
INEQUALITIES IN HEALTH: AN EDITORIAL COMMENTARY

THE 39 STEPS: THE MYSTERY OF HEALTH INEQUALITIES IN THE UK

STEPHEN BIRCH*

Department of Clinical Epidemiology and Biostatistics, McMaster University, Hamilton, Ont., Canada

INTRODUCTION

The report of the UK independent enquiry on inequalities in health (The Acheson Report) [1] follows 18 years of head scratching in response to the Black Report [2]. The Black Report set out to understand the paradox of continuing (and, in some cases, increasing) social inequalities in health within the UK population despite over 30 years of a National Health Service (NHS) in which health care was available to all, free at the point of delivery. The report produced 37 recommendations for government aimed largely at improving the material conditions of the poorest groups and reorienting health and personal social services as ways of reducing these inequalities. Almost 20 years later the Acheson Report indicates that things are no better, and in some cases worse, despite another two decades of health care, by and large free at the point of delivery, and the benefit of Black's insights and recommendations—a mystery of Hitchcock proportions. In contrast to the Black Report, Acheson presents a conceptual framework for understanding the determinants of health and a socioeconomic model of health. Using the model, both 'upstream' issues, concerned with underlying causes of risks to health, and 'downstream' issues, concerned with responding to the consequences of those risks, are identified. Analysis of these 'issues' leads to 39 steps (or 'evidence-based' recommendations) aimed at reducing the demon inequalities.

Despite the introduction of the formal conceptual framework and broad model of health, the 39 steps for policy directions are remarkably similar in scope and content to the recommendations of the Black Report. They can be largely divided into steps 'targeted' at improving the material well-being of the poorest groups and steps aimed at 'universal' changes to health risks in the population. However, the 39 steps are unlikely to provide the panacea for health inequalities that the Acheson Committee was striving for. In the rest of this paper the underlying conceptual framework of the report is shown to be restricted in ways that are particularly pertinent to understanding the distribution of health in a population. Moreover, the application of the framework is shown to be accompanied by a shift in attention from inequalities in the distribution of health towards improving the health of the poorest groups in society. This shift occurs partly as a result of the restrictions in the conceptual framework, but also appears linked to the authors' recognition of a lack of evidence for interventions associated with reductions in inequalities in health. The challenges of persistent social inequalities in health are shared by other countries. Canadian initiatives to understand and respond to social inequalities in health [3–5] share many features with the Acheson Report including the failure to understand the role of social structure as both a potential cause of health inequalities and a barrier to the reduction of health inequalities through other policy directions.

* Correspondence to: Department of Clinical Epidemiology and Biostatistics, McMaster University, 1200 Main Street West, Hamilton, Ont., Canada L9C 2C1. Tel: +1 905 5259140 ext 23244; fax: +1 905 5465211; e-mail: birch@mcmaster.ca

UNDERSTANDING THE PLOT: CONCEPTUAL FRAMEWORKS FOR HEALTH

The underlying motivation for the report is the 'paradox' of the widening gaps in health in the UK between those at the top and bottom of the social scale that are observed over periods of increasing prosperity and substantial reductions in annual mortality rates in the UK population as a whole. Just as Hitchcock appeared in the movies he directed, the conceptual framework of health adopted in the report was developed by one of the members of the committee [6]. In this framework [1] the main determinants of health appear as '... layers of influence, one over another' (p. 5), with each layer representing a potentially modifiable influence on health. The authors [1] emphasize that the model incorporates interactions between 'layers' of influence in the sense that, for example, individual lifestyles are '... embedded in social and community networks and in living and working conditions, which in turn are related to the wider cultural and socioeconomic network' (p. 6). A model of interconnecting health risks is then presented, based on unpublished work at Dr Acheson's own institution (International Centre for Health and Society, University College, London 1998) in which mortality, morbidity and well-being are the outcomes of a series of pathways. In this model the traditional determinants of health, such as lifestyles and work environments, remain as 'key elements' but are viewed not as exogenous influences on health, but as the outcome of other factors (or outer layers) pertaining to the structure of society.

