Poverty and disability among Indian elderly: evidence from household survey

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Abstract

This paper attempts to analyze the depth of poverty and examines the causal relationship between disability and poverty among Indian elderly. We use 58th round of National Sample Survey Organisation (NSSO) data surveyed in 2002. Our analysis finds higher level of poverty and income inequality among disabled elderly as compared to non-disabled elderly and those differences in the income levels vary significantly across different age groups, gender, social groups and educational status. Finally, the estimation results confirm the hypothesis of causal relationship between poverty and disability.

Keywords: poverty, disability, inequality, poverty measures, elderly, estimation

JEL classification: I32, J14, D63, C13

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I. Introduction

With prolonged human life, reduced mortality and fertility rates, ageing[2] has become a global phenomenon in the 21st century. World Health Organisation (WHO) views ageing as a privilege and a societal achievement. This process started in developed countries and slowly shifting to developing countries like India with systematically increased in number of greying population and hence, their proportion in the total population. According to United Nations (2005) estimates, the population of the world has stood around 6.5 billion in the dawn of 21st century and is expected to rise to 9.3 billion by 2050. Also, proportion of the elderly[3] to the total population is expected to increase from 10 percent in 2000 to 15 percent by 2025 and over 21 percent by 2050. The population growth trend of elderly in India is somewhat similar to the world's trend. Following Population Census of India, the population of elderly was only 24 million in 1961; increased to 43 million in 1981; to 57 million in 1991 and about 77 million in 2001. Further, their share in the total population has also risen from 5.63 percent in 1961 to 6.58 percent in 1991 (Irudya Rajan et al., 1996 and 1999) and to 7.5 percent in 2001 (Irudya Rajan, 2006 and 2008).

The linkage between ageing and disability is a biological fact where the risk of disability increases with increase in age. However, with proper policy intervention, onset of disability can be delayed. Ageing should not be treated as synonymous of disability as a large proportion of older people live with good health status and without significant mental or physical decline. This link is very important particularly for the countries like India where age-structure of the total population is still predominantly young or middle aged but the age structure of disabled persons is predominantly elderly. In India, more than one-fourth of the Indian aged population is disabled and age-specific disability rates and the severity of disablement increase with age within old age bracket. In the age-groups young-old (60-64), middle-old (65-69), older-old (70-74) and oldest old (75 and

[2] defined as an increase in the proportion of the aged as comparison to that of a reduction in the proportion of the young

[3] defined as all individuals having age 60 years and above

above), the percentages of disabled persons are 36, 42, 51 and 61, respectively (NSSO, 2003). The absence of a safety net for the aged has exacerbated the problem. Traditionally, the joint family took care of the aged but rapid urbanisation and the exodus of persons from rural to urban areas have created a vicious situation. In the absence of the ability to earn, and without community support, in the form of kinsmen or the extended family, the aged are rendered destitute.

On poverty front, it is already established in developed countries like UK that the proportion of elderly people living at or below the poverty line is very much higher than that of younger people (Townsend, 1981). It is also evident from Indian data that 40 percent of the elderly live below the poverty line and 90 percent are neither covered by any state pension nor have any family to take care of them[4]. However, still little is known about poverty among the elderly[5]. Government of India has some anti-poverty programs particularly for disabled people. Persons with Disabilities Act, 1995 (PWD hereafter) is one of the most important step forward in policy towards disabled people in India. However, World Bank (2007) finds some weaknesses in its design and coverage. Two important limitations are important in our context. One, the act covers only designated types of disability, which are not inclusive of several significant categories of disability (e.g. autism). Second, safety nets for PWD offer low coverage and limited financial protection, for example, the PWD act commits to reservations for PWD of not less than 3 percent in all poverty alleviation schemes, but it appears that PWD are well below 3 percent of beneficiaries in all schemes. Also, the new National Rural Employment Guarantee Act (NREGA) has dropped the provision for reservations for disabled people. However, social assistance cash payments for destitute elderly, widows and PWD is provided by the government through social pension and is one of the most helpful anti-poverty programs operating in recent times. One problem with such programs is the identification of functionally disabled people. According to the World Bank report "……significant categories of people who are functionally disabled will not typically be identified by households as being disabled. The primary example of this is elderly people

[4] http://medicine.creighton.edu/Projectcure/Poverty%20in%20India.htm
[5] Deaton and Paxson, 1995, Dreze and Srinivasan, 1997 and Pal and Palacious, 2008 are some of the important contributions in the area of poverty among elderly

with significant functional impairments who were not disabled before they became old. In field work, the standard answer on probing was that even seriously functionally impaired elderly people were "just old" or "like many other old people" rather than disabled".

