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EMPIRICAL DETERMINANTS OF SELF-REPORTED HEALTH STATUS INDICATORS

(A Sample Study of Urban Chennai Metropolitan Area)

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Abstract: **Health status through self-reported health indicators is examined in this paper. The objective is to identify the determinants of self-reported health status indicators. In addition to OLS estimates of the probability of illness production function, Maximum Likelihood Probit and Logit estimates are used. Illness probability of husband is reduced by his education and increased by his age. Similar results are observed using the dependent variable 'days lost' due to illness. Husband's education has a positive effect on 'amount spent' on health care. Wife's education has a negative effect on her illness probability. Wife's age is found to have a significant relationship with her illness probabilities. Wife's education and age have positive impacts on her 'amount spent' to cure illness.**

Keywords: **Self-reported health indicators, OLS, Maximum likelihood probit and logit.**

1. INTRODUCTION

Health status through self-reported health indicators is examined in this paper. These indicators include: (i) self-reported disease symptoms and (ii) reports on incapacity for undertaking normal respondent activities. We have not included other health status indicators such as clinical measures in this study owing to huge data collection costs. The objective of this paper is to identify the determinants of self-reported health status indicators.

This paper is organized as follows: Section 2 presents and discusses the available evidence on the above mentioned health indicators from the NSS 42nd, 52nd and 60th rounds survey data. Next, the determinants of self-reported health indicators are examined using primary survey data. In section 3, empirical analysis is presented. Section 4 presents the regression results. Section 5 summarizes the findings.

2. AGGREGATE EVIDENCE ON SELF-REPORTED HEALTH INDICATORS BASED ON NSS SURVEY

We have made use of information about hospitalization cases, average duration of stay in hospital, loss in household income due to hospitalization, from the NSS data. Table 1 depicts the trend in hospitalization cases in urban sectors of India. In urban areas, the usage of Government hospitals has come down and that of private hospitals has increased. This shows that the quality of health care preferred by the people is not met by Government hospitals due to lack of perfection in providing such care.

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Table 1: Trend in Hospitalization Cases – Government /Pvt.

NSSO	Govt.	Pvt.
42nd	603	397
52nd	431	569
60th	382	618

Source: NSSO Records

Table 2: Distribution of Hospitalisation Cases Per 1000 by Type of Hospital and Type of Ward (India)

Sector	MPCE/STATE	Public Hospital			Pvt. Hospital			
		Free	Paying	All	Free	Paying	All	Total
Urban	Bottom 20%	506	71	576	22	402	424	1000
	All India	304	78	382	16	602	617	1000

Source: NSSO 60th Round

Table 3: Average duration of stay (in days) in hospitals - public and private (India)

Sector	Average No. of Days stayed in the Hospital	
	Type of Hospital	
	Govt. Hospital	Pvt. Hospital
Rural	10.9	8.3
urban	10.8	7.3
rural + urban	10.9	8.0

Source: NSSO 60th Round

Table 4: Medical and Total expenses per hospitalization case by type of hospital and loss of household Income due to hospitalization in TN and India

1. Medical Expenses by Source of Treatment	T N (urban)	T N (rural)	India (urban)	India (rural)
a) Govt.	17	637	7	3238
b) Private	260	8360	299	7408
c) All	277	5238	306	5695
1. Other Expenses	24	537	20	530
2. Total Expenditure	301	5775	326	6225
3. Loss of House hold Income per treated person	48	369	96	636

Source: NSSO 60th Round Rural Reports

Table 4 presents the details of medical expense component in total expenditure and the loss in household income due to hospitalization across rural and urban sectors of Tamil Nadu and India .The total expenditure (301) is notably less in urban Tamil Nadu against the expenditure (5775) of rural areas. The same trend is observed in the data relating to India. There is a wide difference in the facilities available between urban and rural Tamil Nadu and India. Rural records prove that all the expenses show several times higher than that of urban, both in Tamil nadu and India. A notable difference exists between rural and urban household income spent on health care.

