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Self-Rated Poor Health and Socio-Economic Inequalities among Indian Elderly

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India is in a phase of demographic transition. As per the 1991 census, the population of the elderly in India was 57 million as compared with 20 million in 1951. There has been a sharp increase in the number of elderly persons between 1991 and 2001 and it has been projected that by the year 2050, the number of elderly people would rise to about 324 million. India has thus acquired the label of "an ageing nation" with 7.7% of its population being more than 60 years old. All this has happened due to the decreasing fertility rates, better medical facilities and India too is moving towards the replacement level where the population of a county remains constant and after some time when the population rise is below replacement level, the population of the country starts decreasing as of Japan.

Health plays vital role in the well-being of the elderly, in any country including India. There is a well documented but poorly understood "gradient" linking socioeconomic status to wide range of health outcomes [see Nance E Adler et al. (1994) and Sally MacIntyre (1997) for reviews]. The gradient has both a life-cycle and a temporal component; differences in mortality across socioeconomic groups are widest in late middle age. (Evelyn M. Kitigawa and Philip M. Hauser, 1993; Harriet Orcutt Duleep, 1995; Irma T. Elo and Samueal H. Preston, 1996) and are increasing over time (Jacob J. Feldman et al., 1989; G.Pappas et al., 1993; Preston and Elo, 1995,Recent work has shown that socioeconomic-status (SES) is related to functional decline and mobility disability in later life (Melzer D, Knesebeck O, Martikainen P, Porell FW). Levels of education and/or income have been significantly associated with a decrease in both total and active non-disabled life expectancy among older adults (Berkman LF, Stuck AE, Guralnik JM).

In developing countries, gaps in health related outcomes between the rich and the poor are large (Baker & Garg, 1993; Gwatkin, 2000; Leon and Walt, 2001; Wagstaff, 2002a, 2002c). These gaps limit poor peoples' potential to contribute to the economy by reducing their capacity to function and live life to the fullest. The study of poor-rich inequalities in health status should not, however, solely aim to quantify their magnitude. Research should also aim to identify which population sub-group are the most disadvantaged. For this purpose it should be possible to identify the determinants of inequalities, including those associated with age, gender, economic status, social groups etc. These variables have precisely been identified as powerful sources of health inequalities in low and middle income countries (Braveman, 1998; Starfield, 2006).

Many studies have assisted the level of socio-economic inequalities in health using concentration index and concentration curve. Tough the values of concentration indices (CIs) show the degree of socio-economic inequality, it does not highlight the pathway through which inequality occurs. Decomposition of inequalities is critical to explore pathways of socio-economic inequalities in elderly health.

Data and Methodology

Data is from the 60th round of National Sample Survey (NSS-2004). For core analysis, we considered current health status or poor health as dependent variable to standardize the interception. Independent variables for decomposition analysis included: age (70+/others), economic status (poor/non-poor), sector (rural/urban), social group (SC- ST/others), sex (female/male), education (illiterate/literate) economic dependence (dependent/not dependent) the wealth quintile distribution was used to determine poor- rich household for subsequent modeling.

For the decomposition analysis, quintiles 1 & 2 and quintiles 3, 4 & 5 were grouped together.

Table 1 provides description of variables considered for decomposition analysis. The decomposition analysis is confined to seven possible socio-economic determinants that could explain the maximum dimensions of socioeconomic inequality particularly in developing countries like India. The predictors variables of interest are i) Age above 70+ ii)Poor economic status iii) residence in rural areas iv) SC/ST v) Sex female vi) illiterate

vii) Economically dependent.

Table -1 Definition of variables considered for decomposition analysis

Health Variable (poor=1,good=0)	**Predictive Variables (yes=1,Otherwise=0)**
Current health status	Age : 70+ Poor economic status: poor Sector: Rural Social groups: SC/ST Sex: Female Education:illetrate Economic independence : economically dependent

Measuring socio-economic inequality in elderly health

The literature on the measurement of socioeconomic inequalities in health has mainly drawn on the development of rank-dependent measures in the income inequality literature. A long-standing issue in the literature on healthy inequality is whether all inequalities ought to be measured or only those which show some systematic association with indicators of socioeconomic status (Gakidou et al, 2000; Wagstaff, 2001). Some of the earlier contributions used Lorenz curves and the Gini index to measure inequality in mortality rates (e.g. LeGrand, 1989). Lorenz curve describes the cumulative distribution of health in a population ranked by health and the Gini index, hence forth denoted as G, measures the deviation from an equal distribution as (twice) the area between Lorenz curve and the diagonal.

