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HEALTH CARE INCENTIVES UNDER DISABILITY INSURANCE

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ABSTRACT

Health Care Incentives Under Disability Insurance

This paper examines one of the possible factors which has contributed to the significant recent growth in the Social Security Administration's Disability Insurance program: that of health care incentives under the program.

The examination of health care incentives involves a 2-period, 2-state insurance model under uncertainty which incorporates two general types of insurance. One form of insurance is disability insurance, and the other is the individual's "own" insurance or own risk bearing -- which is represented by acute care and preventive care expenditures. The model predicts a positive effect of disability insurance on acute care, while the extent to which disability insurance discourages preventive care depends largely on the effect of preventive care on the price of disability insurance.

Regression estimates using data from the 1969 Longitudinal Retirement History Study(LRHS) indicate an elasticity of prescription drug expenditures (acute care) with respect to benefits of about .5, and an elasticity of use of X-rays and innoculations(preventive care) with respect to benefits of about -.004.

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I. Introduction

A major characteristic of the Social Security Administration's Disability Insurance (DI) program has been the significant recent growth in the program. The number of covered workers under DI increased from 59.6 million in 1954 to 98.7 million in 1973. Table 1 shows the large increase from 1960-1975 in the amoung of monthly benefits. DI monthly benefit payments in 1975 were over ten times what they were in 1960.

Disability is defined under the DI program as an inability to engage in any substantial gainful activity by reason of a medically determinal physical or mental condition that has lasted or is expected to last for a continuous period of not less than 12 months or result in death.[1/] Since the definition of disability is both health (and work) dependent, this focuses attention on the effectiveness of health care incentives under the program.

II. Uncertainty, Disability Insurance, and Health Care

If individuals knew with certainty what various "states of the world" were to be at any point in time, there would be no role for insurance. In terms of the health care decision, the individual would choose the optimal level of health care by equating the marginal gain in terms of increased utility and present and future earnings capacity to the marginal cost.

Now suppose that there is uncertainty in that the individual faces a probability distribution of states of the world, and thus a probability distirubtion of disability and endowed health. Two alternative responses in the event of uncertainty are: a)"precautionary"

TABLE 1

Social Security (OASDI) Disability Insurance and Retirement Insurance Monthly Benefits in Current Payment Status, 1960-1975

	Disability Insurance (amount in thousands)	Retirement Insurance (amount in thousands)
1960	$ 48,000	$ 888,320
1965	120,986	1,395,817
1970	242,400	2,385,926
1971	295,934	2,763,022
1972	401,462	3,514,741
1973	448,698	3,821,165
1974	556,748	4,445,170
1975	680,102	5,047,656

Source: Social Security Bulletin, Vol. 43, No. 11, November 1980.

health care and savings and b) disability insurance.

Precautionary care may be considered to be the equivalent of one's own risk-bearing. This might consist of acute and preventive care. We would expect this type of behavior in the case of risk averse persons. These persons might also increase pre-disability savings in order to protect themselves against low consumption in "undesirable" states.

Disability insurance is an alternative to precautionary health care and savings. As a form of social insurance, DI consists of a transfer of wealth from those with better health (and fewer losses) to those with poorer health (and greater losses) up until age 65.[2/]

Up until now we have assumed that disability is an involuntary condition for the individual. It can also be considered voluntary. The decision to become disabled (or apply for benefits) may depend on factors such as declining stamina and motivation, assets, and family composition. Also likely to influence the decision is the structure of the DI program, the net market wage rate, the existence of private employer disability plans, and the availability of alternative income maintenance plans. To the extent that the availability of DI enters the health care decision of the individual, the efficiency loss from "moral hazard" or adverse incentives must be balanced against the equity gains from insurance coverage of the disabled. The following section examines health care incentives under disability insurance.

III. Health Care Incentive Under Disability Insurance

A. Insurance Model

In developing our analysis, we posit a model of insurance demand under uncertainty. In response to uncertainty, disability insurance is demanded, as well as health care, in the form of acute care and preventive care. Health care represents the individual's own risk-bearing or "own insurance".