This model forms the basis for the rest of the group's work in which the authors report data on inequalities in mortality, morbidity and years of life lost by social group and then present data on trends in the different 'layers' of determinants of health, starting with the distribution of income, education, housing and employment before considering lifestyle influences of tobacco and alcohol consumption and diet. The same categorizations are then used for considering policy developments for reducing inequalities. Health care does not appear in the socioeconomic model of health. However, a separate section at the end of the report is devoted to health care, or more precisely that part of health care provided under the NHS.

The Acheson framework is restricted compared to some of the other frameworks for health. Despite Acheson's emphasis on interactions between the different layers of determinants, such interactions are not present in either the framework or the model of determinants. Instead, the approach adopted in the report is based on separable, albeit endogenous, influences on morbidity, mortality and well-being. For example, within the socioeconomic model of health, smoking behaviour is determined by work and social environments, but the relationship between smoking and health is independent of those environments. This implies that our ability to change smoking behaviour is determined by social position but the mortality, morbidity and reductions in well-being associated with, or caused by, smoking are independent of social position. It is worth noting that in reviewing the evidence for inequalities in alcohol-related harm, the report suggests that the relationship between alcohol consumption and health might be modified by better diet, housing, health care and other factors (p. 86). However, the report's conceptual framework cannot accommodate such interactions (or effect modifiers) and the notion of such interactions is not discussed with respect to other determinants. Given recent research on the pervasive nature of social environments in the determinants of health [7] it is odd that the authors should introduce the notion of social structure as a determinant of health in this highly restricted way. Unlike the Black Report 20 years ago, the Acheson Report is not alone in examining health inequalities and policy developments for their reduction. The Black Report generated substantial interest in inequalities in health in both academic and policy communities (see, for example, Whitehead [8]). Considerable research has been devoted to the development of conceptual frameworks for health that incorporate the notion of social context as an important element in the distribution of health [9–13]. It is surprising, therefore, that the Acheson committee did not incorporate these considerations into its own conceptual framework.

The empirical implication of this constrained model of health determinants is that clear and stable relationships exist between health determinants and health outcomes that are 'waiting' to be identified and measured by well-designed and well-executed research. Observed variations between individuals in these relationships represent

bias resulting from differences in the composition of the comparison groups in the research (that is, from not comparing like with like), or 'noise'. This interpretation arises from an inappropriate focus of attention on 'interventions' for observed problems as opposed to the social contexts of those problems [14]. It is, therefore, interesting that the research studies that explore the role of social context in the distribution of health in populations are not included in the report's bibliography, even though much of this research has been developed in the UK and performed on UK data sets [15–19]. These and other studies show that controlling for composition effectively removes potentially valuable information from a study in order to produce an artificial or 'context-free' estimate of the relationship being studied [20].

Findings from the Whitehall study provide an interesting illustration of this important point. A greater prevalence of smoking-related diseases was observed in lower social groups indicating an association between social position and health. However, social position is also correlated with smoking behaviour which might bias the estimated relationship between social position and health. Interestingly, significant differences in smoking-related diseases remained, even after controlling for smoking behaviour [21]. An analysis of smoking and self-reported health status using the Quebec population health survey found that probability of poor health was 26% higher among smokers than non-smokers in the highest income group but 54% higher among smokers than non-smokers in the lowest income group [22]. These and other findings suggest that the influence of social structure, or the social, cultural, physical and economic environments (or contexts) need not be confined to the direct influences on the incidence and level of health determinants [7,23,24]. Instead, careful attention needs to be devoted to exploring potential indirect effects of contexts on the precise relationship between health behaviours, including health care consumption, and health outcomes.

