Eur J Health Econom 2004 · 5:236–242
DOI 10.1007/s10198-004-0229-2
Published online: 13. March 2004

Luke B. Connelly · University of Queensland, Australia

Economics and health promotion

Introduction

The economic stakes in health promotion are now substantial. In the OECD countries, a growing proportion of health sector spending is devoted to this activity in most developed countries. In Germany, for example, "public health and health promotion" now accounts for more than double the proportion (6%) of national health spending it did 30 years ago [13]. This type of growth is remarkable in a number of respects, not least of which is the relative confidence it suggests in the marginal product of (largely) preventive activities. The aim of this paper is to provide a conceptual lens for the examination of this growing component of health policy. Its purpose is to clarify the place of health promotion instruments and targets in health and economic policy, and thereby bring further clarity to health sector planning.

For this paper, health promotion is defined as *that set of activities designed to affect the consumption of goods and services, primarily for the purposes of enhancing health, or preventing illness.* Admittedly, more and less catholic definitions than this one abound in the health promotion literature. Nevertheless, this definition imposes a purposeful demarcation that is conceptually close to the taxonomy that is commonly implicit in the public health literature. Interested readers are referred to Connelly [7], for a more detailed discussion. It is worth pointing out that the inherent concept of "goods and services" includes the non-market as well as the market goods and services that individuals combine to produce healthy (and other) outcomes.

The central concepts that are employed in this work are taken from consumer theory and welfare economics. In particular, the notion of the consumer as a producer [5] of health [9, 10, 11] is employed to create a normative account of health production and the role of health promotion. The approach is normative in the sense that (a) it assumes a utilitarian view of society and (b) that governments formulate policies that are designed exclusively to promote a social welfare maximum. By extension, health promotion is viewed here primarily as a public sector initiative for which a necessary, but not sufficient, condition is the existence of some form of market failure. That is, a Pigovian [15], but not an *automatic* Pigovian [8], motivation is assumed.

It is emphasised in this paper that taking the utilitarian view together with the definition of health promotion supplied above need not give rise to universal improvements in health status. For example, some rational individuals (who are assumed, throughout, to be the best judges of their own welfare) might use their improved understanding of the relationship between their own behaviour and health outcomes to trade greater non-health consumption for health. Although it is acknowledged that health promotion will generally be designed to create welfare improvements via health improvements, the distinction between these two ends is brought into sharp focus in this paper. Indeed, one of the examples employed here demonstrates that although one might commonly associate health promotion with health-improving outcomes, this association constitutes neither a necessary nor sufficient condition when health promotion is viewed as constituent of a welfarist economic policy.

An economic conception of health promotion

The operational definition above suggested that two conditions must be met in order for a pursuit to be considered a health promotion activity: it must be designed to affect consumption activities and be motivated by the objective to improve health or ameliorate illness. The first of these tenets suggests that consumer theory can be employed usefully to consider the means and ends, or instruments and targets, of health promotion activities.

Consumer theory – including the theory of household production [5] – suggests that patterns of consumption are affected by the following variables: (a) consumer preferences over goods and services (or outcomes and states of the world); (b) consumer knowledge about the choices available; (c); relative prices; (d) the contents of opportunity (or choice) sets; and (e) the budget constraint.

It will be argued here that variables a to e imply arrays of policy instruments for health promotion programmes. That is, to the extent that variables (a) through (e) may be influenced by policy-makers they may, in turn, be used to affect consumer behaviour and health outcomes in welfare-improving ways. While political malevolence may also be conceived – e.g. consumers might be influenced, for political or other purposes, to make health investments at the expense of strongly preferred non-health consumption – the analysis of