Assume that there are two time periods, 1 and 2.[3/] In any given period, there is a "bad" or "sick" outcome a with probability π, and a "good" or "healthy" outcome b with probability $(1-\pi)$.

Suppose the individual has a utility function $u(\cdot)$ over income outcomes which is invariant over time, but which may vary between outcomes a and b. That is

$$u(Y^i,a) < u(Y^i,b)$$

where Y is income. More succinctly, this is saying that there is "pain and suffering."[4/]

We define the individual's goods and time constraint as

$$Y = \sum_{i=1}^{2} \frac{P_x{}^i X^i}{(1+r)^{i-1}} = \sum_{i=1}^{2} \frac{W^i t_w{}^i + (A^i + D^i - P_m^i M^i)}{(1+r)^{i-1}} \qquad (1)$$

$$\Omega = t_w{}^i + t_m{}^i + t_x{}^i + t_\ell{}^i \qquad (2)$$

where

$P_m M$ = a vector of health care expenditures such as acute care, preventive care, and the premium for disability insurance. These expenditures are subtracted from asset income A and disability income D. In the model, $0 \leq P_m \leq 1$.[5/]

P_xX = a vector of expenditures on other goods and services

W = market wage rate

Ω = total time available

t_w = time spent at market work

t_m = time expenditure on health care

t_x = time expenditures on other goods and services

t_ℓ = time lost from market and nonmarket activities

A = asset income

D = disability income, received in the event of a bad outcome

r = market interest rate

Combining constraints (1) and (2) and rearranging terms, we have:

$$Y = \sum_{i=1}^{2} \frac{(P_x{}^iX^i+P_m{}^iM^i+W^i(t_m{}^i+t_x{}^i+t_\ell{}^i)-A^i-D^i)}{(1+r)^{i-1}} = \sum_{i=1}^{2} \frac{W^i\Omega}{(1+r)^{i-1}} \quad (3)$$

In (3), the left hand side measures net expenditures, while the right-hand side measures income if the individual worked 24 hours per day.

The individual's level of health in each period is related to time lost, $\tilde{t}_\ell$ 6/, by

$$\tilde{t}_\ell{}^i = g(\bar{H}^i) \quad i=1,2 \ ; \quad g' < 0 \quad (4)$$

where $\bar{H}$ is the individual's level, or stock, of health, and a tilde denotes a random variable. In order to simplify the analysis, we assume here that health does not affect wages.7/

The gross investment production function for health is given by

$$I^i = f^i(M^i, t_m{}^i \ ; K); \ f' > 0; \ f'' < 0; \ f^{ia} \neq f^{ib} \quad (5)$$

where K is a vector of human capital, genetic and environmental variables which are parametric to the production function and would be expected to affect the efficiency of health production I.

In the two period model, we define the level of health in period 2 (which is common to all outcomes in period 2) as the (common) level of health in period 1 <u>less</u> any random losses due to a greater than expected depreciation rate in period 1 <u>plus</u> gross investment in health in period 1 <u>minus</u> rate of depreciation in period 1:

$$\bar{H}^2 = \bar{H}^1 - \tilde{\ell}_e + I^1 - \bar{\delta}^1 \bar{H}^1 \qquad (6)$$

where

$$\tilde{\ell}^e = \begin{cases} (\delta^{1a} - \bar{\delta}^1)\,\bar{H}^1 & \text{with probability } \pi \\ 0 & \text{with probability } (1-\pi) \end{cases} \qquad (7)$$

Combining (6) and (7) we obtain:

$$\bar{H}^2 = \bar{H}^1 + I^{1s} - \delta^{1s}\bar{H}^1 \qquad s = a,b \qquad (8)$$

The individual's consumption decision involves maximization of expected utility. In unconstrained form this may be written as:

$$u(\cdot) = EU = \pi_1 U(Y^{1a}) + (1-\pi_1)\psi(Y^{1b}) + \pi_2 U(Y^{2a}) + (1-\pi_2)\psi(Y^{2b}) \qquad (9)$$

where $U(Y) < \psi(Y)$ for common Y because of "pain and suffering" and individuals are assume to be risk averse.

In order to derive the first order demand conditions for disability insurance, acute care, and preventive care, we maximize (8) subject to constraints (3)-(6) and (8).

