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A THEORY OF HEALTH AND
HEALTH POLICY

by

Professor Lok-sang Ho

Faculty of Social Sciences
Lingnan College
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Professor Lok-sang Ho is the Head of Department of Economics and Director of Centre for Public Policy Studies, Lingnan College, Hong Kong.

Faculty of Social Sciences
Lingnan College
Tuen Mun
Hong Kong
Tel : 2616 7429-32
Fax : 2591 0690
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by

Lok Sang Ho

Center for Public Policy Studies
Lingnan College

Economics Department
Lingnan College & Chinese University of HK

Abstract

This paper builds a model of health production that relates functional health and the health stock in a dynamic way. This distinction of the concept of health has been made in the health literature but in different contexts but has so far not been related properly. The paper uses the concept of household production and household utility maximization, and household behavior is seen to interact with providers of health care services, given a budget constraint, a time constraint, and various technological constraints including household consumption technology. Implications for public policy are drawn from the model.

JEL Classification I1, I12, I13


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I. Introduction

Since Grossman published his pioneer piece on the concept of health capital in 1972, economists have applied the concept both theoretically and empirically (Bercowitz, Fenn, and Lambrinos, 1983; Karatzas, 1992). However, health economists so far appear unfamiliar with the concept of functional health and do not know how to deal with it. Grossman (1972) had assumed that “health services” is directly proportional to the stock of health. Similarly, while treating health as a stock in general, Phelps (1992) included health as an argument in the utility function along with consumables X. Implicitly, health services or functional health is taken to be directly proportional to the stock of health.

The concept of functional health is not unfamiliar among researchers in the health sciences (Hornbrook and Goodman, 1996; Smith and Kington, 1997), but is seldom explicitly discussed in the economic literature. The relationship between functional health and stock of health has, as far as I know, never been discussed in the literature and economists appear to be rather confused over the concepts. For example, Santerre and Neun (1996) stipulated a health production function as follows:

\[
\text{Health} = H(\text{Endowment, Medical Care, Lifestyle, Socioeconomic Status, Environment})
\]

They described “health” in this equation as reflecting the “level” of health at a point in time, and “endowment” as “the individual’s endowment of health as of a point in time.” Here again we can see that the authors are clear about the concept of health stock but unclear as to the nature of H in this production function. Normally production function would describe
how a flow of output is determined by a flow of inputs, given specified conditions. If \( H \) reflects a quantity at a point in time it cannot be a flow.

The next section will introduce the concept of functional health and explain how it is related to the stock of health. Section III will describe a model of household maximization behavior incorporating explicitly the relationship between functional health and stock of health. Two sub-models, one assuming perfect foresight and the other incorporating uncertainty, are discussed in turn. Section IV will draw implications from the model.

II. The Nature of Functional Health and Health Stock

The stock of health of a person is defined as the potential of functional health stream that would accrue to that person. This potential, obviously, is related to the state of medical knowledge and medical technology. There was a time when tuberculosis could not be cured. Someone diagnosed as having the disease was expected not to live very long. His stock of health would then be quite low. A person with exactly the same conditions today, however, may be cured and may expect to live many more years. The functional health of the person then and that of the person now may be quite the same and their physiological conditions may also be quite the same. Yet their potentials for life are vastly different. Hence the stock of health of a person with such a disease today would be much higher.

Defined as such, the stock of health is always largest at birth and will always be on a declining trend given the state of medical knowledge and medical technology. Appropriate health care, however, can slow down the speed of this depreciation. But this must involve
various kinds of sacrifice. It is the essence of health economics to find a way to achieve the "optimal rate of depreciation of the health stock" for members of society. In addition to trying to achieve the optimal rate of health stock depreciation, health policy should try to achieve the optimal level of functional health for members of society. As we shall see, these aspects of optimization are extremely complex and they involve many decision makers in both the private and the public sectors.

The stock of health can change significantly without the individual's noticing it. A tumor may develop; blood vessels may be blocking; a kidney stone may be building up. Yet the individual can function at a normal level, i.e., can enjoy "functional health" at a relatively high level, while his stock of health may be falling rapidly. In contrast, an ailment or an accident may significantly reduce one's functional health, but may not affect the stock of health noticeably if one can recover from the condition.