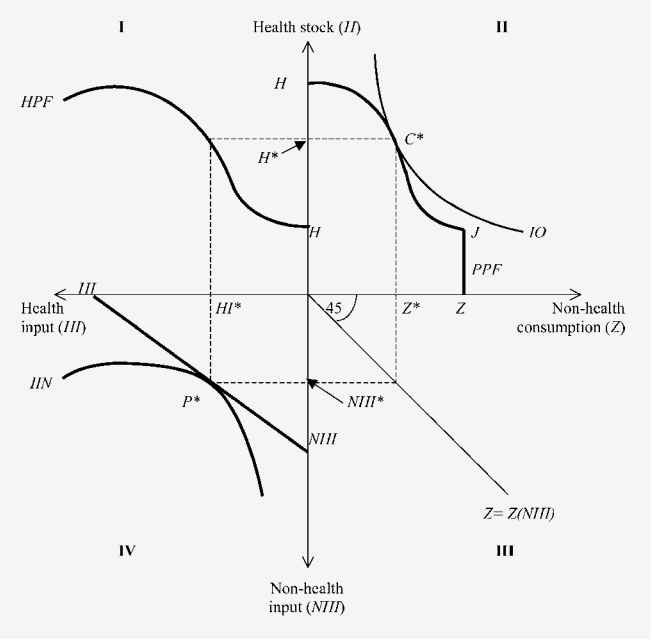

Fig. 1 ◀ **Health and other goods production: input and output equilibria**

such possibilities is not a central purpose of this paper.

The technique of analysis involves an application of a Grossman-type [9, 10, 11] model of consumer decision-making over health and other outcomes. Following Zweifel and Breyer [21], we employ Wagstaff's [20] version of the model, which may be written as follows:

$$W = \int_0^T e^{-\rho\tau} U\{t^s(\tau),\, X(\tau)\}d\tau, \frac{\partial U}{\partial t^s(\tau)} \leqslant 0,$$

$$\frac{\partial U}{\partial X(\tau)} \geqslant 0,\ \frac{\partial t^s(\tau)}{\partial H(\tau)} < 0,\ for\ all\ \tau \qquad (1)$$

$$\dot{H}(\tau) = I(\tau) - \delta\{\tau, X(\tau)\}H(\tau),$$

$$\{\mu(\tau)\}\frac{\partial \delta(\tau)}{\partial \tau} > 0\ ,\ \frac{\partial \delta(\tau)}{\partial X(\tau)} <> 0 \qquad (2)$$

$$\dot{A}(\tau) = rA(\tau) + Y\{t^s(\tau)\} - q(\tau)I(\tau)$$

$$- p(\tau)X(\tau),\quad \{\lambda(\tau)\}\frac{\partial Y(\tau)}{\partial t^s} < 0 \qquad (3)$$

$$H[T] \geqslant H',\ A[T] \geqslant 0 \qquad (4)$$

$$\left(\frac{\partial U/\partial t^s(\tau)}{\lambda[0]} e^{-(\rho - r)\tau} + \frac{\partial Y(\tau)}{\partial t^s(\tau)}\right)\frac{\partial t^s(\tau)}{\partial H(\tau)}$$

$$= \left(r + \delta(\tau) - \frac{\dot{q}(\tau)}{q(\tau)}\right)q(\tau) \qquad (5)$$

where $\cdot$ is the first derivative of the variable with respect to time; W is the welfare of the individual; U is the individual's utility in a given period; H is health stock; δ is the rate of health stock depreciation; A is the stock of financial assets; r is the interest rate; Y is labour income; X is the quantity of non-health inputs; p is the unit price of non-health inputs; I is investment in health; q is the net (or "out-of-pocket") price of health inputs, per unit; τ is time; t^s is sick time, ϱ is the individual's rate of time preference; and $\{\mu(\tau)\}$ and $\{\lambda(\tau)\}$ are Lagrangean multipliers.

Equation 1 provides the individual's maximand, Eq. 2 describes changes to the health stock over time, Eq. 3 describes changes to the financial assets stock over time, and Eq. 4 provides the boundary conditions for both the initial and final period. Equation 5 is the optimality condition, under which the marginal costs and benefits of investments in health are equated (see Wagstaff [20], for its derivation). Since the model is well known, we eschew a detailed discussion of its properties and refer readers to the comprehensive treatments afforded Grossman models by Zweifel and Breyer [21] and Grossman [11], in particular. It is, however, important for the purposes of this paper to note that, in this version of the Grossman model, health is valued both as a consumption good (since sick time produces disutility, i.e. $\partial U/\partial t^s<0$) and an investment good [since sick time is income-reducing, i.e. $\partial Y(\tau)/\partial t^s(\tau)<0$].