Wagstaff et al. (1991) have proposed the use of related concepts of concentration curve and index to measure the extent to which inequalities in health are related to indicators of socioeconomic status like income or education. They argued that the concentration index meets three minimal requirements of an inequality index: (i) it reflects that the experience of the entire population studies, (ii) it reflects the socioeconomic dimension of health inequalities and (iii) it is sensitive to changes in the composition of the underlying socioeconomic ranking variable. A concentration curve describes the cumulative distribution of health in a population ranked by socioeconomic status and the concentration index, henceforth denoted as C, measures the deviation from an equal distribution as (twice) the area between the concentration curve and the diagonal.

The concentration index is defined with reference to the concentration curve. The concentration index is defined as twice the area between the concentration curve and the line of equality (the 45-degree line). So, in the case in which there is no socioeconomic- related inequality, the concentration index is zero. The convention is that the index takes a negative

value when the curve lies above the line of equality, indicating disproportionate concentration of the health variable among the poor, and a positive value when it lies below the line of equality.

If the health variable is a "bad" such as ill health, a negative value of the concentration index means ill health is higher among the poor.

Formally, the concentration index is defined as

$$C = 1 - 2\int_0^1 L_h(p)dp$$

The index is bounded between –1 and 1. For a discrete living standards variable, it can be written as:

$$C = \frac{2}{N\mu}\sum_{i=1}^{N} h_i r_i - 1 - \frac{1}{N}$$

Where hi is the health sector variable, μ is its mean, and ri = i/N is the fractional rank of individual i in the living standards distribution, with i = 1 for the poorest and i = N for the richest. For computation, a more convenient formula for the concentration index defines it in terms of the covariance between the health variable and the fractional rank in the living standards distribution (Jenkins 1988; Kakwani 1980; Lerman and Yitzhaki 1989),

cov (h,r)……(1)

It may be noted that the concentration index depends only on the relationship between the health variable and the rank of the living standards variable and not on the variation in the living standards variable itself. A change in the degree of income inequality need not affect the concentration index measure of income-related health inequality.

The sign of the concentration index indicates the direction of relationship between the health variable and position in the living standards distribution, and its magnitude reflects both the strength of the relationship and the degree of variability in the health variable. Although this is valuable information, one may also wish to place an intuitive interpretation on the value of the index.

Decomposing determinants of inequalities in elderly health indicators

Health economists have widely adopted the Gini coefficient and concentration indices to provide summary measures of inequalities of health within population (Wagstaff 2002a, 2002b; van Doorslaer et al, 1997). Like the Gini coefficient of income inequality, the Gini and concentration indicies for health have the attraction that they can be decomposed by factors (Kakwani, 1980, Hosseinpoor et al, 2006, Yiengprugsawan et al, 2007, Lauridsen et al, 2007). A recent contribution by Wagstaff et al, (2003) has used this property to show how a linear regression approach can be used to decompose the concentration indices into the contributions of different explanatory variables. In this regression-based decomposition approach, the contribution of each factor to overall inequality depends on the elasticity of health with respect to that variable, capturing the health gradient, and on the concentration index for that factor, capturing how much inequality in the distribution is attributable to the factor.

Doorslaer and Koolman (2004) applied the regression-based decomposition to data from the European Community Household Panel (ECHP). They found that Portugal, the UK and Denmark have high degree of health inequalities, while the Netherlands, Germany, Italy, Belgium, Spain, Austria and Ireland show lower level of health inequality. The decomposition of these cross-country differences according to differences in inequalities and elasticities of the factors reveals a striking pattern that the differences in elasticities across countries plays a much greater role than differences in the distribution of factors. These empirical results have important policy implications, implying that reducing health inequalities is likely to be more amenable to health policy that operates on the health-gradient, that to fiscal policy, that operates on income redistributions (Doorslaer and Koolman, 2004).

In this paper, the method proposed by Wagstaff et al (2003), has been used to decompose socioeconomic inequality in elderly health in India. The decomposition analysis allows us to estimate how the determinants proportionally contribute to inequality (the gap between the poor and rich) in a health variable. Wagstaff et al (2003), showed that for any linear regression model linking the health variable of interest, y, to a set of k health determinants, x_k:

$$y = \alpha + \sum_k \beta_k X_k + E \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

where, e is an error term. Given the relationship between y_i and x_{ki} the concentration index for u 'C' can be written as

$$c = \sum_k (\beta_k X_k / \mu) Ck + GCe/\mu \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Where, u is the mean of y, x_k is the mean of x_k, Ck is the concentration index for xk. In the last term (which can be computed as a residual), GCg is the generalized concentration index for e.