B. Demand for Disability Insurance

In our analysis, disability insurance represents a form of indemnity insurance against potential losses, as opposed to reimbursement insurance against medical expenses. Disability insurance involves a net transfer of income from outcome b to outcome a.

Taking the first order condition with respect to period 1 disability insurance, D^1, and rearranging terms, we have:

$$P_D^{\ 1} = \frac{\pi_1}{(1-\pi_1)} \quad \frac{U'(Y^{1a})}{\psi'(Y^{1b})} \tag{10}$$

Note that if the price of insurance is actuarially "fair" (the marginal rate of substitution between income in the bad state is independent of the utility function u(·), equilibrium incomes may not be equal in both states, since U'(Y) may not equal U'(Y) may not equal ψ'(Y).

C. Demand for Acute Care

We assume here that acute care enters the individual's utility function in the bade outcome only. Acute care represents "self-insurance" in the Becker-Ehrlich sense,[8/] where self-insurance reduces the size of the potential loss resulting from the bad outcome, but does not affect the probability distribution of outcomes.

Denoting first period expenditures on acute care as V^1 and the price of acute care as $P_v^{\,1}$, the first order condition is:

$$\pi_1 \frac{P_v^{\,1}}{f_v^{\,1}} = \pi_2 \frac{U'(Y^{2a})}{U'(Y^{1a})} \quad \frac{W^2\gamma^2}{(1+r)} \tag{11}$$

where $f_v^{\,1} = f'(V^1)$ and $\partial^2 = g'(\bar{H}^2)$. Condition (11) implies that in equilibrium, the marginal cost of acute care weighted by the probability of a bad outcome in period 1 equals the discounted marginal benefit from acute care, weighted by the probability of a bad outcome in period 2.

D. Demand for Preventive Care

We assume that preventive care enters the individual's utility function in <u>both</u> the good and the bad outcome.

Preventive care represents both "self-insurance" and "self-protection" in the Becker-Ehrlich sense.[9] As well as reducing the size of potential loss, preventive care also alters the probability distribution of outcomes, shifting the distribution toward the favorable outcome.

Denoting first period preventive care expenditure as C^1 and the price of preventive care as $P_c^{\,1}$, the first order condition with respect to C^1 is:

$$\begin{aligned}
&\pi_1 \left\{ U'(Y^{1a})P_c^{\,1} + (1-\pi_1)\,\psi'(Y^{1b})\,(P_c^{\,1} + D^2 P_D^{\,1'}(C^1)) \right\} + \\
&(1-\pi_2)\left\{ \psi'(Y^{2b})\,\frac{D^2 P_D^{\,2'}(C^2)}{(1+r)} \right\} - \pi_2 \left\{ \frac{U'(Y^{2a})W^2\,\partial^2 f_c^{\,1}}{(1+r)} \right\} - \\
&(1-\pi_2)\left\{ \psi'(Y^{2b})\,\frac{W^2\,\partial^2 f_c^{\,1}}{(1+r)} \right\} + \frac{\partial\pi_1}{\partial C^1}(U(Y^{1a}) - \psi(Y^{1b})) + \\
&\frac{\partial\pi_2}{\partial C^1}(U(Y^{2a}) - \psi(Y^{2b})) = 0
\end{aligned} \tag{12}$$

where $f_c^{\,1} = f'(C^1)$.

Condition (12) implies that in equilibrium, the weighted loss in utility from expenditures on preventive care plus the increment in utility due to shifts in probability toward the good outcome equals the weighted discounted marginal gain due to increased healthy time in period 2.

E. Incentive Effects

In this section, we examine the incentive effects of disability insurance in terms of the individual's demand for health care -- where health care consists of expenditures on acute care and preventive care.

We make the following propositions:

i) Disability insurance, through an "income" effect, encourages acute care expenditures.