To sum up, the NSSO survey indicates that the wide differences between rural and urban sectors in the provision of health care facilities and the choice or preference of these facilities by the people of rural areas is higher than that of urban areas. There exists a substantial variation in sickness days and health expenditure across the states in India.

3. EMPIRICAL ANALYSIS: DATA, MODEL AND VARIABLE SPECIFICATION

The primary data for the study come from a sample survey conducted using a structured interview schedule in randomly selected 20 divisions out of 150 divisions in the Chennai urban agglomeration. The sampling procedure used is multi-stage stratified random sampling method.

The demand equations for health are expressed as functions of prices, wages, other income and environmental variables. In our empirical model, we treat price as a constant. We use 'education' in years to capture the effect of wages on the self-reported health status variables. In empirical studies, education is used as a proxy for wages due to problem of missing observations since wage data is not available for all individuals as some of them are unemployed and some others self employed. In our specification, we include only education of the particular individual and ignore spouse's education, since problem of multicollinearity is encountered due to high positive correlation between education and spouse's education. Zero – order correlation between education and spouse's education is 0.85. We also tried square terms and interaction terms of relevant variables in our earlier specifications.

Further, we have included 'assets' to capture non-labor income effects. Assets refer to total household assets. Assets are used in empirical studies as a proxy for non-labor income.. Since it is difficult to assess returns from assets in various forms, any attempt to construct individual-specific non-earned income will lead to imprecise measurement.

The empirical model used in this paper can be specified as

$H_{ij} = B_0 + B_1 Ed_{ij} + B_2 assets + B_3 E_i + U_{ij}$;

$i = 1, 2, 3, \ldots \ldots \ldots, N$ observations

Where,

J → H, W.

H → Husband

W→ Wife

H_{ij} is the health status of jth member, Ed_{ij} is the education of the j^{th}, member, assets is the total value of the assets. E_i is the environmental variable. The set of variables included to capture the environmental factors are caste, religion, drinking water, toilet and drainage dummies. Physical exercise is also included as a dummy variable in the model. B's are the parameters to be estimated. U_{ij} is the random disturbance term.

For estimation of the above model household-level-data collected through the survey method in the urban Chennai city from 500 households is used. The description of the variables included in the model and the rationale for including them are discussed below:

Dependent Variables

The dependent variables namely self-reported health status indicators are classified into the following two sets of variables.

Husband and wife health indicator variables: Illness, days lost and amount spent.

The analysis is restricted to only husbands and wives. The other adult members in the household are outside the purview.

Illness: This is a dummy variable dichotomised with 1 for self-reported illness and 0 otherwise. The reference period is one month preceding the time of interview. Some studies have attempted health status measurement by the absence of illness dummy variable.

Days Lost: Number of days lost by the husband or wife intends to measure morbidity with the reference period of one month.

Amount Spent: The expenditure incurred by husband or wife for treatment of illness is also used as a self-reported measure of health status. It intends to reflect the severity of illness and the quality of health care sought.

Exogenous Variables

Education: We measure this variable by years of education. It is expected to have a negative effect on probability of illness, since educated people are aware of preventive health care and hence will maintain a good health status. Education is also expected to have a negative effect on days lost and amount spent on health subsequently. But education could

have a positive association with amount spent on health care, since educated people spend more on preventive health care.

Assets: This variable is measured as the money value of all assets including house, inheritances, gifts and jewelry net of outstanding loans and past savings. It is expected that higher asset values would have a negative impact on illness probabilities and days lost but positive impact on amount spent on health care.

Household Environmental Variables: Household environmental variables are also important determinants of health status.

For this study, household demographic variables such as age of husband and wife, sociological variables such as religion christian, muslim, other religions like jainism, buddhism etc, backward caste and SC/ST dummies and household environmental variables such as drinking water, boiled water and drainage dummies are included. Toilet dummy is excluded since almost all samples have toilet facilities in their house. Physical exercise is included as a dummy. Religion is believed to have an influence on health status, since various religious beliefs such as karma, and religious practices such as vegetarianism etc. may affect one's health status. Hence, we include religion in our model. Religions christian, muslim and others are dummy variables. All these dummy variables, take value 1 if the respondent household belongs to that religion and 0 otherwise.