The model can be characterised, for a given period t, with some simple geometry. To simplify the notation and analysis, it is convenient to suppress the distinction between time and market inputs and to treat these as composites, i.e. simply as "health inputs" and "non-health inputs". For example, health inputs (HI) are to be viewed as a composite of time and market goods and services (e.g. time exercising, gymnasium membership) that are consumed primarily for the purposes of increasing or maintaining health [thus subsuming $I(\tau)$], and non-health inputs (NHI) viewed as a composite of other time and market goods consumption [thus subsuming $X(\tau)$]. Also, for convenience, (and following Becker [5]) let us refer to the output due to the household use of NHI as the household product Z. Finally, assume that non-health inputs do not affect the rate of depreciation of the health stock

$$\left(i.e.,\ our\ new\ simplifying\ assumption\ is\ that\ \frac{\partial \delta(\tau)}{\partial X(\tau)} = 0\right).$$

Figure 1 contains a representation of the model that incorporates these simplifications for time period t. The four quadrants of **Fig. 1** contain the elements of the model for a given period. Quadrant I contains the individual's health production function (HPF) drawn in health inputs–health stock space. The origin of the HPF, H_{MIN}, represents the minimum health stock that the individual will take forward to period t+1, i.e. this is the health stock that results from setting HI_t=0. The position of the intercept is somewhat arbitrary but, by reference to the boundary conditions in Eq. 4, its non-zero quality indicates that this is neither the starting nor the terminal period. The function is assumed not only to become subject to diminishing marginal returns in the health input (HI), but also to eventually zero and then negative marginal returns. H_{MAX} (dropping the t subscripts, henceforth) thus represents the maximum producible health stock for the individual.

Quadrant II depicts the individual's preferences and production possibilities in output space, where the pertinent outputs are health stock (H) and non-health consumption (Z=NHI). The optimal consumption basket (H^*, Z^*) is found at the tangency (C^*) of the indifference curve IO_1 and the production possibilities frontier PPF_1.

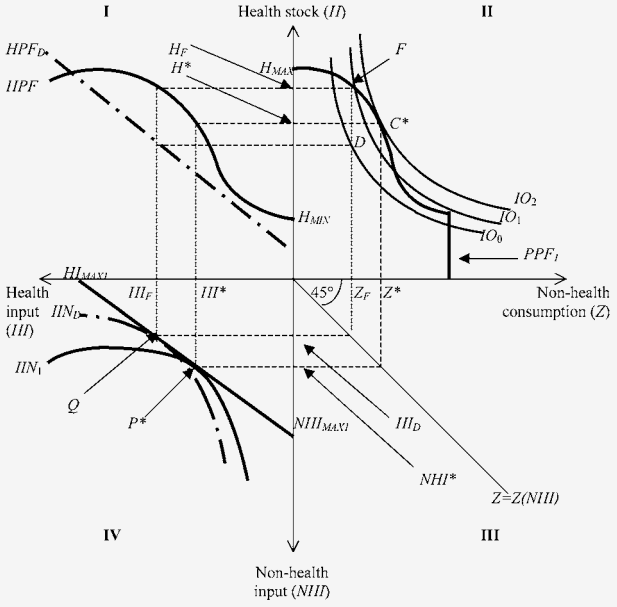

Fig. 2 ▲ **Market failure by information in health production**

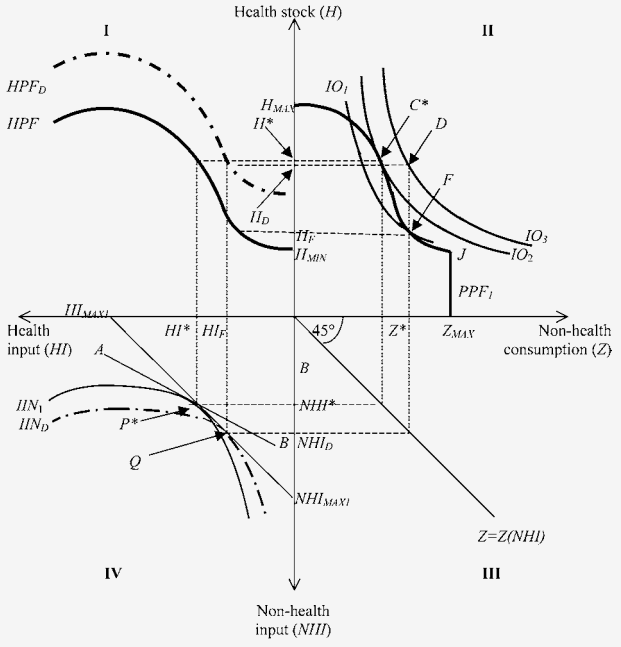

Fig. 3 ▲ **Taxes and subsidies as instruments of health promotion**

Quadrant III contains the household production function for *Z*. It is assumed for convenience that the function is homogeneous of degree 1, yielding a linear function in non-health input *NHI-Z* space. It is also assumed, for convenience, but without loss of generality, that the production function has a zero intercept and unit-slope. The ray from the origin produced by these assumptions has a slope of 45°, which serves as a reference line to quadrants II and IV.