To see this, substitute the first order condition for disability insurance (10) into the first order condition for acute care expenditures(11).

$$\frac{P_V^{\;1}}{f_V^{\;1}} = \frac{1}{P_D^{\;1}} \; \frac{\pi_2 U'(Y^{2a})}{(1-\pi_1)\,\psi'(Y^{1b})} \; \frac{W^2 Y^2}{(1+r)} \tag{13}$$

In equation (13), disability insurance will decrease Y^{1b} since income is transferred from the good outcome to the bad outcome. If the individual is risk averse in the good outcome, $\psi'(Y^{1b})$ will increase. With all else held constant, the left hand side of (13), the marginal cost of acute care, will fall. Therefore, we would expect demand for acute care to rise.

ii) Disability insurance will likely discourage preventive care expenditures, but the ultimate effect will depend on the effect of preventive care on the price of disability insurance.

Substituting the first order condition for disability insurance (10) into first order condition for preventive care (12), we have:

$$-\pi_1 P_c^{1} U'(Y^{1a}) + U(Y^{1a}) \frac{1}{P_D{}'(C^1)} (P_c^{1} + D^1 P_D{}'(C^1)) - (1-\pi_2)\ \psi'(Y^{2b}) \frac{(D^2 P_D^{2\prime}(C^1))}{(1+r)} = \pi_2\ \psi'(Y^{2a}) \frac{W^2 Y^2 f_c^{1}}{(1+r)} + (1-\pi_2)\ \psi'(Y^{2a}) \frac{W^2 Y^2 f_c^{1}}{(1+r)} + \frac{-\partial\pi_1}{\partial_C^1} (\psi(Y^{1b}) - U(Y^{1a})) + \frac{-\partial\pi_2}{\partial_C^1} (\psi(Y^{2b}) - U(Y^{2a}) \quad (14)$$

The ultimate effect ofdisability insurance on preventive care will depend on the sum of two effects: a) the effect of disability insurance on the self-protection aspect of preventive care, which will be positive in a similar manner to the acute care case; and b) the effect of disability insurance on the self-protection aspect of preventive care, which may be positive or negative.

The second effect is the measure of the extent of "moral hazard."[10/] We focus on the moral hazard effect here, assuming for now that the self insurance aspect of preventive care is constant.

The left-hand side of (14) measures the marginal utility cost of preventive care, both in terms of own cost, and its effect on the price of disability insurance. The final two terms of (14) measure the increments in utility from favorable shifts in the probability distribution in the presense of disability insurance. This is really posing the question: how productive is preventive care if disability insurance is available?

We may specify the price of disability insurance as:

$$P_D^{\,i} = \frac{\lambda_i \pi_i}{(1-\pi_i)} \qquad i = 1,2 \tag{15}$$

where $\lambda_i \geq 1$ and the the load factor is $(\lambda_i - 1)$. The load factor factor may reflect demand side costs (e.g., application costs) as well as supply side administrative costs.

The effect of preventive care on the price of disability insurance may be written as:

$$P_d^{\,i'}(C^1) = \frac{\partial P_D^{\,i}}{\partial C1} = \frac{\Pi_i}{(1-\pi_i)} \frac{\partial \lambda_i}{\partial C^1} + \lambda_i \left(\frac{\partial \Pi_i}{\partial C^1} / (1-\pi_i)\right) i = 1,2 \tag{16}$$

where $\frac{\partial \Pi_i}{\partial C^1} < 0$. Equation (16) measures the marginal gain from preventive care expenditures in the presence of disability insurance. We would expect the decline in $P_D^{\,i}$ because of $\frac{\partial \pi_i}{\partial C^1} < 0$ to be offset by the increase in λ_i when disability insurance is present, thereby leaving the final effect on the price of disability insurance uncertain.

The effect of disability insurance in the last two terms in (14) is to reduce the utility gain from preventive care expenditures. Disability insurance reduces the difference in income between outomce a and outcome b since it transfers income from the good to the bad outcome. Given a normal utility function, the utility gain, which is $\frac{\partial \Pi_i}{\partial C^1}(\psi(Y^{1b})-U(Y^{1a}))$ will be decreased. To the extent that the (negative) utility effect dominates the (positive) price effect, disability insurance will discourage preventive care as a by product of moral hazard.

IV. Empirical Results

In empirically testing the insurance model of Section II, of primary interest is the effect of disability insurance on expenditures on acute and preventive care, in line with results derived in the previous sections.