We include community variables such as forward caste, backward caste and SC/ST in the model in order to control for variation between these groups.

Backward caste and SC/ST are dummy variables dichotomized between 1 and 0 if the respondent household comes from a backward or SC/ST community respectively and 0 otherwise.

Environmental variables such as provision of toilet and drainage exert significant influence on health status in recent studies. Drainage facility, drinking water, boiled water etc are those dummy variables which take values 1 - 0 for availability and otherwise.

Estimation Method

In addition to OLS estimates of the probability of illness production function, we also use Maximum Likelihood Probit and Logit estimates, since the dependent variable is a dummy variable and OLS is inconsistent. However, in the other two functions namely `days lost' and `amount spent', we use OLS and Tobit estimates. Since `days lost' and `amount spent' variables have non-zero observations only in case of respondent reporting illness, we have estimated Tobit functions due to this discontinuity. The truncated nature of the dependent variables `days lost' and `amount spent' renders the OLS estimates inconsistent. Hence, these procedures involve the use of Maximum Likelihood Tobit to estimate the parameters for all the individuals.

4. EMPIRICAL RESULTS

This section is organized as follows: In section 4.1 descriptive statistics (means and standard deviations) of the entire variables are presented. In section 4.2, we explain the OLS estimation results of the household level, husband and wife health indicator equations. In section 4.3, a summary of empirical results are presented.

4.1 Results of Descriptive Statistics

The variables, their means and standard deviations are given in tables 5. The endogenous dependent variables namely household level variables and husband and wife health indicator variables are alternatively measured in order to check whether the results are sensitive to these measures. It is evident from table 5 that the mean years of husband's education is greater than that of wife in the sample households.. The mean assets is less than standard deviation of assets indicating the extent of variation in the distribution of assets in the sample households.

56 percent of the households are equipped with drainage facilities. Husband's mean age is greater than that of wives by 2 years. Husband's and wife's mean probability of illness is 0.26.and 0.11 indicating an inverse association between education and probability of illness. Both mean `days lost' for husbands and mean `amount spent' by husbands are much greater than that of wives. These results also support the expected education – health relationships.

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Table .5: Variable Means and Standard Deviations

Variable	Husband		Wife	
	Mean	S.D	Mean	S.D
Dependant Variables				
Illness Dummy	.2655	.44356	.1053	.30825
Days Lost Due to Illness	1.7965	7.02694	.1842	.61782
Amount spent on Health Care	937.0885	3799.63518	96.9298	443.24004
Health Expenditure of the Household	881.8584	617.67356	881.8584	617.67356
Exogenous Variables				
Education in years	17.0531	1.68417	16.2982	2.34211
Age	34.6991	14.43142	32.4474	14.02595
Assets (in Rs.)	761238.9381	4.52756E5	761238.9381	4.52756E5
Religion Christian dummy variable = 1 if Christian, 0 otherwise	.1939	.43093	.2018	.40308
Religion Muslim dummy variable = 1 if Muslim, 0 otherwise	.0919	.26213	.0919	.26213
Religion Others dummy variable = 1 if Other Religions, 0 otherwise	.0591	.24523	.0614	.24113
Caste Backward Caste (BC) dummy variable = 1 if BC, 0 otherwise	.3951	.47753	.4035	.49277
Caste SC/ST dummy variable = 1 if SC / ST, 0 otherwise	.0708	.25763	.0702	.25657
Physical Exercise dummy variable = 1 if Exercise is done, 0 otherwise	.5664	.49778	.7632	.42702
Drinking Water dummy variable = 1 if Drinking Water is available, 0 otherwise	.7522	.43365	.7456	.43744
Boiled Water dummy variable = 1 if Christian, 0 otherwise	.7434	.43872	.7719	.42144
Drainage dummy variable = 1 if Drainage facility is available, 0 otherwise	.5614	.49841	.5614	.49841
N	500		500	

4.2 Regression Results

The empirical model is estimated by OLS, Maximum Likelihood Probit, Logit and Tobit methods. The results are discussed in this section equation by equation.