Quadrant IV depicts a budget constraint and input indifference curve, IIN_1. The relevant inputs are the composites *NHI* and *HI* and consumer preferences over them are derived from the relationships in quadrants I–III. Note that IIN_1 is not strictly convex to the origin. Rather, for combinations on IIN_1 where $HI > HI_E$, the marginal rate of substitution of health input for non-health input ($MRS_{HI\,NHI}=\Delta NHI/\Delta HI$) becomes zero, and then changes sign (i.e. $MRS_{HI\,NHI}=-\Delta NHI/\Delta HI$). This non-convexity arises due to the fact that, eventually, increments of *HI* have zero and then negative impacts on the stock of health, while simultaneously decreasing non-health production–consumption possibilities. In this range, health inputs are output- and hence utility-decreasing (bads) and their consumption must be compensated by increasing other consumption (*Z*). In input space, this demands an increased allocation in *NHI*.

Market failure and health Promotion

It is well known that a variety of factors, summarised with the idiom "market failure" [4], may thwart the achievement of a social welfare maximum. See, in particular, Arrow [1]. Specifically, market failure due to problems of information (e.g. ignorance), problems of monopoly power (see, e.g. Smith [17]), public goods [16], and/or externalities [15] may pervert optimal allocations of resources at the level of society. For discussions see, for example, e.g. Arrow [3] and Cullis and Jones [8].

It is useful to distinguish between these sources of market failure based on the role that correct or erroneous private calculus plays. Public goods, externalities, and positive price–cost margins tend to distort societal resource allocations precisely because individuals take rational, private utility-maximising, decisions: to free ride, to pollute, to maximise profits, and so on. In these cases, it is not even a necessary condition that the private calculus of marginal costs and benefits be distorted. Take, for example, monopoly pricing for a price-elastic product. Consumers respond, rationally, to consume less of the product at the higher price. The source of welfare loss is not a failure of the private calculus (indeed it is partially a result of the monopolist's success in applying it). By contrast, problems of information tend to result in market failure due to the difficulty that ignorance introduces to the private calculus: the marginal costs and benefits of the alternatives are likely to be weighed incorrectly due to poverty of information or knowledge.

While the definition of health promotion adopted here does not preclude policies that are designed to correct each kind of market failure, this paper focuses only on the last source of market failure – problems of information – for the purposes of illustration. This is convenient for several reasons, not least of which is that public information and education programmes are two common policy responses that are associated with health promotion in practice. We also restrict our attention to the effects of such policies at the level of individuals. The motivation for doing so is not simply the impossibility of individual preference aggregation [2] but also the view that, for the purposes of this paper, little additional insight might be added by appealing to the social welfare function construct.

Figure 2 presents a case of market failure by information that might consti-

tute a target for health promotion policy. In this figure, it is assumed that the individual is ignorant of the health production relationship, but is fully informed regarding the production of other (i.e. the Z) consumption.

The basic apparatus in **Fig. 2** is that of **Fig. 1**, with several additions. In quadrant I, the dashed line HPF_D represents the consumer's distorted understanding of the relationship between health inputs and the output, health status. The solid line HPF indicates, as it did before, the true health production function. Note that output preferences, expressed in quadrant II, are unaffected by ignorance about the technology of production. However, the individual's distorted view of health production does distort his/her preferences over inputs and also his/her view about production possibilities. The dashed curve IIN_D depicts the budget–tangent contour in the distorted inputs indifference map. Note that the resulting tangency, Q, corresponds to bundle D in quadrant II, which is the consumer expects to be an outputs maximum. (To avoid geometric clutter, the anticipated production possibilities frontier – with which IO_0 is tangent at D – is not depicted). That is, both the individual's expectations about possible output combinations (or, geometrically, the shape and position of the PPF) and his/her preferences over inputs are distorted by the knowledge gap. Note that *ex ante* input preferences depend directly upon the individual's understanding of the production technology (i.e. on the production function). The output combination that results from allocation Q is, in fact, F in quadrant II. Although bundle F provides greater utility than D, it is still inferior to the utility-maximising bundle, C^*. Moreover, because health stock is non-tradeable, the consumer cannot augment utility by making *ex post* trades along the *PPF*. The individual's ignorance of the true relationship between HI and H is thus a source of welfare loss.