Though numerous literature is available on the relationship between disability and poverty[6], very few are focused on elderly in India (Sengupta and Agree, 2003; Prakash, 2003). Audinarayana and Sheela (2002) reveal that elderly people who belong to the higher socio-economic class were found to have lesser disabilities. Sengupta and Agree (2003) analyze covariates of mobility difficulty among the older adults in India and find that there is a substantial association between mobility and chronic diseases in the elderly. Kerketta et al. (2009) find that there is a high prevalence of physical disabilities with both non-communicable as well as communicable diseases among the elderly primitive tribal members and recommend for the implementation of a special health care strategy to reduce suffering at this crucial age and improve quality of life. In India most of the studies are either just informative or descriptive without much statistical work and therefore, of limited scope. The relationship between disability and poverty in developing countries has not been well-established in the quantitative literature (Braithwaite and Mont, 2008). Also, studies like Sengupta and Agree (2003) and Prakash (2003) are based on old data sources[7] and given the fact that in last two decades a lot of changes had taken place on the fronts of age structure, industrialization, urbanization, family disintegration and weakening of social safety nets for elderly in India and therefore, at least for the policy point of view, these studies may not be of much use.

In this paper, we try to re-look the relationship between disability and poverty among Indian elderly. Further, paper aims to compare the poverty scenario between individuals with disability and without disability using different measures of poverty and inequality. The estimation results confirm the causal relationship between poverty and disability. However, these findings must be read with caution as later phase of life is naturally

[6] See World Bank (2007)
[7] Sengupta and Agree, 2003 use 42nd round (1986-87) data for the purpose of analysis

associated with high rate of disability and incidences of poverty due to retirement and out of pocket expenditures on health and other necessities.

The outline of the paper is as follows: section II briefly describes what literature speaks on the causal relationship between poverty and disability followed by description of data and variables in section III. Unadjusted poverty estimates and gini index have been computed in section IV and mean per capita expenditures are compared across various groups in section V. Discussion on econometric models and results are done in section VI. Finally, concluding observations are presented in section VII.

II. Poverty and Disability: A Causal Relationship

The association between poverty and disability has been well documented (U.S. Census Bureau, 2004; Wittenburg & Favreault, 2003, Elwan, 1999) in the literature. The relationship is, in general, found to be causal (Braithwaite and Mont, 2008, Lustig et al., 2007; DFID, 2000; Moore and Yeo, 2003; Yeo, 2001). It is argued that though not all disability is caused by poverty, poor people who suffer from malnutrition and in lack of adequate access to health services including maternal care and trauma services, are more likely to suffer from disability which further ensure their exclusion and marginalization of by reducing their opportunities to contribute productively to the household and to the community, which in turn increases the risk of poverty. DFID (2002) and Moore and Yeo (2003) provide specific mechanism how the vicious circle between poverty and disability exists and work[8]. DFID (2000) describes a vicious circle and the causal link between disability and poverty suggest that in one hand the poverty increases the likelihood of injury and impairment and hence the risk of disability; on the other hand the exclusion of disability leads to greater rates of poverty. Other studies also suggest that poverty increases the risk of disability through social role devaluation (Wolfensberger, 2000), environmental risk factors (Evans, 2004; Link & Phelan, 1995), negative group influences (Durlauf, 2001), and weakened sense of coherence[9] (Antonovsky, 1987, 1991). Recently Lustig et al. (2007) emphasise that poverty limits access to resources that

[8] For detailed discussions see Yeo (2005)

[9] defined as a global orientation that the world is incomprehensible, unmanageable, and unmeaningful, see Lustig et al. (2007) for useful discussions

finally leads to a chronic health problem or disability. Research shows that this vicious circle varies as well within and between cultures and contexts, but is generally acknowledged to be strong. Thus, the link between poverty and disability may be attributed to the discrimination, social exclusion and denial of rights together with lack of access to basic services.