The distinction between health stock and functional health is useful in discussions relating to health policy because there is an obvious need to balance measures devoted to improving or maintaining the health stock and measures devoted to improving functional health. The choice over these two aspects of health is related to the discount rate. If the rate of discount is higher, implying stronger time preference for the present, functional health will be given greater weight relative to the health stock. If the rate of discount is lower, on the other hand, replenishing or protecting the health stock will be given greater weight. This is obviously related to the fact that the value of the stock of health is contingent on actual survival and is therefore subject to some risks. This is one of the reasons why some individuals choose to take drugs that may enhance their functional health at the short term.
but may hurt the stock of health over the longer term. Some drugs, such as the pain-killer morphine, will improve functional health and are therefore prescribed even though they are known to damage the stock of health.

Functional health has many aspects: the general feeling of well being, the faculties of sight, hearing, smell, taste, touch, speech, and mobility. Functional health can be looked upon as a flow, and flows have a time dimension. As such, it is like the service provided by a capital stock. In general, a larger health stock can be expected to provide more years of functional health. The reverse, however, is not true. Very high functional health in a particular year does not necessarily mean that the stock of health is high.

We can measure functional health in a year as the number of *equivalent* healthy days (EHD) in that year. Unlike the “healthy year equivalent” (HYE) which is a derivative from the utility function (Gafni and Birch, 1997, 1989), however, EHD is an entirely physical measure, being a summary measure of the physical conditions of an individual for the given year in terms of the extent to which the various body faculties function. As such, it is a derivative from the household production function.

Mathematically, EHD is derived from $X(c, D(health \text{ at full level})) = X(c, D(\text{attenuated health at h}))$ where $X$ is a vector of utility-determining characteristics produced with the household production function defined over market goods $c$ and days of a given health status. HYE is derived from $U(LY(health \text{ at full state } | ...)) = U(LY(health \text{ at attenuated state } | ...))$ where the other arguments in the utility function are held constant (Gafni and Birch, 1997, p.603). EHD attempts to translate days of a given health status into equivalent healthy days.
in terms of potential productivity. It makes no attempt to estimate a utility-equalizing change in health.

If we refocus on the current period, representing functional health as $H$ and the "consumption attributes" derived from market goods and services as $X$, we can draw the "health production possibility frontier" (HPP) applicable to one individual as shown in Figure 1.

![Figure 1: Functional Health Production Possibility Frontier](image)

Here $h_{\text{min}}$ is the number of equivalent healthy days that would occur even when there is no health-care input allocated for the purpose of increasing health. Starting from this level, suppose some medical input is now used to increase functional health. Because functional health is needed to enjoy life it is possible to increase the enjoyment of consumption attribute $X$ while at the same time enhancing $h$. Beyond a point, however, it is possible to increase functional health only at the expense of $X$. Finally, there is a limit to which medical input can be used to enhance the number of equivalent healthy days and this is represented as $h_{\text{max}}$. $h_{\text{min}}$, $h_{\text{max}}$, and the curvature of the production possibility frontier depend on the stock of
health of the individual at the time as well as the state of medical knowledge.

We can now superimpose the indifference map onto the diagram. We can then easily see that optimality in the sense of utility maximization subject to the health possibility frontier generally implies that functional health will not normally be maximized. The simple reason is that beyond a certain point improving functional health carries a price in terms of the enjoyment of other goods and services.

While it is generally not in the interest of utility maximization to maximize functional health in a year, it is usually in the interest of long term utility maximization to conserve the health stock. There is, however, an optimal rate of health stock depreciation. Reducing the rate of depreciation brings a return in terms of greater functional health in the future, but it also carries a cost in terms of loss of some consumption opportunities.

In general, as the individual's stock of health depreciates over the course of life the HPP will drift downwards. In the short term, it is also possible for the HPP to shift down under the influence of some random factors such as the outbreak of some epidemics or accidents.

III. A Model of Household Behavior and Health Dynamics

In order to model household behavior incorporating present-future considerations, I assume that there are two periods in the life cycle of an individual: working years and retirement years. Life time utility is the sum of the utilities pertaining to these two periods.
In both periods, utility is determined by a vector of consumption attributes $X$, functional health $h$, and work $L$. The vector of consumption attributes $X$ is produced by a vector of household activities $A$, where each element in $A$ requires a vector of market goods and services $e$ as well as functionally healthy time $h_a$ to undertake. It is assumed that during retirement years $L = 0$.