The sub-optimal outcome illustrated in **Fig. 2** presents a necessary, but not a sufficient, condition for public intervention to correct the market failure. Although F is not a utility-maximising basket, its attainment does produce some information the individual previously did not possess. In subsequent periods, the consumer's learning might be brought to bear on his/her production activities and input allocations so that, by trial and error, the output equilibrium may eventually be achieved. However, the process of discovery of the true production relationship could be protracted and/or expensive. The process may be especially costly, in terms of utility forgone, if (a) the individual misinterprets the information produced (e.g. as the result of stochastic shocks); (b) the health production technology changes over time; and/or (c) the rate of health stock depreciation changes with age, confounding the signals received. Furthermore, for various conditions of ill-health, the consequences of market failure might be catastrophic if the first opportunity that knowledge-poor individuals have to learn about the relationship between consumption choices and their health consequences arrives too late.

Other things equal, as the cost of locating the health production function grows, so too does the economic case for public intervention. The instruments that might be used to correct market failure include information programmes, public production, quantity controls and/or subsidies and taxes. These are considered, in turn, below.

Information dissemination, public education

A possible policy target is the consumer's knowledge state regarding health production, and one of the available instruments is information dissemination. Programmes that are designed to disseminate accurate information about the relationships between health and diet, exercise, consumption of medical and preventive health care services, and so on, are examples of this type of health promotion policy. Many of the high-profile health promotion campaigns of recent decades (e.g. anti-smoking, road safety, HIV/AIDS "safe-sex" campaigns) have comprised considerable information dissemination components. Insomuch as these programmes are designed to correct imperfect knowledge about the relationship between behaviour and health, they may constitute second-best efficient responses by government.

Abstract

Eur J Health Econom 2004 · 5:236–242
DOI 10.1007/s10198-004-0229-2

Luke B. Connelly

Economics and health promotion

Abstract
Health promotion activities consume a growing proportion of health sector spending in most developed countries. Yet, there is still considerable debate in the non-economic literature about exactly what health promotion constitutes and precisely how its role is to be conceived. This paper provides one economic answer to such questions. It sets out an argument that health promotion may be viewed, through the lens of traditional welfare economics, as a response to problems of market failure. A Grossman-type health investment model is invoked to analyse individual deviations from equilibrium and the possible instruments and targets of health promotion policy. The paper concludes by suggesting some of the alternative conceptual approaches that might be brought to bear, as well as some ideas for empirical research.

Keywords
Welfare economics · Health promotion

Figure 2 suggests that the consumer, if fully informed, would correctly select the input combination P^*, to create the output bundle C^*. Note that, by construction, C^* contains H^* while F contains H_F and that, although $u(C^*)>u(F)$, $H^*<H_F$. In other words, when one conceives of health promotion activities to correct misperceptions about health production, the result may be expected to be *utility*-increasing, but not necessarily *health*-increasing: the outcome cannot be generalised a propos its effect on health. This will be especially true if, for example, consumers overestimate the ill effects of health-reducing goods or underestimate the health benefits of health-improving goods. Finally, note that the omniscience of government (regarding consumer preferences, the extents of deviations from utility-maxima, etc.) is not a necessary condition in relation to information dissemination/public education policies. Rather, a necessary condition is that accurate generic information about the technical relationship(s) between behaviour and outcomes be provided. Provided that information becomes "full knowledge" in the hands of consumers (and absent other sources of market failure), the policy will also be sufficient to deliver each consumer to his/her (possibly second-best) utility maximum. At the aggregate level, such policies may even produce Pareto-improvements.

Taxes and subsidies

One alternative to the information dissemination approach is to levy taxes and/or place subsidies on inputs. Specifically, the relative prices of health and non-health inputs could be manipulated in such a way as to bring the information-poor consumer immediately to his/her output equilibrium.