This broader interpretation of interactions within a model of health determinants affects not only what we look for in health research but also the methods used. Traditional approaches to health research are narrowly focussed on estimating the effect of interventions on the total burden of a particular disease or condition. Factors that

might 'affect' the degree to which the intervention under investigation 'works' are excluded as 'confounders'. In this way no consideration is given to the possibility of contextual (or ecological) variation in the relationships and hence to understanding the particular contexts in which the intervention works better, worse or not at all. But the real world consists of people whose characteristics are determined in part by these contexts. Responsiveness to even the most 'evidence-based' attempts to change health may, therefore, be dependent on these contexts. A lone parent mother with a history of physical and sexual abuse does not leave this portfolio of social circumstances (and potential effect modifiers) at the physician's door. Research methods to unravel the relative and interacting role of population composition and context in understanding the determinants of health have been developed in the health research literature over recent years [15,25–27]. However, since the complex pathways to health implied by the broader conceptual frameworks and these empirical methods are not incorporated into the Acheson framework and model of health, there is no sense in including them under a report based on this framework and model.

In summary, neither the conceptual framework used in the Acheson Report nor the application of that framework to the search for evidence reflects current research in the determinants and population distribution of health. Instead, the framework appears to have been developed and applied in accordance with a particular interpretation of empirical findings in mind. As we shall see in the next section, these interpretations are, in some cases, without empirical base and where empirical support is provided this does not relate to inequalities in health.

WHO DID IT? THE SEARCH FOR EVIDENCE

The report's 39 steps for priority policy development cover both 'upstream' issues, concerned with the outer layers of the framework (that is, the structural aspects of society that provide the context in which health is protected, promoted and restored), and 'downstream' issues concerned with the inner layers of the framework (that is, the immediate influences on health such as lifestyle, work and material well-being).

In practice, we know very little about how to remove or reduce inequalities in health. Attempts to identify health service interventions that reduce such inequalities have tended to present policies that, at best, improve the health of the poor, or more likely are associated with changes in risks to health among poor groups [28]—a somewhat different focus of attention. This shifting focus is apparent in the reports recommendations, as is the lack of evidence for inequality-reducing policies.

Perhaps the clearest example of this is the report's discussion of the distribution of income as one of the 'upstream' structural factors associated with inequalities in health. The authors welcome the UK government's intention to establish a national minimum wage as one of the structural changes to be made. Further action is recommended in terms of increasing the levels and uptake of welfare benefits and restoring a link between benefit levels and average earnings over time. Note that each of these policies is aimed primarily at improving the material conditions of the least well-off. However, no evidence is provided that indicates that minimum wage policies improve the material conditions of the poor, or that improving the material conditions of the poor in this or other ways reduces inequalities in health.

Minimum wage legislation is widely recognized to be associated with increased unemployment and presumably, therefore, increased poverty, as employers off-load low-skilled workers [29–31]. More importantly, increasing wage rates, welfare benefits and the uptake of those benefits represent policies 'targeted' at one end of the income distribution which may have little, if any, impact on the population distribution of income (as opposed to a particular group's position in that distribution). No evidence is presented to show that jurisdictions with minimum wage legislation, such as the US and Canada, have lower levels of income inequality than the UK, or that lower levels of income inequality follow the introduction of a minimum wage.

The report's focus on material conditions of the poor implies that the authors see health inequalities as a result of income *inadequacy* in the poorest groups, and not with income *inequality* in the population. Poor standards of living are seen as the cause of the poorer health of low income groups, as opposed to being a marker for some

other unidentified cause. A continuation of the 'go for growth' policies of the 1990s, based on the 'trickle-down' hypothesis [7], would seem to be an appropriate response to improve the health of the poor under this approach. Instead the authors recommend targeted policies of improvements in living standards for the poor.

The relationship between standard of living and health is less than clear. McKeown [32] argued that the main contributor of improvements in life expectancy *over time* was improvements in the standard of living within the population. However, Wilkinson [7] suggests that the use of measures of national income as a proxy for living standards underestimates the change in living standards and hence overestimates the contribution of these changes to improvements in life-expectancy over time. He argues that the relationship between living standards and health is more complex than implied by McKeown and suggests that improvements in living standards *per se* are unlikely to produce major improvements in health within developed countries. Even if changes in living standards in a population were the main contributor to changes in life expectancy in the population over time, this does not mean that changing the standard of living of those in a population with poorest health will lead to a reduction in that group's health 'deficit' *within* that population.