Functional health is depicted by “functionally healthy time” $h$ while health stock is depicted by $H$. $h$ is measured in days and is obtained by discounting total available time within the period by a factor that relates to the state of functional health. Given the stock of health inherited at the beginning of each period($H$), the number of functionally healthy days as measured by $h$ is determined by the activities in which the individual engages($A$) or in other words his life style, medical spending made privately($m$), stock of medical technology embodied in the doctor and in private medical facilities($Y_p$), medical spending made by the government($g$), stock of medical technology embodied in public medical facilities($Y_g$), his work time($L$), health care time when sick($t_{h_s}$) and health care time when healthy($t_{h_h}$), in addition to random factors $e$. There is a health stock adjustment function that depicts how the stock of health depreciates over time: $H_t = H_0 - \delta(A_t, m_t, g_t, L_t, t_{h_a}, t_{h_s}, t_{h_h}, H_0, e_t)$. The two technology variables are assumed given at any given time.

While the above describes the general framework of the model, we consider two sub-models: one assuming perfect foresight, and one incorporating uncertainty.
In the sub-model assuming perfect foresight, households maximize\(^1\), with respect to 
\(c_{0a}, c_{1a}, h_{0a}, h_{1a}, m_0, m_1, L_0, t_{hec0}, t_{hec1}, t_{hec1}\). The vectors \(c\)'s and \(h\)'s are respectively market goods and services and healthy time allocated to the various activities.

\[
U_0(X_0(A_0(c_{0a}, h_{0a})), h_0, L_0) < U_1(X_1(A_1(c_{1a}, h_{1a})), h_1, 0)
\]

subject to:

1. budget constraint 
\(c_0, P_{ce} + m_0 + \beta(c_1, P_{te} + m_1) \leq W \cdot L_0(1 - \text{tax rate})\)

2. household production functions
\(X_0(A_0(c_{0a}, h_{0a})), X_1(A_1(c_{1a}, h_{1a}))\)

3. the functional health production function:

\[
h_0 = f(A_0, m_0, g_0, L_0, t_{hec0}, t_{hec1}, H_0)
\]

\[
h_1 = f(A_1, m_1, g_1, 0, t_{hec1}, t_{hec1}, H_1)
\]

4. the health stock adjustment function:

\[
H_1 = H_0 - \delta_0(A_0, m_0, g_0, L_0, t_{hec0}, t_{hec0}, H_0)
\]

5. time allocation constraint
\(h_{ai} = h_i - L_i - t_{hec1} - t_{hec1}\) for \(i = 0, 1\)

6. tax rate, \(g\), all market prices, and the stock of medical technology available in both the private and public sectors.

\(^1\) It is not necessary to incorporate a time-preference or discount factor. If the individual knows with perfect foresight that he is going to survive into the second period, lifetime utility is the simple sum of the utilities pertaining to the two periods.
From this model we can solve for:

Maximized equilibrium utility:
\[ U^* = U_0(X_0(A_0(c_{0a}^*, h_{0a}^*)), h_0^*, L_0^*) + U_1(X_1(A_1(c_{1a}^*, h_{1a}^*)), h_1^*, 0) \]  \[ 8 \]

Optimal health care plan = \((m_0^*, t_{bct0}^*, t_{bcht0}^*)\) and \((m_1^*, t_{bct1}^*, t_{bcht1}^*)\)  \[ 9 \]

Optimal health:
\[ h_0^* = f(A_0^*, m_0^*, g_0, L_0^*, t_{bct0}^*, t_{bcht0}^*, H_0) \]  \[ 10 \]
\[ h_1^* = f(A_1^*, m_1^*, g_1, 0, t_{bct1}^*, t_{bcht1}^*, H_0 - \delta_0^*) \]  \[ 11 \]

Alternatively, in the sub-model incorporating uncertainty, we assume that the household does not know what will happen in the current period as well as the next period. We assume that there are two possible states of the world: the normal one and the emergency one. We further allow that within each state of the world there are random effects on health, so that even if the state of the world is normal in the current period some variation among individuals in the level of functional health may take place. These effects can be depicted as a stochastic variable “e” in the health production function. We further assume that household behavior affect the probability of occurrence of each state. Before we proceed further, let us make some definitions:

*Definition:* Period: A period consists of the number of years of either pre-retirement or post-retirement life. It is made up of the sum of equivalent healthy days and equivalent
unhealthy days.

**Definition**: Normal state of the world. This is a benchmark state of the world without any unexpected, major illness or incidents adversely affecting health.

**Definition**: Emergency state of the world. A state of the world with an unexpected illness or incident significantly and adversely affecting health.