The estimating equations are of the general form:

$$M = f(D,W,X,u) \tag{17}$$

where M is expenditures on health care, D is the amount of disability insurance purchased (the level of potential benefits), W is the market wage rate, X is a vector of human capital, environmental, and socioeconomic variables, and u is an error term reflecting unobserved variables such as individual tastes and genetic endowment, measurement error in the endogeneous variables, and errors in the specification of functional form.

Ideally, we would like to separate M into acute case and preventive care expenditures. However, most types of health care are a combination of both, although expenditures such as hospitalization might be considered acute care.

The data used for estimation are taken from the 1969 original interview sample of the Longitudinal Retirement History Study(LRHS). The subsample drawn from the LRHS was males aged 58-63 who were eligible for disability benefits based on covered employment under Social Security.

Table 2 gives definitions for the variables used in the analysis. BEN is a measure of the individual's potential monthly benefits from Social Security disability insurance (DI). WAGE is a measure of the hourly wage rate for the individual. A wage rate was imputed for non-workers in order to correct for possible selectivity bias.

The variable WKDIS is a work disability dummy variable which is intented to serve as a measure of the individual's lagged or past health status. One would prefer a measure of health from a past point in time; however, use of the original 1969 LRHS precludes this. WKDIS does reflect a certain measure of past health, although it may also reflect a current disability.

The dependent variables with the exception of PRE measure dollar expenditures in 1968 including the amount covered by insurance. Since quality is an important element in describing health care, expenditures as opposed to number of "units" purchased would seem to be a better measure of health care demand.[11/]

TABLE 2

Definition of Variables Used in Health Care Equations

Independent Variables

RURAL = dummy variable equal to 1 if person resides in rural area code, 0 otherwise

ED = individual's years of schooling completed

MARRIED = dummy variable equal 1 if married, 0 otherwise

RACE = dummy variable equal to 1 if black, 0 otherwise

AGE = age of individual

HEAD = dummy variable equal to 1 is head of household, 0 otherwise

HHSIZE = number of persons in household

COMINSUR = dummy variable equal to 1 if covered by employer health plan(such as Blue Cross), 0 otherwise

KIDS = number of children currently living

SIBS = number of brothers and sisters of individual

WAGE = hourly wage rate of individual

BEN = potential monthly benefits from Social Security disability insurance, given that the individual is eligible based on their earnings records as of 1968

WKDIS = dummy variable equal to 1 if individual reported having a work limitation of at least 1 year's duration, 0 otherwise

FAM = total family income in 1968

ASSETS = total net family assets in 1968

Dependent Variables

DOCBILL = doctor's bills during 1968 (including amount covered by insurance)

DRUG = bills for drug prescriptions during 1968

NON = bills for nonprescription medicine during 1968

OTH = bills for other medical services and supplies during 1968

TABLE 2 (continued)

HOSBLL = bills for overnight hospital stays during 1968

PRE = dummy variable equal to 1 if received, "free medical services" in 1968 such as X-rays, vaccinations, etc., 0 otherwise

(A variable prefixed by LN denotes the log of that variable)

TABLE 3

Mean and Standard Deviation of Variables Used in Health Care Expenditure Equations   N = 3960

Independent Variables	Mean	Standard Deviation
ED	9.9	3.7
MARRIED	.90	.30
RACE	.073	.26
AGE	60.3	1.7
HEAD	.98	.13
HHSIZE	2.6	1.3
WKDIS	.28	.45
KIDS	2.5	2.2
SIBS	3.3	2.4
HINSUR	.25	.43
LNWAGE	2.1	2.7
LNBEN	4.9	.25
LNASSETS(in thousands)	3.0	1.4
LNFAM	8.5	1.9
Dependent Variables		
LNHOSBLL	0.6	1.9
LNDRUG	2.7	2.2
LNNON	1.5	1.0
LNOTH	1.6	2.0
PRE	.17	.38

Least Squares Estimates

Tables 4 and 5 show ordinary least squares estimates of six health care demand equations.