The poorest groups in society may benefit little from increasing national prosperity. Structural changes in society may be required to reduce or remove poverty even within a growing economy. Moreover, Wilkinson [7] argues that such structural changes might actually increase economic growth. If so, consideration might be given to the underlying *causes* of poverty in society and the structural changes required to prevent poverty, as distinct from responses to the presence of poverty. In contrast Acheson's recommendations are based on a naive argument that '... policies which increase the income of the poorest are likely to improve their living standards, such as nutrition and heating, and so lead to improvements in health' (p. 36) along with recommendations about increasing opportunities for work which seem to be more motherhood-ish than substantive. Legalizing prostitution and the sale, possession and consumption of hard drugs and reopening disused coal mines might increase such opportunities but, from a health perspective, unemployment might be a preferred option for those without work.

The evidence presented in the report to support income supplements is restricted to a single study of low income mothers in an industrial city in Midwest USA [33]. Those randomized to receive income support had heavier babies than control group mothers. The lack of other evidence that income improvements lead to health improvements is acknowledged in the report. Increased income of the poor might not (all) be spent on nutrition and heating, even though this would appear to be the rational choice from Acheson's perspective, presumably immune from the broader social circumstances of the poor. For example, the authors note that the proportion of income spent on tobacco in the lowest income group is six times that in the highest income groups.

It is important to distinguish the positive issue of whether improving the incomes of the poor *does* lead to reductions in health inequalities from the normative position that the incomes of the poor *should* be increased. Justifying the normative position on the basis of the effects of income support on health inequalities risks losing support for that position in the event that the underlying assumption of effectiveness is not valid.

The report's focus on poverty and material deprivation represents a remarkable resemblance to the main thrust of the Black Report as well as an interesting interpretation of the income inequality argument. For example, Wilkinson [7] notes that inequalities in health are not confined to the distinction between poor and non-poor but are represented by a consistent and persistent gradient in health along the continuum of income levels. The importance of income inequality seems to be independent of the level of income. He argues that inequality in income is a marker for social cohesion in which societies with higher levels of inequality are associated with greater risks to health and well-being. Although these risks are not confined to the least well-off, they are less likely to be able to deal with the risks. Policies that alleviate poverty may improve the health of the poor through the improvements in material well-being, but they may have little impact on the overall distribution in health.

This shift in focus from inequalities in health to 'health poverty' continues throughout the report. Moreover, recommendations for improving

the health of the poor are much less evidence-based than the authors appear to suggest. For example, the recommendation that pre-school education programmes be provided to meet '... the needs of disadvantaged families' (p. 40) is based on evidence that such programmes improve '... the health of disadvantaged children...'. However, the authors acknowledge that few of the studies measure health status, never mind the distribution of health status. Other recommendations concern health promoting schools, breast feeding of infants, sexual health promotion among adolescents, moderate intensity exercise and nicotine replacement therapy for smokers. In each case there is no evidence to suggest that these programmes are particularly favourable to the most disadvantaged groups. Moreover, in some cases the evidence on which the recommendation is based is confined to studies of non-disadvantaged groups!

In summary, in searching for evidence the report has focussed on interventions for which there is 'evidence' of effectiveness. But in most, if not all, cases the evidence is taken from studies that were not designed to study the interaction of the intervention with social conditions or its impact on the distribution of health in the population. As Bob Evans has said in the past, if your only tool is a hammer, all your problems begin to resemble nails! In contrast, Acheson might have supplemented his 'toolbox' with studies that focus on understanding the interaction of interventions with social circumstances in order to explore the distribution of effectiveness within societies and hence the effects on inequalities in health. The reasons why poor people smoke may differ from the reasons why rich people smoke. For example, the social circumstances of the rich may be associated with lower rates of time preference, at the margin [34]. If so, the value of improved health profiles associated with reductions in smoking would be greater for more prosperous groups. Hence, interventions which are effective in reducing smoking among the rich and smoking-related diseases among rich smokers are unlikely to work, or work as well, in the poor. But that is not the fault of the poor—they do not have the choice of being exposed to the same social circumstances as the rich. But reductions in health inequalities might depend on exposing the poor to these circumstances.