III. Data and sample description

The paper is based on micro-level 58th round of National Sample Survey Organization (NSSO) data collected during July 2002 to December 2002. The survey period was divided into two sub-rounds of three months duration each. Equal number of sample first stage units was allocated to each of these sub-rounds with a view to ensuring uniform spread of the interviews over the entire survey period. A stratified multi-stage sample design was adopted for the 58th round. The number of sample villages and urban blocks surveyed in central sample was 4637 and 3354, respectively. A total of 45571 and 24731 households were surveyed in rural and urban areas, respectively. The survey collects information relating to the magnitude and type of disability, age at onset of disability, possible cause of disability housing condition, village facilities, particulars of slum and consumer expenditure, employment and unemployment. The analysis is done on the truncated sample for individuals with age more than 60 years. Our analysis is based on a size is 41,499 elderly out of which 26,871 were from rural areas and remaining 14,628 were from urban areas of the country. The estimated population of elderly is about 76.15 thousands, 21.29 thousands and 97.44 thousands, respectively in rural, urban and all India.

Percentage distribution of disabled elderly according to their age group, sex, social status and education are shown in Table 1. It can be observed that about 46% of the elderly suffer from at least one kind of disability. However, the share of disabled elderly is little higher in urban India and this may be attributed to the fact that the likelihood of disability detection is higher in urban areas due to better health care facilities. Also, it is evident that with increase in age, the share of disabled elderly increases in both rural and urban areas. While only 36% of elderly are suffering from disability in the age-group 60-64, it

becomes 42% in age bracket 65-69; 51% in 70-74 and about 61% in the age group 75+ years. The same trend exists in both rural and urban areas. Further, in the same line with individuals of all ages, the share of male elderly is higher than that of female elderly in the old age population.

Table 1: % distribution of disabled elderly

	All	Rural	Urban
All	45.86	45.76	46.21
Age-Group (year)			
60-64	36.07	36.23	35.49
65-69	41.74	41.57	42.36
70-74	51.05	51.45	49.55
75 plus	60.75	60.45	61.74
Gender			
Male	46.83	46.28	48.83
Female	44.94	45.25	43.86
Social Group			
ST	51.70	51.45	54.39
SC	48.91	48.81	49.39
OBC	45.90	45.87	46.06
Other	43.03	42.19	44.94
Educational Status			
Below Primary	47.52	47.27	49.27
Primary	46.56	46.56	46.57
Middle	43.25	42.60	44.99
Secondary	42.59	41.31	44.98
Higher	42.88	41.89	43.79

However, while more elderly reports for disability in urban India as compared to rural India (49% and 46%, respectively); the reverse is true in case of female elderly (44% and 45%, respectively for urban and rural areas).

Now, turning to social group wise distribution of disabled elderly in India, we find that the percentages of Scheduled Tribes elderly are the most disabled among all social classes in India. Scheduled caste elderly comes next followed by other backward castes and other castes. While nearly 52% of ST elderly have at least one disability, the percentage goes down to 49% in case of SC elderly. The proportion of OBC and other castes are 46% and 43%, respectively. Here also, Table 1 suggests that more disability live in urban areas as compared to rural part of the country. Furthermore, as expected most of disabled elderly are illiterate too. Table 1 indicates that among illiterate elderly,

48% suffer from disability. This figure reduced with 47% among elderly with primary education and about 43% who are educated with middle and higher level.

IV. Unadjusted Poverty Estimates and Gini Index

After brief discussion about sample characteristics, in this section we will try to estimate unadjusted poverty for elderly with and without disability using standard poverty measures. For this purpose, we classify sample households with elderly by disability status-households with disabled elderly and households without any disabled family members. Further, we use average per capita monthly expenditure (PMCE) as an indicator of standard of living (see Deaton and Paxson, 1995; Pal and Palacios, 2008). Three measures of poverty are used: Head Count Ratio (HCR hereafter), Poverty Gap (PG hereafter) and Squared Poverty Gap (SPG hereafter)[10]. The headcount is calculated by comparing the income $y_i (i = 1,2,.....n)$, where n is the total number of households in the sample, of each household to the state-level poverty lines poverty line z_s. Let us suppose that q households have incomes below z_s, the HCR = q/n .This does not take account of the depth of poverty and also does not satisfy the principle of transfers. The poverty gap measure sums of all the proportionate shortfalls below z_s: $\frac{1}{n}\sum_{i=1}^{q}(\frac{z_s - y_i}{z_s})$. This measure takes account of poverty depth but does not satisfy the principle of transfers. To incorporate the principle of transfers, SPG is used which measures the income gap by the gaps themselves awarding a higher weight to poorer households and given as $SPG = \frac{1}{n}\sum_{Y_I < z_s}^{q}(\frac{z_s - y_i}{z_s})^2$. These poverty indices for elderly with and without disability are shown in Table 2.