Table 4 shows the unrestricted OLS estimates, while Table 5 shows estimates using an alternative specification of potential disability benefits. In this specification, the coefficient on the log of the wage rate(LNWAGE) is restricted to be of equal and opposite sign to the coefficient on the log of benefits (LNBEN).[12/]

There are two major reasons for using this alternative specification. First, since benefits are a positive function of past wages covered by Social Security, this variable may be causing a "wage" effect as opposed to the desired insurance effect. Therefore, entering wages and benefits in essentially ratio form (the restriction) helps control for the possible wage effect. Secondly, the restricted specification for benefits is similar to that used by authors such as Parsons (1980 a,b).

In the unrestricted estimates of Table 4, the coefficients on potential disability benefits, LNBEN, are positive and significant for doctor's bills (LNDRUG). The coefficients are positive but not significant for the other health care categories.

In Table 5, showing the restricted estimates, the coefficients on LNBEN are negative and significant for expenditures on physician services (LNDOCBLL), and bills for prescription drugs (LNDRUG). The coefficient is negative and significant at the 10 per cent level for use of medical services such as X-rays

TABLE 4

Ordinary Least Squares Estimates of Health Care Expenditure Equations for Males Aged 58-63; Unrestricted (t-statistics in parentheses) N = 4563

Dependent Variable	LNDOCBILL	LNDRUG	LNNON	LNOTH	LNHOSBLL
Independent Variables					
Intercept	-2.8 (-1.9)	-2.4 (-1.7)	.75 (1.2)	-.60 (-.5)	-.70 (-.6)
EDUC	.02 (1.9)	.01 (1.0)	.002 (.4)	.04 (4.1)**	.03 (2.8)**
MARRIED	.10 (.8)	.32 (2.7)**	.41 (7.4)**	.25 (2.3)*	.12 (1.1)
RACE	.16 (1.1)	.02 (.1)	.17 (2.6)	-.09 (-.8)	-.13 (-1.1)
AGE	.02 (1.0)	.03 (1.4)	-.008 (-.9)	.006 (.4)	.007 (.4)
HEAD	.008 (.02)	.14 (.5)	.28 (2.4)*	-.08 (-.3)	.21 (1.0)
HHSIZE	-.09 (-3.1)	-.04 (-1.3)	.06 (4.7)**	-.037 (-1.4)	-.023 (-.9)
WKDIS	1.4 (17.3)**	1.3 (17.8)**	.17 (4.7)**	.17 (2.4)**	.4 (6.1)**
KIDS	.02 (1.1)	.008 (.5)	-.002 (-.3)	.007 (.4)	.013 (.9)
SIBS	-.01 (-.7)	-.02 (-1.3)	.0007 (.01)	-.008 (-.6)	.01 (.9)
COMINSUR	.22 (2.7)**	.09 (1.2)	.01 (.3)	.06 (.9)	.14 (2.1)*
LNWAGE	.05 (3.3)**	.04 (3.2)**	-.003 (-.5)	-.016 (-1.3)	-.007 (-.6)
LNBEN	.7 (4.1)**	.50 (3.4)**	.08 (1.1)	.21 (1.5)	.007 (.05)
LNASSETS	.1 (3.4)**	.11 (4.0)**	-.004 (-.3)	.07 (2.8)**	-.007 (-.3)
LNFAM	.02 (1.0)	-.007 (-.4)	.0005 (.06)	.01 (.8)	.03 (1.8)
RURAL	-.24 (-3.0)**	-.34 (-4.6)**	-.14 (-4.1)**	-.05 (-.7)	-.11 (-1.7)
R^2	.0862	.0907	.0369	.0199	.0145

TABLE 4

Ordinary Lease Squares Estimates of Health Care Expenditure Equations for Males 58-63; Unrestricted (Continued)

Dependent Variable	PRE
Independent Variables	
Intercept	-.14 (-.6)
EDUC	.002 (1.2)
MARRIED	.007 (.3)
RACE	.12 (5.0)**
AGE	.001 (.5)
HEAD	-.06 (-1.3)
HHSIZE	.005 (1.0)
WKDIS	.007 (.5)
KIDS	.0007 (.2)
SIBS	-.001 (-.5)
COMINSUR	.06 (4.2)**
LNWAGE	.004 (1.8)
LNBEN	(.03) (1.2)
LNASSETS	-.007 (-1.6)
LNFAM	.01 (3.3)**
RURAL	-.02 (-1.9)