THE SEQUEL: INEQUALITIES IN HEALTH IN THE NEW MILLENNIUM

While the Black Report was responsible for getting social inequalities in health on both research and policy agendas worldwide, the Acheson Report is just one of many initiatives in considering health inequalities in the 1990s. In Canada, collaboration between the Provincial, Territorial and Federal-level administrations led to successive reports on Strategies for Population Health [3,4]. In addition, The Prime Minister's own National Forum on Health produced a synthesis report on the determinants of health [5]. Much of the work of these committees resembled that reported by Acheson—reviewing the evidence for social inequalities in health and health determinants (in ways that recognize social context) and interventions for health improvements (in ways that by and large exclude social context). Although the Canadian reports are based on a broader conceptual framework than the Acheson Report, the application of the framework pays little attention to the interactions between social context and individual characteristics inherent in the framework. The general recommendations for policy directions were similar to Acheson's, calling for improvements in the material conditions of the poorest groups in society and supporting healthy lifestyle choices while also emphasizing the importance of spending better as opposed to spending more on health care services by greater use of evidence-based decision-making. As we have seen, there is no evidence that such policies, no matter how normatively appealing they are, do anything to reduce social inequalities in health.

The UK and Canadian reports are silent concerning social structures and instead focus on improving the material conditions of the poor and enabling and supporting healthy lifestyle choices within these structures. It has been argued that this reflects the lack of social theory in the development and presentation of conceptual frameworks for the production of health in populations [35,36]. For example, the Acheson Report outlines policy directions for improving services for 'looked after' children (or children in care) without any consideration being given to why such children need to be 'looked after'—an amazing omission for a report that

claims to consider upstream policies. Similarly the report outlines policy developments for 'enabling' healthy lifestyle choices (tobacco, alcohol, sex and food). No attempt is made to understand what leads to certain groups in society systematically taking greater health risks in these areas than other groups. Attempts to *enable* these groups to change behaviours may do little to change the reasons why these behaviours are observed in these groups [37,38]. Providing groups with more choice does not mean that those groups will necessarily make the same choice as we might like them to make. Nor does it mean they are choosing unwisely. Instead we are failing to understand the circumstances that lead these groups to make those, and not alternative, choices. A healthy choice might be a poor choice under social circumstances that we are not familiar with. As Marmot and Theorell [39] note:

'It is insufficient to say that risk factors are related to social position and therefore risk factors account for social class differences. We should ask why are risk factors social class based'.

The importance of social forces has been emphasized by Rose [40,41] who argued that the distribution of risk in a population is a social phenomena. Because individual behaviour is determined by societal factors, change in individual behaviour requires changes in those societal factors or as Wilkinson [7] argues '... to change behaviour we need to do more than change behaviour' (p. 64). Rose argued that more universal approaches aimed at changing the average level of risk in the population would, therefore, be expected to have a greater impact on the size of the problem, or burden of illness, than attempting to change risks among those in the tail of the distribution of risks. Rose was concerned with the overall burden of disease within a population, however, and not the distribution of that disease. As a result, such societal level changes may still be in favour of the already favoured groups in society. For example, both UK and Canada have adopted policies of universal publicly-funded health care systems to change the propensity to use health care services when needed as opposed to targeted services on only the poorest groups. These universal programmes might generate greater health for the poor than targeting only the poor for publicly-funded health care. How-

ever, as Acheson notes, universal programmes for publicly-funded health care have been associated with increasing inequalities in health. Unless the universal approach changes the underlying social forces giving rise to the inequalities in health, and publicly-funded health care programmes do not, it is unlikely to be associated with a reduction in health inequalities.