[10] See Foster et al., 1984

Table 2: Unadjusted poverty measures

	Headcount Index			Poverty Gap Index			Squared Poverty Gap Index		
	Without Disability	With Disability	All	Without Disability	With Disability	All	Without Disability	With Disability	All
Age-group (years)									
60-64	0.296 (0.006)	0.282 (0.010)	0.291 (0.005)	0.065 (0.002)	0.065 (0.003)	0.065 (0.002)	0.021 (0.001)	0.023 (0.002)	0.022 (0.001)
65-69	0.293 (0.007)	0.300 (0.009)	0.296 (0.006)	0.067 (0.002)	0.068 (0.003)	0.068 (0.002)	0.022 (0.001)	0.023 (0.001)	0.023 (0.001)
70-74	0.281 (0.009)	0.288 (0.010)	0.285 (0.007)	0.064 (0.003)	0.069 (0.003)	0.066 (0.002)	0.021 (0.001)	0.024 (0.001)	0.022 (0.001)
75 plus	0.244 (0.009)	0.242 (0.008)	0.243 (0.006)	0.053 (0.003)	0.054 (0.002)	0.054 (0.002)	0.018 (0.001)	0.018 (0.001)	0.018 (0.001)
Gender									
Male	0.274 (0.006)	0.274 (0.006)	0.274 (0.004)	0.061 (0.002)	0.063 (0.002)	0.062 (0.001)	0.020 (0.001)	0.021 (0.001)	0.021 (0.001)
Female	0.294 (0.005)	0.278 (0.007)	0.287 (0.004)	0.066 (0.002)	0.065 (0.002)	0.066 (0.001)	0.022 (0.001)	0.022 (0.001)	0.022 (0.001)
All	0.284 (0.004)	0.276 (0.005)	0.281 (0.003)	0.064 (0.001)	0.064 (0.001)	0.064 (0.001)	0.021 (0.001)	0.022 (0.001)	0.021(0.000)
Sector									
Rural	0.287 (0.005)	0.279 (0.006)	0.284 (0.004)	0.063 (0.001)	0.063 (0.002)	0.063 (0.001)	0.021 (0.001)	0.021 (0.001)	0.021 (0.000)
Urban	0.275 (0.007)	0.264 (0.008)	0.27 (0.005)	0.066 (0.002)	0.068 (0.002)	0.067 (0.002)	0.022 (0.001)	0.023 (0.001)	0.023 (0.001)
Social group									
ST	0.473 (0.019)	0.469 (0.025)	0.471 (0.016)	0.122 (0.007)	0.124 (0.010)	0.123 (0.006)	0.047 (0.004)	0.045 (0.004)	0.046 (0.003)
SC	0.389 (0.010)	0.375 (0.011)	0.382 (0.007)	0.093 (0.003)	0.092 (0.003)	0.093 (0.002)	0.031 (0.001)	0.032 (0.002)	0.032 (0.001)
OBC	0.307 (0.006)	0.281 (0.007)	0.295 (0.005)	0.066 (0.002)	0.061 (0.002)	0.064 (0.001)	0.021 (0.001)	0.020 (0.001)	0.021 (0.001)
Others	0.175 (0.005)	0.165 (0.006)	0.171 (0.004)	0.037 (0.001)	0.036 (0.002)	0.037 (0.001)	0.012 (0.001)	0.012 (0.001)	0.012 (0.000)

Note: 1. Figures in parenthesis are the standard errors of indices.

2. Poverty cut-off line is derived from Himanshu (2007) by adjusting for CPIIW in urban India and CPIAL in rural India for the year 2001-02. These estimates come to 481.1638 and 325.3861, respectively.