R^2 0.189

** denotes significant at 1 percent level

* denotes significant at 5 percent level

TABLE 5

Ordinary Least Squares Estimates of Health Care Expenditure Equations for Males Aged 58-63; Restricted (Coefficient on LNWAGE Equals Minus Coefficient on LNBEN) (t-statistics in parentheses) N = 4563

Dependent Variable	LNDOCBILL	LNDRUG	LNNON	LNOTH	LNHOSBLL
Independent Variables					
Intercept	.61 (.5)	.19 (.2)	1.1 (2.0)**	.34 (.3)	-.7 (-.7)
EDUC	.03 (2.4)*	.01 (1.5)	.003 (.5)	.04 (4.2)**	.03 (2.9)**
MARRIED	.13 (.9)	.33 (2.9)**	.41 (7.4)**	.25 (2.3)**	.11 (1.1)
RACE	.05 (.3)	-.06 (-.5)	.15 (2.5)**	-.12 (-1.0)	-.13 (-1.1)
AGE	.02 (.9)	.02 (1.3)	-.008 (-.9)	.006 (.3)	.007 (.4)
HEAD	.06 (.3)	.18 (.7)	.3 (2.4)*	-.07 (-.3)	.2 (1.0)
HHSIZE	-.1 (-3.1)*	-.04 (-1.4)	.06 (4.7)**	-.04 (-1.4)	-.03 (-.9)
WKDIS	1.4 (16.9)**	1.3 (17.5)**	.16 (4.6)**	.16 (2.3)*	.40 (6.1)**
KIDS	.02 (1.0)	.008 (.5)	-.002 (-.3)	.007 (.4)	.01 (.9)
SIBS	-.01 (-.7)	-.02 (-1.3)	-.0000007 (-.001)	-.008 (-,6)	.01 (.9)
COMINSUR	.25 (3.1)**	.11 (1.5)	.02 (.4)	.07 (1.0)	.14 (2.1)*
LNWAGE	.04 (3.2)**	.04 (3.2)**	-.003 (-.5)	-.02 (-1.4)	-.007 (-.6)
LNBEN	-.04 (-3.2)**	-.04 (-3.2)	.003 (.5)	.02 (1.4)	.007 (.6)
LNASSETS	.12 (4.2)**	.12 (4.7)**	-.002 (-.2)	.07 (3.0)**	-.007 (-.3)
LNFAM	.03 (1.3)	-.002 (-.1)	.001 (.1)	.01 (.9)	.03 (1.8)
RURAL	-.4 (-4.5)**	-4.2 (-6.0)**	-.15 (-4.6)**	-.08 (-1.2)	-.1 (-1.8)
t-statistics for restriction	4.4**	3.6**	1.1	1.4	-.002
R^2	.0822	.0880	.0367	.0194	.0145

TABLE 5

Ordinary Least Squares Estimates of Health Care Expenditure Equations for Males Aged 58-63; Restricted (Continued)

Dependent Variable	PRE
Independent Variables	
Intercept	.03 (.1)
EDUC	.002 (1.4)
MARRIED	.008 (.4)
RACE	.11 (4.8)**
AGE	.001 (.4)
HEAD	-.06 (-1.2)
HHSIZE	.005 (1.0)
WKDIS	.004 (.3)
KIDS	.0007 (.2)
SIBS	-.001 (-.5)
COMINSUR	.06 (4.4)**
LNWAGE	.004 (1.8)
LNBEN	-.004 (-1.8)
LNASSETS	-.006 (-1.4)
LNFAM	.01 (3.5)**
RURAL	-.03 (-2.4)*

t-statistic for regression: 1.4

R^2: .0185

** denotes significance at the 1 per cent level on a two-tailed test

* denotes significance at the 5 per cent level on a two-tailed test

and innoculations(PRE). The coefficients are insignificant for the other three health care categories.