**Definition**: Actual choice variables. Actual choice variables are the choice variables actually implemented by the household as a decision maker. During normal times, they assume values as planned. During emergency times, their values are supplemented by "emergency contingent variables".

**Definition**: Hypothetical choice variables. These are choice variables pertaining to a future period but mentally chosen in the current period in the maximization process. As the next period unfolds, the actual choice variable will replace these hypothetical choice variables.

Denoting the probabilities of the normal state of the world for the current and the future periods as \( P_{NO} \) and \( P_{N1} \), and the probabilities of the emergency state of the world as \( 1 - P_{NO} \) and \( 1 - P_{N1} \), we can now picture the decision problem of the household as follows.
### Table 1: Decision Matrix in a Two Period, Two State-of-the-World Model

<table>
<thead>
<tr>
<th>State of the World</th>
<th>Decisions Made in Period One</th>
<th>Decisions Made in Period Two</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>State-independent or benchmark implementation variables ( c_{00}, m_{0}, L_{0}, t_{hca0}, t_{hcb0}, ) Hypothetical choice variables in Period Two</td>
<td>State-independent or benchmark implementation variables ( c_{1a}, m_{1}, t_{scl1}, t_{hch1}, )</td>
</tr>
<tr>
<td>Emergency</td>
<td>State-independent or benchmark implementation variables + emergency contingent variables ( c_{0a}', m_{0}', L_{0}', t_{hca0}', t_{hcb0}', ) Hypothetical choice variables in Period Two</td>
<td>State-independent Implementation Variables + Emergency Contingent Variables ( c_{1a}', m_{1}', L_{1}', t_{scl1}', ) Hypothetical choice variables in Period Two</td>
</tr>
</tbody>
</table>

Given these assumptions, expected utility becomes:

\[
U_0(X_0(A_0(c_{00} \cdot h_{00}), h_0, L_0) \times P_{N0} + U_0(X_0(A_0(c_{00} \cdot c_{0a}' \cdot h_{0a} \cdot h_{0a}'), h_0', L_0' + L_0') \times (1 - P_{N0}) \\
+ U_1(X_1(A_1(c_{10} \cdot h_{10}), h_1, 0) \times P_{N1} + U_1(X_1(A_1(c_{10} \cdot c_{1a}' \cdot h_{1a} + h_{1a}'), h_1', 0) \times (1 - P_{N1})
\]

[12]

This, however, is not the objective function. We postulate that households maximize an *ex ante utility function* which represents the subjective valuation of the prospect of
utilities to be obtained under different scenarios\(^2\). The *ex ante* utility function has as its arguments the expected utility as well as the dispersion of the utilities to be realized under different scenarios. This will be further elaborated in the next section.

Denoting the rate of discount as \(\beta\), the budget constraint with both period one and the future period being under the normal state of the world is:

\[
\mathbf{c}_0 \mathbf{P}_{0c} + \mathbf{m}_0 + \beta(\mathbf{c}_1 \mathbf{P}_{1c} + \mathbf{m}_1) \leq \, \mathbf{W}.L_0 (1 - \text{tax rate}) \tag{13}
\]

The budget constraint in period one, with the normal state of the world in the current period and assuming emergency state in the future period is:

\[
\mathbf{c}_0 \mathbf{P}_{0e} + \mathbf{m}_0 + \beta(\mathbf{c}_1 + \mathbf{c}_1')\mathbf{P}_{1e} + \beta(\mathbf{m}_1 + \mathbf{m}_1') \leq \, \mathbf{W}.L_0 (1 - \text{tax rate}) \tag{14}
\]

The budget constraint in period one, with the emergency state of the world in the current period and assuming normal state in the future period is:

\[
(\mathbf{c}_0 + \mathbf{c}_0')\mathbf{P}_{0e} + (\mathbf{m}_0 + \mathbf{m}_0') + \beta(\mathbf{c}_1 \mathbf{P}_{1c} + \mathbf{m}_1) \leq \mathbf{W}.(L_0 + L_0')(1 - \text{tax rate}) \tag{15}
\]

Finally, the budget constraint in period one, with the emergency state of the world in both the current period and the future period is:

---

\(^2\) This is a departure from the von Neumann-Morgenstern expected utility theory and is justified by reference to the state of anxiety suffered by individuals at the time of making decisions when they face an uncertain prospect about the state of the world in the future.
\[(c_0 + c_0')P_{0c} + (m_0 + m_0') + \beta(c_1 + c_1')P_{1c} + \beta(m_1 + m_1') \leq W.(L_0 + L_0')(1 - \text{tax rate})\]