Health Indicator Equations

Illness Equation: The illness equation are estimated by OLS , Maximum likelihood Probit and Logit techniques.

Illnes Probability: The elasticity estimates of husband and wife health indicators are presented in table 9. Husband's education is found to influence husband's illness probability negatively. Its effect is also statistically significant at 1percent level. Elasticity of husband's illness probability with respect to husband's education shows that a 1 percent increase in husband's education would decrease illness probability by 0.10 percent. The change in illness proportion is less than that in husband's education. It could be due to the fact that apart from husband's education, there are other variables which influence illness. The coefficient of assets is positive but not statistically significant.

Husband's age has a positive effect on husband's illness. The effect is statistically significant at 1 percent level. It indicates that as individual ages, his chance of falling ill is more. A one percent increase in husband's age leads to 1.3 percent

increase in husband's illness. Among the household-specific sociological and environmental variables, both physical exercise, drinking water facility and drainage variables have negative signs.

'Dayslost' Equation:

The estimated results of this equation are presented in table 7. In this equation, the effect of husband's and wive's education are statistically significant at 5 percent level. The sign of the variable implies that as education increases, days lost decreases. Elasticity estimate suggests that a 1 percent increase in husband's education decreases days lost by 2 percent. Though asset variable has the expected negative sign, it is not statistically significant for wives. It implies that the effect of assets on 'days lost' is negligible. The coefficient of husband's age is positive and statistically significant at 1percent level. A 1 percent increase in husband's age increases husband's day lost by 3 percent pointing to the fact that as husband ages, the husbands lose more days due to illness more than proportionately. Even though age is positively related to days lost in wife, it does not show much significance. Physical Exercise shows negative sign implying that regular exercise helps individuals from frequent illness. Drinking water and drainage variables have significant and negative influence on days lost in case of wife and husband respectively.

'Amount Spent' Equation:

Table 8 presents the regression results on amount spent by husband and wife in the event of illness. Husband's education influences 'amount spent; theoretically in two diametrically opposite ways. Firstly, educated parents are medically better informed than their uneducated counterparts. As a result, they may fall sick less often than others and hence amount spent on medical services should be less.

The other argument is that highly educated parents earn more and hence spend more on better quality medical services. In our study, husband's education has a statistically significant positive coefficient. As we expect, husband's age has a significant positive association with amount spent.

Elasticity estimates suggest that a 1 percent increase in husband's age would increase husband's amount spent by 4 percent. In case of household specific environmental factors, drainage facility has a significant negative relationship with husband's amount spent.

Wife's education has a positive effect on wife's amount spent and the coefficients are statistically significant at 5 percent level. A one percent increase in husband's education increases wife's amount spent by 0.8 percent. Religion Christian is statistically significant at 5 percent and the caste dummies seem to have no significant influence on this variable. The environmental dummy drainage is influencing health care spending negatively.

Table 6: Ordinary Least Squares (OLS) Maximum Likelihood Probit (PROBIT) and Logit (LOGIT) Estimates of the Determinants of Illness Probabilities of Husband and Wife

Variables	Husband			Wife		
	OLS	PROBIT	LOGIT	OLS	PROBIT	LOGIT
Education	-.165 (-8.213)	-.099[A] (-3.201)	-.774[A] (6.910)	-.021[B] (-2.058)	-.019[C] (-1.498)	-.244 (0.871)
Age	.010[A] (4.280)	.008[A] (2.347)	.101[B] (3.642)	-.005 (-1.295)	-.007 (-.793)	-.049 (.708)
Assets	5.583E-8 (.793)	.000 (-.013)	.000 (7.773)	-1.279E-7[C] (-1.501)	.000 (-.662)	.000 (1.540)
Religion Christian	-.010 (-.136)	-.006 (-.047)	.009 (.000)	-.029 (-.324)	-.113 (-.521)	-.461 (.132)
Religion Muslim	.120 (1.135)	.253[A] (1.707)	1.015 (.342)	.000 (.003)	.191 (.789)	.322 (.062)
Religion Others	.030 (.276)	.116 (.545)	-15.866 (.000)	.237[C] (1.897)	.084 (.295)	2.368[3] (2.655)
Caste BC	-.139 (-1.434)	.033 (.260)	.278 (.025)	.196[A] (2.916)	.035 (.264)	2.561[A] (7.240)
Caste SC/ST	.222[B] (2.194)	.293[A] (1.721)	1.217 (1.091)	.047 (.404)	.243 (1.041)	.009 (.000)
Physical Exercise	-.007 (-.100)	-.036 (-.340)	2.405[B] (4.945)	.032 (.382)	-.212 (-1.205)	.191 (.034)

