *Estimating Health and Productivity Gains in England from Improving the Coverage, Compliance and Appropriateness of Prescribing Statins for High Cholesterol*. London School of Economics.

Office of National Statistics (2003). *Mortality Statistics, Series DH1, No. 36*. www.statistics.gov.uk/downloads/theme_health/Dh1_36_2003/DH1_2003.pdf

Petersen S, Peto V, Scarborough P and Rayner M (2005). *Coronary Heart Disease Statistics*. British Heart Foundation.

Peterson AM, McGhan WF (2005). Pharmacoeconomic Impact of Non-Compliance with Statins. *Pharmacoeconomics* 23(1): 12-25.

Public Accounts Committee (2005). *Reducing Brain Damage: Faster access to better stroke care*. Fifty–second Report of Session 2005–06, HC 911. The Stationery Office.

Raftery J (2006). 'Review of NICE's recommendations, 1999–2005'. *British Medical Journal*, vol 332, pp 1266–68.

Ravnskov U, Rosch PJ, Sutter MC and Houston MC (2006). 'Should we lower cholesterol as much as possible?'. *British Medical Journal*, vol 332, pp 1330–32.

Rossing P, Hougaard P, Borch-Johnsen K and Parving HH (1996). 'Predictors of mortality in insulin dependent diabetes: 10 year observational follow up study'. *British Medical Journal*, vol 313, pp 779–84.

Scottish Executive (2002). *Choose Life: A national strategy and action plan to prevent suicide in Scotland*. Scottish Executive.

Smee C (2005). *Speaking Truth to Power*. Radcliffe.

Soedamah-Muthu SS, Fuller JH, Mulnier HE, Raleigh VS, Lawrenson RA and Colhoun HM (2006a). 'All-cause mortality rates in patients with Type 1 diabetes mellitus compared to a non-diabetic population from the General Practice Research Database (GPRD) 1992–1999', *Diabetologia*, vol 49, pp 660–66.

Soedamah-Muthu SS, Fuller JH, Mulnier HE, Raleigh VS, Lawrenson RA and Colhoun HM (2006b). 'High Risk of Cardiovascular Disease in Patients with Type 1 Diabetes in the U.K. A cohort study using the General Practice Research Database', *Diabetes Care*, 29 (4): 798-804.

Stouthard MEA, Essink-Bot ML, Bonsel GJ, Barendregt JJ, Kramers PGN, van de Water HPA, Gunning-Schepers LJ and van der Maas PJ (1997). *Disability Weights for Diseases in the Netherlands*. Rotterdam, Erasmus University, Department of Public Health.

UK Centre for the Measurement of Government Activity. (2006). 'Public service productivity: health'. *Economic Trends*, vol 628, pp 26–57. www.statistics.gov.uk/downloads/theme_economy/ET628.pdf

Walley T, Folino-Gallo P, Schwabe U, Ganse E and Stephens P (2004). 'Comparison of national administrative and commercial databases to monitor expenditure and costs of statins across Europe'. *European Journal Clinical Pharmacology*, vol 60, pp 503–11.

Wanless D (2004). *Securing Good Health for the Whole Population. Final Report.* The Stationery Office.

Wanless D (2002). *Securing Our Future Health: Taking a long-term view. Final Report*. HM Treasury.

Ward S, Lloyd Jones M, Pandor A et al.. (2005). Technology Assessment Report Commissioned by the HTA Programme on behalf of The National Institute for Clinical Excellence. Statins for the Prevention of Coronary Events. National Institute for Health and Clinical Excellence.

Williams A (1999). 'Calculating the global burden of disease: time for a strategic re-appraisal. *Health Economics*, vol 8, pp 1–8.

Williams A (1985). 'Economics of coronary artery bypass grafting'. *British Medical Journal*, vol 291, pp 326–29.

World Bank (1993). *World Development Report 1993: Investing in health.* Oxford University Press.

World Health Organization (2003). *Making choices in health: WHO guide to cost-effectiveness analysis*. Geneva: WHO.