A t-test was performed to test the null hypothesis that $\beta_1 + \beta_2 = \emptyset$, where β_1 is the coefficient on wages and β_2 is the coefficient on benefits. The low t-values for LNNON, LNOTH, LNHOSBLL, and PRE does not lead us to rejection of the null hypothesis(the restriction), while the high t-values for LNDOCBLL and LNDRUG would suggest rejection of the null hypothesis.

The results indicate the expected positive effect of disability insurance on acute-care oriented expenditures such as prescription drugs. The elasticity of drug prescription expenditures with respect to benefits was found to be about .5 from Table 4.

The results also indicated (less strongly) a negative effect of disability insurance on preventive care oriented expenditures such as X-rays and innoculations(PRE). This suggests possible moral hazard effects. The estimates from Table 5 indicated an elasticity of use of X-rays and innoculations with respect to benefits of about -.004.

V. Conclusion

We have examined one possible factor which has contributed to the significant recent growth in the Social Security Disability Insurance(DI) program: that of health care incentives in the presence of disability insurance.

The examination of health care incentives involved a 2-period, 2-state insurance model under uncertainty which incorporated two general types of insurance-disability insurance and the individual's "own" insurance or own risk-bearing. Own insurance was represented by the individual's expenditure on health care goods and services. These expenditures were of two distinct types -- acute care and preventive care. The theoretical model predicted that disability insurance had a positive effect on acute care, while the extent to which disability insurance discouraged preventive care depended largely on the effect of preventive care on the price of disability insurance.

Ordinary least squares regressions for the health care demand equations indicated a positive effect of disability benefits on acute-oriented care (prescription drugs) and a negative effect on preventive oriented care (X-rays and innoculations). The regression coefficients indicated an elasticity of expenditures on prescription drugs with respect to benefits of about .5, and and elasticity of use of X-rays and innoculations with respect to benefits of about -.004.

From a social policy standpoint, the health care effects suggest only minor adverse incentives and efficiency losses in terms of individual expenditures on health care inputs. Therefore, from a microeconomic point of view, any health care efficiency losses may well be offset by an improvement in the position of disabled persons both in terms of absolute and relative income.

NOTES

1/ From Social Security Handbook, 1974.

2/ At age 65, Disability Insurance reverts to retirement insurance under Social Security.

3/ The model could be extended to a multi-period, multi-state model. However, the results remain basically the same. Also, we assume that the individual lives through period 2, although the outcome in periods 1 and 2 will affect the future probability of death.

4/ For a discussion of the pain and suffering assumption, see Thaler and Rosen (1976).

5/ This assumption is also made by Shavell (1979).

6/ We may define time lost, $\tilde{t}_\ell$, by $\tilde{t}_\ell = \bar{t}_\ell + k$; where $\bar{t}_\ell$ is the expected loss of market and nonmarket time, and k is a stochastic term where $k>0$ with probability π, and $k=0$ with probability $(1-\pi)$.

7/ This is the assumption made by Grossman (1972). Authors such as Taubman and Bartel (1979) have decomposed the effect of health on earnings into a labor supply a wage effect.

8/ See Becker and Ehrlich (1972) for a discussion of market insurance, self-insurance and self-protection.

9/ Ibid.

10/ As Arrow (1962) states, "One of the limits which has been much stressed in the insurance literature is the effect of insurance on incentives" (p.961). Mehr and Commack (1966) describe moral hazard as a subjective characteristic of the insured that increases that probability of a loss" (p.174). Rea (1981) in his article dealing with workmen's compensation and occupational safety describes moral hazard as a) the difficulty for the employer in monitoring the precautions taken by employees; b) an inability of the workmen's compensation board or insurance carrier to monitor employer's or employee's precautions, and c) the inability of the insurance carrier to monitor the extent of injury.

We would expect the general problem of monitoring to be especially great in the case of a large public insurance mechanism such as Social Security Disability Insurance.

NOTES

11/ Expenditures are used as a measure of health care by Grossman (1972) and Menefee (1981) among others. Although PRE denotes "free medical services" as worded in the LRHS survey, there still may be time costs involved.

12/ The double-log form used for the demand equations in Tables 4 and 5 showed a better fit (higher R-squared) for almost all expenditure categories, than did the linear form.

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