Also, this is further classified according to gender, rural/urban, social group, education and age group. HCR for elderly with disability is little lower with higher standard error than those without disability. Poverty gap index is almost similar for both the elderly groups. However, SPG index suggests that in general households with disables elderly are having little higher value suggesting for higher level of poverty among households with disabled elderly. For simplicity, we would focus only on SPG index for interpretation purpose.

Table 2 also indicates that in each age group within elderly, as compared to persons without disability the value of SPG index is little higher for persons with disability. This infers that in each phase of old age disabled individuals are in a bad economic condition. It also shows that 21% disabled elderly male are living below poverty line as compared with 20% elderly male without disability. The percentage female elderly with and without disability are same (22% each). Again while 22% disabled elderly live in poverty as compared to 21% with no disability. Furthermore, the proportion of female disabled elderly is little higher than their male counterpart. This clearly indicates that disabled elderly, in particular female are little disadvantaged in terms of their living standard.

Table 3: Inequality measures (Gini-index)

	Without Disability	With Disability	All
Age-Group (Years)			
60-64	0.287	0.295	0.290
65-69	0.291	0.300	0.295
70-74	0.294	0.298	0.296
75 plus	0.306	0.327	0.319
Gender			
Male	0.292	0.310	0.301
Female	0.294	0.305	0.299
All	0.293	0.308	0.300
Sector			
Rural	0.247	0.261	0.254
Urban	0.319	0.337	0.328
Social Group			
ST	0.263	0.264	0.264
SC	0.240	0.249	0.244
OBC	0.256	0.265	0.261
Others	0.315	0.340	0.327

Now, the value of SPG index suggests that the while in rural India, the economic condition of elderly with and without disability are almost similar, in urban India elderly without disability are little well-off in comparison to elderly with disability. As far as social group is considered, SPG index value declines from SC to others and here also, higher level of poverty can be found for disabled elderly.

To increase our understanding about the income inequality, we calculate gini-index for elderly with and without disability. Gini-index for elderly according to their age- group, gender, location of residence (rural/urban) and social group are shown in Table 3. It suggests that across each age-group, gender, sector and social groups' inequality among elderly without any disability is lower than that of persons with disability. This means that the distribution of income among disabled elderly is more unequal than that of non-disabled elderly. Interestingly, gini value for disabled male elderly is slightly higher than that of their female counter part. Also, Income inequality is more pronounced among disabled elderly living in urban areas (0.337) as compared to those who reside in rural part of the country (0.261). As for as income inequality within social group is concerned, scheduled castes (SCs) disabled elderly have least inequality, followed by disabled elderly from OBC, ST and other castes.

V. Does differences of average income/expenditure significant across demographic composition of elderly?

In order to answer this question, we use t-test of comparison of means followed by F-test for equality of variance for demographic indicators with dichotomous categories. For multiple category demographic variables, we apply Analysis of Variance (ANOVA hereafter). Table 4 documents results of t-test followed by F-test. It can be seen from the table that while there is no statistical difference in the mean PMCE between male and female elderly without any disability; elderly male with disability have significantly higher PMCE as compared with female disabled elderly. However, variation in the PMCE distribution is not significantly different between male and female elderly. Further, as expected average PMCE for urban elderly with and without disability are significantly higher in comparison to rural elderly. Also, variances of rural and urban PMCE are not statistically equal for all elderly, elderly with and without disability.

Table 4: Gender and sector wise comparison of mean and variance of PMCE

	Mean PMCE for			Standard Deviation for		
	With Disability	Without disability	All	With Disability	Without disability	All
Gender						
Male	601.28	571.01	584.91	431.87	392.03	411.06
Female	591.84	570.62	579.56	428.85	395.41	409.96
Difference/Ratio$	9.44*	0.39	5.34*	1.01	0.99	1.00
Sector						
Rural	484.53	467.21	474.70	272.39	238.69	253.94
Urban	792.88	768.52	779.56	564.95	531.81	547.20
Difference/Ratio#	-308.35***	-301.30***	-304.87***	0.48***	0.45***	0.46***

Note: T-test is used to compare differences of means of PMCE across groups and F-test is used to test the equality of variances. Also, in general t-test with equal variance is applied, except in those cases where variances are found significantly unequal. $for mean columns, values in this rows are difference of male and female PMCE and for standard deviation columns; values are ratio of standard deviations of PMCE. #for mean columns, values in these rows are difference of rural and urban PMCE and for standard deviation columns values are ratio of standard deviations of PMCE. ***, **, * indicates significance at 1%, 5%, 10% level of significance.