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Drinking Water	-.432[A] (-6.594)	-.053 (-.504)	-3.719[A] (11.952)	-.176[B] (-1.927)	-.248[C] (-1.420)	-2.477[B] (3.586)
Boiled Water	.076 (.780)	.011 (.077)	1.868 (1.140)	-.191 (-1.138	-.357 (-1.098)	-1.977 (.714)
Drainage	-.075 (-1.454)	.026 (.337)	-1.759[C] (-3.219)	.023 (.276)	.089 (.518)	.291 (.063)
Constant	3.013 (7.038)	-3.414[B] (-2.869)	2.698 (.241)	.861 (2.053)	-1.333[C] (-1.640)	5.890 (1.082)
$\overline{R^2}$ /Log Likelihood	.671	------	50.382	.081	-------	55.596
F- Statistic/ χ^2	1.484	163.491	80.408	1.801	270.462	20.218
N	500	500	500	500		

Note: Figures in parenthesis denote't' values for OLS, 'Z' values for PROBIT and 'WALD Statistic for LOGIT. (Significance Level: - A: 1%, B: 5%, C: 10 %.)

Table 7: Ordinary Least Squares (OLS) and Tobit (TOBIT) Estimates of the Determinants of Days Lost due to Illness of Husband and Wife

Variables	Husband		Wife	
	OLS	TOBIT	OLS	TOBIT
Education	-.207[B] (-2.450)	.8802[C] (1.810)	-.018[B] (-2.432)	-0.0684 (-1.628)
Age	.189[A] (3.711)	.2809[A] (3.926)	.008 (.942)	.004 (.275)
Assets	-3.656E-6[B] (2.271)	-5.231E-6[B] (2.419)	-1.642E-7 (-.933)	-2.16E-7 (-.654)
Religion Christian	5.099[A] (2.953)	9.562[A] (2.718)	.129 (.689)	5.672 (.541)
Religion Muslim	.943 (.391)	1.372 (.276)	-.088 (-.353)	-.089 (-.166)
Religion Others	-.491 (-.201)	-.7103 (-1.255)	.483[C] (1.870)	.75993 (1.729)
Caste BC	-2.749 (-1.239)	-12.3034 (-2.430)	.292 (0.101)	.5274 (1.017)
Caste SC/ST	-.339 (-.147)	-.7291 (-.258)	.015 (.064)	.4392 (.0524)
Physical Exercise	-1.476 (-.961)	-8.6654 (1.760)	.013 (.076)	.394 (.642)
Drinking Water	.253 (.169)	.6365 (.192)	-.289[B] (-1.532)	-.4512 (-1.736)
Boiled Water	-2.755 (-1.235)	-18.667 (-.895)	-.368 (-1.063)	-.5521 (-1.125)
Drainage	-1.953[C] (1.660)	-9.847 (-3.626)	-.045 (-.255)	-.2956 (-.429)
Constant	-4.759 (-.486)	-66.9342 (-6.142)	1.212 (1.398)	-12.629 (-1.074)
$\overline{R^2}$ / Log Likelihood	.274	-646.006	.024	-952.428
F- Statistic/ χ^2	4.428	-------	1.226	-------
N	500	500	500	500

Note: Figures in parenthesis denote't' values for OLS, and asymptotic't' values for TOBIT
(Significance Level:- A: 1% , B: 5%, C: 10%.)