Figure 3 presents an example of the use of taxes and subsidies to produce an outcome in which both the individual's utility and his/her health stock increases. The dashed production function HPF_D, in quadrant I, once again represents the individual's perception of the health production technology and the solid line represents the true production function. Unlike the previous example, this individual overestimates the productivity of health inputs, yet is aware of the non-linear nature of returns to health investments. Given the inputs budget constraint in quadrant IV and his/her understanding of the health production relationship, the individual will choose bundle Q, which is given by the tangency of the distorted inputs indifference curve IIN_D and the initial budget constraint $HI_{MAX}NHI_{MAX}$. The individual's expectation is for the production of D as a result of this inputs choice. However, the resulting output bundle will be F, which contains the same quantity of non-health consumption as expected (i.e. Z^*), but less health stock than expected ($H_F<H_D$), due to the unexpected lower total product of health input investments.

Note that the resulting output combination at F is sub-optimal: indifference curve IO_1 intersects PPF_1 at this point, while combination D is unattainable, and C^* is utility-maximising. The latter is the tangency between indifference curve IO_2 and PPF_1.

The visible hand of government [6], manifest as a goods and services or value-added tax and/or subsidy on inputs, could be used to redirect the budget allocation to the optimal bundle. For example, the relative prices implied by the relative prices AB involve a tax on non-health inputs and a subsidy on health inputs. This will effect the consumption of inputs bundle P^*, which is consistent with the production of the optimal output bundle C^* in quadrant II.

Unlike the previous policy set, this solution is complicated by an implicit and unrealistic requirement that governments possess more information about individuals' optimal bundles of *inputs* than the individuals themselves do. Furthermore, unless preferences are homogenous, no single set of relative prices will be sufficient to produce a utility maximum for all individuals. For these reasons, taxes and subsidies will not generally be efficient instruments of policy when information poverty is the source of market failure. Specifically, since preferences and knowledge states differ across the individuals across whom the policy is constituted, a single tax or subsidy will introduce inefficiencies at the margin, taking some individuals further from equilibrium than might have been the case before the tax/subsidy was introduced.

While policies of this genre might pass a potential-Pareto test, i.e. the social benefits they confer may outweigh the costs, they are unlikely ever to pass the Pareto test. Suppose, for example, that young smokers are genuinely myopic about the effects of their behaviour. A comparison between an information campaign and a tax on tobacco may show the latter to be net benefit-maximising. Nevertheless, the latter imposes costs on all smokers and will be utility-reducing for fully-informed (non-myopic) smokers.

Note also that the analytical outcome in **Fig. 3** is, unlike the previous example, health-stock increasing. Moreover, note that unless some individuals have the zero and constant marginal rate of substitution the effect of the tax and subsidy arrangements will uniformly be health-improving – although not necessarily utility-maximising for the reasons given above.

Quantity controls and public production

Finally, it is worthwhile to consider non-price limitations on opportunity sets. Such limitations are, in fact, commonplace in the health sector and include measures such as place-specific bans on smoking and the consumption of alcohol, as well as embargoes on the consumption (and production) of drugs such as cocaine, heroin, and so on. Arguments of a negative externality kind exist for interventions of this kind; however, quantity limits might also be used as a response to inefficiencies due to problems of information. Limits of this kind might also be potential-Pareto-improving.

A quantity control, in the form of a quota on non-health inputs, is illustrated in **Fig. 4**. **Figure 4** employs the same basic assumptions as **Fig. 3**, with respect to initial relative prices (given by $HI_{MAX}NHI_{MAX}$), preferences, and the underlying household production technologies. Production possibilities are also initially given by PPF_1, as in **Fig. 3**. However, the quota on household production has the effect of restricting the individual's opportunity set to that indicated by PPF_2 in quadrant II, and giving rise to the corner solution C^*. In inputs space, the consumer will now choose bundle P^* which is the tangen-