Mean and standard deviations of PMCE for elderly with and without disability according to their age group, social group and educational status are presented in Table 5 followed by analysis of variance and comparison of multiple means results in Table 6, 8 and 9, respectively.

Table 5: Mean and standard deviations of PMCE for elderly

	Without Disability		With Disability		All	
	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev
Age Group (Years)						
60-64	512	333	518	368	514	346
65-69	520	332	525	348	522	339
70-74	528	353	527	351	528	352
75+	564	424	595	461	583	447
Social Group						
ST	392	213	395	215	394	214
SC	421	205	433	230	427	218
OBC	480	261	501	282	490	271
Others	655	468	705	547	676	504
Educational Status						
Below Primary	432	203	441	218	436	210
Primary	501	293	519	315	510	304
Middle	535	288	580	354	554	319
Secondary and higher	775	559	856	644	810	598

Table 6: ANOVA and comparison of mean per capita monthly expenditure by age groups

Age groups	Analysis of Variance											
	Without Disability				With Disability				All			
Source	Sum of Squares	Degrees of Freedom	Mean Sum of Squares	F Stats.	Sum of Squares	Degrees of Freedom	Mean Sum of Squares	F Stats.	Sum of Squares	Degrees of Freedom	Mean Sum of Squares	F Stats.
Between groups	7174734	3	2391578	19.33***	19264940	3	6421647	42.4***	28294717	3	9431572	69.11***
Within groups	2.88E+09	23249	123711.5		2.76E+09	18241	151437		5.66E+09	41494	136466	
Total	2.88E+09	23252	124004		2.78E+09	18244	152468		5.69E+09	41497	137138	
comparison of mean per capita monthly expenditure by age groups												
Age Groups	60-64	65-69	70-74	Bartlett's test for equal variances	60-64	65-69	70-74	Bartlett's test for equal variances	60-64	65-69	70-74	Bartlett's test for equal variances
65-69	7.571			$chi^2(3)$ = 358.9538***	6.831	-	2.530	$chi^2(3)$ = 509.4147***	7.59582		5.90586	$chi^2(3)$ = 1.0e+03***
70-74	16.018*	8.448			9.361	2.530	-		13.5017*	5.90586	-	
75 plus	1.77***	44.202	35.75***		76.8022***	69.97***	67.44***		68.4325***	60.8367***	54.9308***	

***, **, * indicates significance at 1%, 5%, 10% level of significance.

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Table 7. ANOVA and comparison of mean per capita monthly expenditure by social groups

Analysis of Variance												
Social groups	Without disability				With disability				All			
Source	Sum of Squares	Degrees of Freedom	Mean Sum of Squares	F Stats.	Sum of Squares	Degrees of Freedom	Mean Sum of Squares	F Stats.	Sum of Squares	Degrees of Freedom	Mean Sum of Squares	F Stats.
Between groups	222134072	3	74044691	646.71***	232153907	3	77384636	553.64***	449354353	3	1.5E+08	1185.58***
Within groups	2.66E+09	23243	114494.2		2.55E+09	18237	139774.7		5.24E+09	41484	126338.7	
Total	2.88E+09	23246	124035.3		2.78E+09	18240	152479.4		5.69E+09	41487	137160.7	
Comparison of Mean Per Capita Monthly Expenditure by Social groups												
Social groups	ST	SC	OBC	Bartlett's test for equal variances	ST	SC	OBC	Bartlett's test for equal variances	ST	SC	OBC	Bartlett's test for equal variances
SC	29.2022**			$chi^2(3)$ = 4.6e+03***	37.9774***			$chi^2(3)$ = 4.3e+03***	33.3917***			$chi^2(3)$ = 8.9e+03***
OBC	88.0921***	58.8899***			105.914***	67.9367***			96.0603***	62.6686***		
Others	262.953***	233.751***	174.861***		309.909***	271.931***	203.995***		282.84***	249.449***	186.78***	

***, **, * indicates significance at 1%, 5%, 10% level of significance.

Table 8: ANOVA and comparison of mean per capita monthly expenditure by educational status