What does all this mean for population health in the new millennium? Many of the 39 steps, if adopted, might be expected to lead to improvements in health of the poorest in the population *ceteris paribus*. However, there is no reason to believe that this will be associated with a reduction the social gradients in health. Moreover, the Acheson Report is limited to identifying directions for policy developments. Hence, no attempt is made to estimate the cost of the recommended directions, to give any priority ranking for the recommendations or to consider the developments as part of a package of restructuring in which both the uses and sources of resources for the policy developments are identified. Clearly the opportunity costs of such developments are dependent on the choices to be made by governments in what must be given up. In the absence of any changes to social structures it requires only a modest level of scepticism to believe that the interests of the poorest groups in society are unlikely to be paramount considerations in such deliberations. For example, one might consider a general 'belt-tightening' within an already well-funded health care system to be an appropriate basis for funding the rich menu of developments for a more equitable health distribution. But the increased fiscal constraints on health care funding in Canada in the 1990s have been associated with increasing inequalities in the distribution of health care in relation to need [42]. As such, attempts to implement the 39 steps might do more harm than good with respect to the demon inequalities.

The challenge of creating a society for more equal health requires that the causes (as opposed to the correlates) of the distribution of health be understood as well as the distribution of the effectiveness of interventions aimed at changing those causes [43]. If policy developments are to be constrained by current social structures being viewed as sacrosanct, the pursuit of reductions in inequalities in health is likely to represent a mystery that even Hitchcock would be proud of.

REFERENCES

1. Acheson, D., Barker, D., Chambers, J., Graham, H., Marmot, M. and Whitehead, M. *Independent inquiry into inequalities in health: report*. London: The Stationery Office, 1998.
2. Black, D., Morris, J., Smith, C. and Townsend, P. *Inequalities in health: report of a research working group*. London: Department of Health and Social Security, 1980.
3. Federal, Provincial and Territorial Advisory Committee on Population Health. *Strategies for population health: investing in the health of Canadians*. Ottawa: Ministry of Supplies and Services, 1994.
4. Federal, Provincial and Territorial Advisory Committee on Population Health. *Report on the health of Canadians*. Ottawa: Ministry of Supplies and Services, 1996.
5. National Forum on Health. *Determinants of health working group synthesis report*. Ottawa: Ministry of Supplies and Services, 1997.
6. Dahlgren, G. and Whitehead, M. *Policies and strategies to promote social equity in health*. Stockholm: Institute of Futures Studies, 1991.
7. Wilkinson, R. *Unhealthy societies: the afflictions of inequality*. London: Routledge, 1996.
8. Whitehead, M. The health divide. In: Townsend, P., Whitehead, M. and Davidson, N. (eds.), *Inequalities in health: the Black Report and the health divide*. London: Penguin, 1992.
9. Hancock, T. Lalonde and beyond: looking back at a new perspective on the health of Canadians. *Health Promotion* 1986; **1**: 93–100.
10. Gunning-Schepers, L. and Hagen, J. Avoidable burden of illness: how much can prevention contribute to health? *Social Science and Medicine* 1987; **24**: 945–951.
11. World Health Organization, Health and Welfare Canada, Canadian Public Health Association. *Ottawa charter for health promotion*. Ottawa: Health and Welfare Canada, 1986.
12. Sagan, L. *The health of nations*. New York: Basic Books, 1987.
13. Evans, R. and Stoddart, G. Producing health, consuming health care. *Social Science and Medicine* 1990; **31**: 1347–1363.
14. Birch, S. As a matter of fact: evidence-based decision-making unplugged. *Health Economics* 1997; **6**: 547–559.
15. Duncan, C., Jones, K. and Moon, G. Do places matter? A multi-level analysis of regional variations in health-related behaviour in Britain. *Social Science and Medicine* 1993; **37**: 725–733.
16. Duncan, C., Jones, K. and Moon, G. Health-related behaviour in context: a multi-level modelling approach. *Social Science and Medicine* 1996; **42**: 817–830.