[16]

Optimization in this model is rather complicated. We cannot solve, once and for all, all the actual choice variables right at the beginning. However, it is clear that the individual can be seen to confront a range of budget constraints, ranging from the most restrictive one in the form of equation [16] to the least restrictive one in the form of equation [13]. These limiting budget constraints can be illustrated in Figure 2.

\[c_0P_0 + \beta_{c1}P_{1c} = W.L_0(1-t)-m_0-\beta m_1\]

\[(c_0 + c_0')P_{0c} + \beta(c_1 + c_1')P_{1c} = W.(L_0 + L_0')(1-t)-(m_0 + m_0') - \beta(m_1 + m_1')\]

Figure 2: Limiting Budget Constraints

If there is only a small probability for the emergency state of the world to occur in both
periods it will not be rational to assume the emergency state and realize a much lower level of utility. However, if the emergency state does occur the individual could be caught in a very difficult situation, having made no preparation for the eventualty at all. It is generally rational for him to make some allowance for all possibilities, and the general rule is that in equilibrium the ex ante benefit from making the marginal effort in taking precaution is equal to the ex ante cost from making that effort³.

We stipulate that the state-independent actual choice variables in the first period are $c_{01}$, $m_{01}$, $L_{01}$, $t_{10}$, and $t_{20}$, and further note that these variables have already reflected the precautions. If state normal occurs these variables will not be changed. However, if state emergency occurs, the contingent variables, all marked by “ • ”, will take on non-zero values. Both actual choice variables for state normal and the supplementary variables in the event of the emergency state of the world occurring would depend on assumptions as to whether the emergency state of the world would occur in the second period.

In other words, his welfare will depend, ultimately, on the state of the world as well as his earlier decisions. Clearly, the available institutional set-up will affect his behavior. In general, however, the household will need, upon the realization of the state of the world, to choose supplementary choice variables, to correct his earlier mistakes and to maximize his true utility. The same kind of predicament happens in the next period, as the household will again choose ex ante variables and will in the course of the period choose supplementary choice variables upon the realization of the state of the world.

³ Equalizing marginal ex ante benefit with marginal ex ante cost of a precautionary move does not necessarily mean maximizing the mathematical expectation of net benefit. Thus an individual may prefer an actuarially
IV: Implications of the Model

Excess Risk Insurance

One key implication of the sub-model incorporating uncertainty is that there is a clear need for *excessive risk insurance*. Excessive risk insurance (Ho, 1997) is defined as an insurance arrangement such that the individual will be protected from excessive risks through the payment of a risk premium, where excessive risk means medical expenditures beyond some threshold level. Such kind of insurance is welfare-enhancing as the individual cannot afford to ignore the possibility of an emergency situation occurring in either or both of the periods, and yet if the worst but not so probable scenario is assumed consumption may have to be seriously curtailed. One element of optimal health policy has to be the setting up of such excessive risk insurance. The rationale for such excessive risk insurance can be illustrated in Figure 3 and 4.

Figure 3 illustrates the concept of expected utility as distinct from *ex ante* utility. Expected utility is the mathematical expectation of the utility that will be realized under different states of the world with known probabilities. *Ex ante* utility is the subjective valuation of the prospect of having to face a range of utility levels with known or unknown probabilities. In Figure 3, we assume that two alternative prospects yield the same expected utility $E(U)$. In one case, however, there is a very small probability of a very low utility level. In the other case there is a much higher probability of a not so low utility level. The curved lines show the *ex ante* utility levels for the given, alternative utility limits at different probability combinations. $\alpha(U)^*$ is the *ex ante* utility of the prospect with the higher utility.
limits. $\alpha(U)^{**}$ is the ex ante utility of the prospect with the lower utility limits. According to the diagram, the individual is averse to extreme risks and so $\alpha(U)^*$ is preferred.

\[\text{Figure 3}\]

\[\text{Figure 4}\]
Figure 4 illustrates the value of excessive risk insurance. It shows that the payment of a risk premium during times when the individual can afford it in exchange for an alleviation of the pain suffered during times when the individual cannot afford it is welfare-improving.

Reference to the functional health determination and the health stock adjustment functions suggest that the government has effects on health through various channels. A comprehensive strategy on health policy has to address, apart from the need for excessive risk insurance, all of the following.