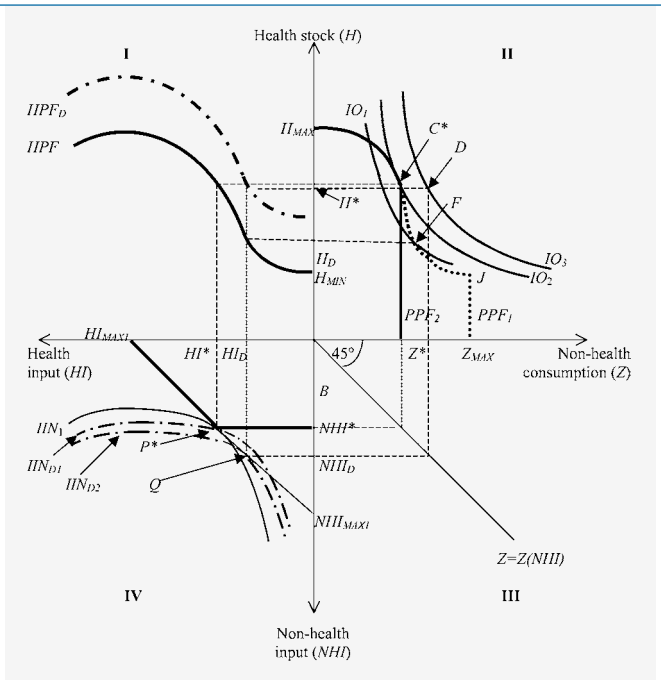

Fig. 4 ◀ **Quantity controls as instruments of health promotion**

cy of IIN_{D1} with the new budget constraint $HI_{MAX}NHI^*$. Note that, although the input bundle P^* produces the optimal outputs bundle for this consumer, he/she will view this input bundle as inferior to Q, given his/her distorted view of the production technologies. This is evident from the fact that P lies on a lower indifference curve (IIN_{D2}) than Q (IIN_{D1}) for this individual.

Another alternative to the policy just discussed involves the public provision – perhaps at the zero price – of a good or service that is health-improving. Such policies, although not depicted geometrically here, pivot the inputs budget constraint at the *NHI* intercept, increasing HI_{MAX1}. In output space, the effect is to pivot the *PPF* at its *Z* intercept, increasing the *H* intercept, provided the marginal product of health inputs is positive.

As with the taxes-and-subsidies response that was illustrated in the previous section, the welfare effects of quota and public provision responses to problems of information are likely to be utility-reducing for some individuals (i.e. those with different degrees of knowledge of the production technologies to that of the representative individual). Whether or not a quota (motivated by this source of market failure) will result in a potential-Pareto improvement thus depends inter alia upon the distribution of knowledge of the production technologies. Note also that the formulation of such policies that are even potential-Pareto efficient places a heavy and probably unrealistic information requirement on governments.

Conclusion

The purpose of this paper was to bring conceptual clarity to the economics of a growing sub-sector of health policy, namely health promotion. Readers of the general non-economic literature on the topic will be aware that considerable debate exists about not only the role of health promotion, but also the delineation of activities as constituents or non-constituents of health promotion. This paper brings the discipline of economics to bear on this issue. It proposes that health promotion policies can be viewed as responses to market failure with respect to household investments in health production.

The work produced as a result is of a normative kind: it is undertaken in the mould of traditional welfare economics and assumes a similarly normative view of government intervention in the health sector. One of the central themes of the paper is that attempts to improve health by correcting market failure, e.g. due to ignorance, should not be expected to be universally health-improving. The example employed in the case of information dissemination and public education programmes illustrated the effect of a campaign, aimed at improving health information, on an individual who chooses to substitute other goods consumption for health investments, at the margin. This, admittedly provocative, example is designed to bring into sharp focus the distinction between welfare-maximising and health-maximising frameworks of analysis.

Notably, while the results of health promotion in the context of conventional welfare economics are generalisable, the direction of their influence on the choices of particular individuals is not: it depends on consumer preferences over health and other consumption. It was also argued that policies that are designed to generate more universal improvements in health status are likely to have unpredictable net effects on social welfare. Taken together, these observations amount to an argument that information dissemination and education programmes may constitute first-best responses of (utilitarian) health promoters to problems of information, or gaps in knowledge about health production.

Basic extensions to the conceptual work could involve the inclusion of household health-bads production (e.g. tobacco consumption activities) in the analysis.

Alternative economic approaches to this growing branch of public policy might also be productive. For example, descriptive theories of government (such as those commonly associated with the "public choice" school) might be fruitful, as might applications of alternative social choice frameworks, such as those associated with the notion of "extra-welfarism". (Exploratory analyses of this kind may also be found in Connelly [7].)

Furthermore, the model employed in this paper suppresses the role of uncertainty and this results in a deterministic view of health (and other goods) production. Relaxing this assumption, along with the implicit assumption that the "true" health production relationship is known, might also be useful. In particular, an explicit consideration of the impact of process and product innovations in health production and the dynamic role of health promotion might be fruitful.