Analysis of Variance												
Educational Status	Without Disability				With Disability				All			
Source	Sum of Squares	Degrees of Freedom	Mean Sum of Squares	F Stats.	Sum of Squares	Degrees of Freedom	Mean Sum of Squares	F Stats.	Sum of Squares	Degrees of Freedom	Mean Sum of Squares	F Stats.
Between groups	389532462	3	1.3E+08	1210.56***	417107639	3	1.39E+08	1072.58***	798614326	3	2.66E+08	2257.93***
Within groups	2.49E+09	23250	107259.7		2.36E+09	18241	129627		4.89E+09	41495	117897.7	
Total	2.88E+09	23253	123997.8		2.78E+09	18244	152468.4		5.69E+09	41498	137133.8	
Comparison of Mean Per Capita Monthly Expenditure by Educational Level												
Educational Status	Below Primary	Primary	Middle	Bartlett's test for equal variances	Below Primary	Primary	Middle	Bartlett's test for equal variances	Below Primary	Primary	Middle	Bartlett's test for equal variances
Primary	69.0665***				78.8099***				73.5208***			
Middle	102.58***	33.5136***			139.534***	60.7241***			118.197***	44.6761***		
Secondary and higher	343.146***	274.079***	240.566***	$chi^2(3)$ = 6.5e+03***	415.069***	336.259***	275.535***	$chi^2(3)$ = 5.4e+03***	373.478***	299.958***	255.282***	$chi^2(3)$ = 1.2e+04***

ANOVA results for comparison of mean MPCE across age groups, social groups and educational level suggests for significance mean difference for all elderly persons with and without disability. Further, based on Chi-square statistics, Bartlett's test rejects the null hypothesis of equal variances between groups. However, the results of difference of means between pair wise combination of age, social and educational groups is mixed.

Table 6 suggests for among elderly people with disability while there is no significant difference of mean PMCE between age groups 60-64 and 65-69; 60-64 and 70-74; 65-69 and 70-74 years, there are evidences of significant differences of mean PMCE between age groups 60-64 and 75+; 65-69 and 75+ and 70-74 and 75+ years. This suggests that though the per capita monthly expenditure for younger old, middle old and older old are not statistically differ, it is significantly different for the oldest old elderly with disability in comparison to elderly below 75 years of age.

Multiple comparison of MPCE according to ST, SC, OBC and others are shown in Table 7 which suggests for significant difference in mean MPCE across each paired combination of social groups for elderly with and without disability. Similar results are documented in Table 8 for educational status.

VI. Empirical analysis

After exploring the economic condition and inequality among elderly with and without disability, in this section we would do some econometric exercise to explain the possible relationship between poverty and disability. Following the hypothesis that there is causal association between poverty and disability, our model is based on two-stage approach of estimation (Stern, 1989). In first stage, we estimate per capita monthly expenditure and disability using following equations (1) and (2),

$$PMCE_i = \alpha_1 + \sum_k^m \beta_{1k} X_{i\,jk} + \varepsilon_1 \qquad (1)$$

$$Disability_{ij} = \alpha_2 + \sum_k^m \beta_{2k} X_{i\,jk} + \varepsilon_2 \qquad (2)$$

where $PMCE_i$ is the observed per capita monthly expenditure (PMCE) of i^{th} household, $X_{i\,jk}$ is the k^{th} (k=1, 2….m) all the controls for the j^{th} member of i^{th} household, and

$Disability_{ij}$ is dummy for presence of disability for j[th] member of i[th] household. $\alpha's$ are intercept, and $\beta's$ are coefficients corresponding to $X_{i\,jk}$, respectively. $\varepsilon's$ are independently and identically distributed (i.i.d) error terms. Here $X_{i\,jk}$ are age beyond 60 and its square; dummies for gender, social groups, education level, location of residence, marital status; land possessed by household and size of the households.