*Household Activities, Moral Hazard, and the Trade-off Between Medical and Consumption Expenditures*

The government can affect the lifestyle of household directly through regulations and indirectly through taxes and subsidies, which will affect the prices of market goods and services. Grossman (1989) for example showed that raising the tax on beer in line with inflation over the three decades prior to his study would have cut motor vehicle fatalities of the 18-to-20 year olds by about 15 per cent. Similarly he found that preserving the real value of the federal excise tax on cigarettes at the value as it stood in 1951 would have averted 800,000 premature deaths in the cohort of Americans who were 12 years or older in 1984.

To the extent that the probabilities of the emergency states of the world depend on the lifestyle chosen, moral hazard is real. In order to minimize the problem of moral hazard it is necessary to hold the household responsible for the maximum endurable level of costs associated with the health problem. Medical insurance that shelter households from medical
cost may reduce preventive activities ("health care time when healthy") and increase consumption activities which are hazardous to health. Thus, while excessive risk insurance is provided universally, within the threshold of health care expenditures beyond which full coverage for standard care is available the individual should assume full responsibility for all direct costs associated with medical care.

A direct result from the model is the following equilibrium condition, which would apply in the certainty model for current period expenditures, and equally in the uncertainty model if $U$ is interpreted as *ex ante* utility:

\[
\sum \frac{\partial U}{\partial \delta} \frac{\partial \delta}{\partial m} + \sum \frac{\partial U}{\partial h} \frac{\partial h}{\partial m} = 1
\]

\[17\]

This says that the marginal benefit of medical care expenditures, which may be of the stock of health promoting type (in which case it is possible that $\frac{\partial h}{\partial m} \leq 0$) or the functional health promoting type (in which case it is possible that $\frac{\partial \delta}{\partial m} \leq 0$), must be equal to the marginal benefit of consumption expenditures. The summation signs show that the effects of changes in the health stock and functional health on utility include a direct and an indirect component, and that the effects of consumption expenditures on utility may be via various consumption attributes. The former, moreover, works through the impact on future functional health. The equation also shows that if a large proportion of health care expenditures are paid by health insurance, medical expenditures would rise. This is illustrated in Figure 5. Medical expenditure borne by the individual falls from OACG to
OBEK while total medical expenditure rises to OAEK.

Figure 5

*Work-place Safety Regulations and Road Safety Regulations*

Apart from its effects on household activities A, the government, by suitable regulations, taxes, and subsidies, will also have effects on what are usually regarded as random variables, namely the e’s in health production function in the sub-model. For example, if drunk driving is reduced traffic accidents involving innocent victims and drunk drivers would also be reduced. Being hit by a car driven by a drunk driver is a random event from the point of view of the individual, but it is definitely influenced by government’s policies. Regulations on work-place safety also have effects on the incidence of accidents and thus on health care expenditures.
The Health Care Plan. Governments can directly or indirectly affect the prices and the qualities of health care services provided in the market place or through government-run facilities and thus affect functional health and the rate of health stock depreciation. Because of high information cost patients generally rely on medical practitioners to serve as their agents to look after their health. An important element of health policy is to devise an incentive structure so that the interest of these agents is aligned with the interest of their principals.

Working Hours. Governments can also affect the hours of work L among the labor force. They can mandate weekly rest days and holidays, and can limit the amount of overwork for specific age groups or for the entire labor force. Haveman et al. (1994) found that the relationship between work-time and health was complicated but significant.

Health Education, Self-Care and Prevention. By directly changing the availability of health care facilities and by educating the public about health care, governments can influence the amount of time households spend looking after their health (t_{heal} and t_{hchi}).

Random Factors. Common sense hygiene and sound public health measures can reduce the chances of an outbreak of epidemics. Immunization campaigns can reduce the chances of an individual’s contracting a contagious disease.

In summary, we have formulated a model of health distinguishing between functional health and the stock of health and introduced a framework that describes how the stock of health changes over time. Particularly we have argued that a comprehensive health strategy
should involve a form of excessive risk insurance, a strategy on the prices of market goods and services, regulations which aimed at "random variable management" such as safety standards and regulations, a strategy aimed at containing moral hazard on the part of households and one aimed at containing supply-side moral hazard. The framework also highlights the areas of health policy research and how they relate to one another.
References


Ho, Lok Sang (1997) Health Care Delivery and Financing: A Model for Reform, Hong Kong Economy Policy Studies Series, City University of Hong Kong Press.