17. Duncan, C., Jones, K. and Moon, G. Smoking and deprivation: are there neighbourhood effects? *Social Science and Medicine* 1999; **48**: 497–505.
18. Jones, K. and Duncan, C. Individuals and their ecologies: analysing the geography of chronic illness within a multi-level modelling framework. *Health and Place* 1995; **1**: 27–40.
19. Jones, K. and Duncan, C. People and places: the multi-level model as a general framework for the quantitative analysis of geographical data. In: Longley, P. and Batty, M. (eds.), *Spatial analysis: modelling in a GIS environment*. London: Longman, 1996.
20. Syme, L. Strategies for health promotion. *Preventive Medicine* 1986; **15**: 492–507.
21. Marmot, M., Rose, G., Shipley, M. and Hamilton, P. Employment grade and coronary heart disease in British civil servants. *Journal of Epidemiology and Community Health* 1978; **32**: 244–249.
22. Birch, S., Eyles, J. and Jerrett, M. Heterogeneity in the determinants of health? An empirical analysis of the smoking—health relationship in socioeconomic context. *Working Paper # 97-8*. Centre for Health Economics and Policy Analysis. McMaster University, Hamilton, Ontario, 1997.
23. Evans, R., Barer, M. and Marmor, T. (Eds.) *Why are some people healthy and others not? The determinants of health of populations*. New York: Aldine de Gruyter, 1994.
24. Amick, B., Levine, S., Tarlov, A. and Chapman Walsh, D. (eds.) *Society and health*. New York: Oxford University Press, 1995.
25. Rice, N. and Leyland, A. Multi-level models: applications to health data. *Journal of Health Services Research and Policy* 1996; **1**: 154–164.
26. Diez-Roux, A. Bringing context back into epidemiology: variables and fallacies in multi-level analysis. *American Journal of Public Health* 1998; **88**: 216–222.
27. Birch, S., Stoddart, G. and Beland, F. Modelling the community as a determinant of health. *Canadian Journal of Public Health* 1998; **89**: 402–405.
28. Arblaster, L., Lambert, M., Entwistle, V., Forster, M., Fullerton, D., Sheldon, T. and Watt, I. A systematic review of the effectiveness of health service interventions aimed at reducing inequalities in health. *Journal of Health Services Research and Policy* 1996; **1**: 93–103.
29. Shannon, M. and Beach, C. Distributional employment effects of Ontario minimum wage proposals: a microdata approach. *Canadian Public Policy* 1995; **21**: 284–303.
30. Culyer, A. *The political economy of social policy*. Oxford: Martin Robertson, 1980.
31. Le Grand, J., Propper, C. and Robinson, R. *The economics of social problems*. London: Macmillan, 1992.
32. McKeown, T. *The modern rise of population*. London: Arnold, 1976.
33. Kehrer, B. and Wolin, V. Impact of income maintenance on lowbirthweight: evidence from the Gary experiment. *Journal of Human Resources* 1979; **14**: 434–462.
34. Farrell, P. and Fuchs, V. Schooling and health: the cigarette connection. *Journal of Health Economics* 1982; **1**: 217–230.
35. Poland, B., Coburn, D., Robertson, A., Eakin, J. and members of the Critical Science Group. Wealth, equity and health care: a critique of a population health perspective on the determinants of health. *Social Science and Medicine* 1998; **46**: 785–798.
36. Hayes, M. and Dunn, J. *Population health in Canada: a systematic review*. Report prepared for the Canadian Policy Research Network. Ottawa: Canadian policy Research Network Inc., 1998.
37. Birch, S. and Stoddart, G. Incentives to be healthy: an economic model of health related behaviour. In: Lopez-Casasnovas, L. (ed.), *Incentives in health systems*. Berlin: Springer-Verlag, 1991, pp. 169–187.
38. Le Grand, J. *Equity and choice: an essay in economics and applied philosophy*. London: Harper Collins, 1991.
39. Marmot, M. and Theorell, T. Social class and cardiovascular disease: the contribution of work. *International Journal of Health Services* 1988; **18**: 659–674.
40. Rose, G. Strategy of prevention: lessons from cardiovascular disease. *British Medical Journal* 1981; **282**: 1847–1851.
41. Rose, G. Sick individuals and sick populations. *International Journal of Epidemiology* 1985; **14**: 32–38.
42. Eyles, J., Birch, S. and Newbold, B. Delivering the goods? Access to family physician services in Canada: a comparison of 1985 and 1991. *Journal of Health and Social Behaviour* 1995; **36**: 322–332.
43. Syme, L. To prevent disease: the need for a new approach. In: Blane, D., Brunner, D. and Wilkinson, R. (eds.), *Health and social organization*. London: Routledge, 1996.