Finally, the empirical impact of health promotion policies on individual efficiency in the production of health also bears investigation. One interesting topic for empirical investigation concerns the impact of health promotion programmes – such as those that involve information dissemination or public education – on subjective perceptions of health risks and benefits. Part of the existing literature on risk perceptions, for example, emphasises the role of the "availability heuristic": risks that are easily brought to mind (e.g. murder, car accidents) tend to be overestimated, while more risky events (e.g. stroke, stomach cancer) tend to be underestimated (see, e.g. Lloyd [12]). However, notwithstanding this general result, there is some evidence that perceptions of two diseases that have been the subject of intensive health promotion campaigns – namely, smoking-related illnesses and breast cancer – are apparently routinely overestimated (see Paul et al. [14] and Viscusi [18, 19], respectively). Empirical investigations of the relationship, if any, between systematic misunderstandings of risk and the intensity and form of the information dissemination or advertising campaigns that form a central part of the health promotion arsenal seem worthy of investigation.

Corresponding author

Luke B. Connelly

Centre of National Research on Disability and Rehabilitation Medicine,
The University of Queensland,
Mayne Medical School,
Herston Road, Q 4006 Herston, Australia
e-mail: l.connelly@uq.edu.au

Acknowledgements

The author gratefully acknowledges Dr. Darrel Doessel's helpful suggestions on an early draft of this paper and the helpful comments of two anonymous referees. The contributions from participants at a seminar delivered at the Centre for Health Economics Research and Evaluation (CHERE), are also gratefully acknowledged. Any errors that remain are solely the author's responsibility.

Conflict of interest: No information supplied.

References

1. Arrow KJ (1963) Uncertainty and the welfare economics of medical care. Am Econom Rev 53:941–73
2. Arrow KJ (1963) Social choice and individual values. Wiley, New York
3. Arrow, KJ (1971) The organisation of economic activity: issues pertinent to the choice of market versus non-market allocation. In: Haveman, RH and Margolis J (eds) Public expenditure and policy analysis. Markham, Chicago, pp 59–73
4. Bator FM (1958) The anatomy of market failure. Quart J Econom 72:351–379
5. Becker JS (1965) A theory of the allocation of time. Econom J 75:493–517
6. Chandler AD (1977) The visible hand: the managerial revolution in American business. Belknap Press, Cambridge
7. Connelly LB (2002) Welfarist and non-welfarist conceptions of "health promotion". Discussion Papers in Economics, Finance and International Competitiveness, 104. QUT, Brisbane
8. Cullis JG, Jones PR (1998) Public finance and public choice: alternative perspectives, 2nd edn. Oxford University Press, Oxford
9. Grossman M (1972) The demand for health: a theoretical and empirical investigation. National Bureau of Economic Research and Columbia University Press, New York
10. Grossman M (1972) On the concept of health capital and the demand for health. J Politic Econom 80:223–255
11. Grossman M (2000) The human capital model. In: Culyer AJ, Newhouse JP (eds) Handbook of health economics, vol. 1A. Elsevier, Amsterdam
12. Lloyd, AJ (2001) The extent of patients' understanding of the risk of treatments. Qual Health Care 10 [Suppl I]:i14–i18
13. Organisation for Economic Co-operation and Development, OECD (2002) OECD health data 2002. OECD, Paris
14. Paul C, Barratt A, Redman S, Cockburn J, Lowe J (1999) Knowledge and perceptions about breast cancer incidence, fatality and risk among Australian women. Aust N Z J Public Health 23:396–400
15. Pigou AC (1932) The economics of welfare, 4th edn. Macmillan, London
16. Samuelson PA (1954) The pure theory of public expenditure. Rev Econom Statistics 37:387–389
17. Smith A (1776) An inquiry into the nature and causes of the wealth of nations. Liberty Fund, Indianapolis
18. Viscusi WK (1990) Do smokers underestimate risks? J Politic Econom 98:1253–1269
19. Viscusi WK (1991) Age variations in risk perceptions and smoking decisions. Rev Econom Statistics 73:577–588
20. Wagstaff A (1986) The demand for health: some new empirical evidence. J Health Econom 5:195–233
21. Zweifel P, Breyer F (1997) Health economics. Oxford University Press, Oxford