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Table 8: Ordinary Least Squares (OLS) and Tobit (TOBIT) Estimates of the Determinates of Amount Spent by Husband and wife on Health Care

Variables	Husband		Wife	
	OLS	TOBIT	OLS	TOBIT
Education	35.277[B] (2.140)	84.892[B] (5.840)	5.073[B] (2.170)	7.349 (0.788)
Age	94.638[A] (3.389)	125.281 (4.216)	.766 (.124)	.927 (.725)
Assets	.002[A] (2.645)	.04278 (1.894)	-4.598E-5 (-.358)	-13.487E-5 (-1.053)
Religion Christian	2195.011[A] (2.321)	5281.124 (1.58)	229.537[A] (1.683)	475.558[A] (1.672)
Religion Muslim	-281.083 (-.213)	-364.672 (-.137)	-17.289 (-.095)	-19.726 (-.0748)
Religion Others	-325.553 (-.243)	-537.102 (-.671)	180.269 (.956)	342.634 (.849)
Caste BC	-1113.217 (-.916)	-1924.97 (-.712)	152.706 (1.506)	295.261 (1.462)
Caste SC/ST	-411.043 (-.325)	-681.129 (-.524)	-13.514 (-.077)	-45.275 (-.0849)
Physical Exercise	1604.760[C] (1.907)	2254.72 (1.812)	43.279 (.345)	92.527 (.648)
Drinking Water	443.564 (.540)	784.263 (.792)	-183.636 (-1.332)	-347.743 (-1.521)
Boiled Water	-1581.419 (-1.294)	-3281.124 (-1.127)	-103.353 (-.408)	-206.472 (-.395)
Drainage	-1410.463[B] (2.189)	-2018.34[B] (2.014)	-98.117 (-.767)	-142.354 (-.953)
Constant	6181.530 (-1.153)	9524.720 (1.429)	212.499 (.336)	397.843 (.784)
$\overline{R^2}$ / Log Likelihood	.255	-1286.549	-.009	-.01184.53
F- Statistic	4.110	------	.918	--------
N	500	500	500	500

Note: Figures in parenthesis denote 't' values for OLS, and asymptotic 't' values for TOBIT
(Significance Level:- A: 1% , B: 5%, C: 10%.)

Table 9: Elasticity Estimates: Husband and Wife Health Indicators Equations

Variables	Husband			Wife		
	Illness	Days Lost	Amount Spent	Illness	Days Lost	Amount Spent
Education	-10.5980	-1.9649	0.6420	-3.2504	-1.5926	0.853
Age	1.3069	3.6505	3.5043	-1.5407	-1.4092	-0.2564
Assets	0.1601	1.5492	1.6247	-0.8722	0.6401	-0.3406
Religion Christian	-7.30E-3	0.5503	0.4542	-0.0556	0.1413	0.4779
Religion Muslim	0.0415	0.0482	-0.0276	00000	-0.0461	-0.0172
Religion	6.678E-3	-0.0162	-0.0205	0.237	0.161	0.1142

Others						
Caste BC	-0.2069	-0.6046	-0.4694	0.7511	0.6396	0.6357
Caste SC/ST	0.0592	-0.0134	-0.0311	0.0133	-0.1291	-9.78E-3
Physical Exercise	-0.0149	0.4654	0.9700	0.0320	0.0539	0.3407
Drinking Water	-1.2239	0.1059	0.3560	-1.2462	-1.1698	-1.4126
Boiled Water	0.2128	-1.1400	-1.2546	-1.4001	-1.5421	-0.8231
Drainage	0.1586	-0.6103	-0.8450	0.1226	-0.1371	-0.5683

4.3 Summary of Empirical Results

Illness probability of husband is reduced by his education and increased by his age. Similar results are observed using the dependent variable 'days lost' due to illness. Husband's education has a positive effect on 'amount spent' on health care. Wife's education has a negative effect on her illness probability. Wife's age is found to have a significant relationship with her illness probabilities. Wife's education and age have positive impacts on her 'amount spent' to cure illness. Summing up, an increase in education, age and assets reduces the probability of illness. The above results on health indicators show that there exists a wide disparity between health status and health determining factors.

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