The above equation therefore shows that C comprises of two components. The first is the deterministic or explained components. This is equal to weighted sum of the concentration indices of the regressors', where the weights are simply the elasticity's [an elasticity is a unit free measure of (partial association), i.e. the percentage change in the dependent variable associated with a percentage change in the explanatory variables]. The second is a residual or 'unexplained' component. This reflects the inequality in health that cannot be explained by systematic variation in the x_k across socioeconomic groups.

Methodological steps of decomposition of socioeconomic inequalities in elderly health

The steps of decomposition analysis are as follows:

i) Regress the health variable against its determinants, which provides coefficients of explanatory variable(βk).

ii) Calculate the mean of the health variable and each of its determinants (μ and k).

iii) Calculate the concentration indices for the health variable and for the determinants(C and Ck) using equation (1). At this stage, the values of all the variables included in equation (3) are known. Finally, the contribution of each of the determinants included in the model to the inequality in the health variables can be quantified through the following steps:

iv) Calculate the absolute contribution of each determinants by multiplying the health variable elasticity with respect to that determinant and its concentration index

v) Calculate percentage contribution of each determinant simply by dividing its absolute contribution by the concentration index of the health variables.

Results

Table 2 presents the mean value of the selected covariates considered in this analysis. Results show that about 24% of the elderly are in poor health status currently in India.

Forty two percent of the elderly belong to poor economic status, and majority of them come from rural areas (63%).

Table -2 Descriptive statistics of individual covariates

Variables	Mean	Std.Dev	Min	Max
Current health status	0.247612	0.431631	0	1
Age 70 (above)	0.352703	0.477818	0	1
Poor Economic Status	0.421665	0.493833	0	1
Living in Rural Areas	0.639229	0.480231	0	1
SC/ST	0.244925	0.430049	0	1
Female	0.490396	0.499915	0	1
Illiterate	0.611834	0.48734	0	1
Economically dependent	0.655263	0.475289	0	1
N 34831				

Table 3 presents the concentration indices for both dependent and predictive variables. Concentration indices provide insights on the poor- rich distribution of the socio-economic determinants. A positive CI value implies that the extent of inequality is greater in favor of rich and a negative CI value implies that the inequality is in favor of the poor. The CI value of elderly health is -0.0854 at national level.

Table-3 Concentration index (CIs) for socioeconomic determinants variable for analysis of inequality of elderly health

Variables	Mean	Concentration Index (C I)	Marg. Effect
Age 70 (above)	0.352703	0.0316	0.1506
Poor Economic Status	0.421665	-0.5710	0.0448
Living in Rural Areas	0.639229	-0.1968	0.0259
SC/ST	0.244925	-0.1956	-0.0048
Female	0.490396	-0.0047	-0.0204
Illiterate	0.6118	-0.1709	0.0255
Dependent	0.6553	-0.0457	0.1397
Health	**0.2476**	**-0.0854**	
Residuals= –0.0089			

Table-4. Contribution of various socio-economic covariates to total health inequality in elderly health for India, 2004

Variables	Mean	Marg effect	CI	Contribution to CI	% Contribution
Age	0.3527	0.0785	0.0316	0.0068	-8.9

Poor	0.4216	0.0605	-0.571	-0.0436	57.0
Rural	0.6392	0.0348	-0.1968	-0.0132	17.2
SC/ST	0.2449	-0.0001	-0.1956	0.0009	-1.2
Female	0.4939	0.0402	-0.0047	-0.0002	-0.3
Illiterate	**0.6118**	0.0255	**-0.0108**	-0.0108	14.1
Dependent	**0.6553**	0.1397	**-0.0169**	-0.0169	22.1
Health	**0.2476**		**-0.0854**	-0.0765	100.0
Residuals=-0.0089					

Such precise decomposition outcomes demonstrate evidence that most socioeconomic inequalities primarily arise from these three socio-economic predictors namely: poverty, economic dependence and rural residence Conclusion

This paper presented first time evidence on the decomposed contributions of socio-economic determinants of inequalities in the elderly. Decomposition approach reveals that variables, poor economic status (57%) economically dependent (22%) and living in rural areas (17%) contribute to about 96% of predictable socioeconomic inequalities in self rated poor health status. Further study is needed to find out other dimensions regarding elderly health.

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