We estimate equation (1) using robust regression and equation (2) using probit procedure and predicted estimate per capita monthly expenditure and disability can be obtained. In the final stage, we employ these estimates as follows:

$$PMCE_i = \delta_1 + \sum_{e=1}^{v} \omega_{1e} X_{i\,je} + \lambda_1 \overline{disability_{ij}} + \xi_1 \qquad (3)$$

$$Disability_{ij} = \delta_2 + \sum_{e=1}^{v} \omega_{2e} Z_{i\,je} + \lambda_2 \overline{PMCE_i} + \xi_2 \qquad (4)$$

where again $Disability_{ij}$ is the observed disability indicator (dummy for presence of any disability), $Z_{i\,je}$ is the e[th] exogenous variable corresponding to the j[th] member of i[th] household. $Z_{i\,je} = X_{i\,jk}$ minus land possessed by household. $\overline{PMCE_i}$ is the predicted per capita monthly expenditure for the i[th] household and $\overline{disability_{ij}}$ is the predicted disability from equation (1) and (2) respectively. $\xi's$ are i.i.d disturbance term. We again estimate equation (3) and (4) in the second stage and see the effect of poverty on disability and of disability on poverty.

The definition and descriptive statistics of the variables used in the analysis are presented in Table 9 and final stage results are presented in Table 10. Robust regression result of Table 10 suggests that increased disability among elderly is significantly and negatively associated with the per capita monthly expenditure. This means that with increase in the likelihood of being a disabled elderly, the likelihood of being poor increases significantly. Further, probit model estimates of disability also indicates that the effect of PMCE is negative on disability is negative and significant. Marginal effect of estimated log of per capita expenditure in second stage disability equation suggests that with each unit increase in it would reduce the probability of disability by 0.11. This means as the standard of living will go up; the likelihood of being disabled will get reduced. In other

words, by reducing poverty among elderly Indians, the probability of being suffered from disability can be significantly reduced.

Table 9: Definition and descriptive statistics of the variables used in the analysis

Variables	Definition	%	Mean	SD	Min	Max
Dependent Variables						
Disability: dummy	1 if suffers from any disability	45.86	-	-	0	1
Log of per capita monthly expenditure	Logarithm of per capita monthly expenditure	-	6.13	0.52	-1.95	9.43
Explanatory Variables						
Gender: dummy	1 if male	48.60				
Age beyond 60	Actual age-60	-	8.35	7.70	0.00	39.00
Age-square	Square of age beyond 60 years	-	129.11	213.20	0.00	1521.00
ST: dummy	1 if social group is Scheduled Tribes	25.02	-	-	0	1
SC: dummy	1 if social group is Scheduled Castes	42.00	-	-	0	1
Others: dummy (Reference category)	1 if social group is other backwards and other castes	32.98	-	-	0	1
Below primary education: dummy (Reference category)	1 if education below primary including illiterate	52.22	-	-	0	1
Primary Education: dummy	1 if primary education	14.15	-	-	0	1
Middle Education: Dummy	1 if middle education	15.07	-	-	0	1
Secondary Education: dummy	1 if secondary education	8.65	-	-	0	1
Higher Education: dummy	1 if higher education	9.91	-	-	0	1
Rural: dummy	1 if belongs to rural areas	78.15	-	-	0	1
Currently Married: dummy (Reference category)	1 if currently married	60.31	-	-	0	1
Unmarried: dummy	1 if unmarried	1.46	-	-	0	1
Widow: dummy	1 if widowed	37.58	-	-	0	1
Divorced/Separated: dummy	1 if divorced or separated	0.65	-	-	0	1
Land possessed by household	Land possessed by household in hectare	-	1.00	2.36	0.00	91.06
Estimated log of per capita expenditure	Predicted log of per capita expenditure	-	6.13	0.33	4.89	10.19
Size of household	Size of the household	-	6.27	3.64	1.00	38.00

Table 10 : Second Stage Estimation Results

Estimation Method	Probit Model		Robust Regression
Dependent Variables	Disability: dummy		Log of per capita monthly expenditure
Explanatory Variables	Coefficient (Standard errors)	Marginal Effect	Coefficient (Standard errors)
Predicted Disability	-	-	-0.322***(0.076)
Estimated log of per capita expenditure	-0.277***(0.083)	-0.109***(0.033)	-
Gender: dummy	0.331***(0.015)	0.1297***(0.006)	0.112***(0.025)
Age beyond 60	0.034***(0.002)	0.0134***(0.001)	0.013***(0.003)
Age-square	0.000***(0.000)	-8E-05***(0.000)	0.000(0.000)
ST: dummy	0.059 *(0.034)	0.0233*(0.013)	-0.087***(0.012)
SC: dummy	0.048**(0.023)	0.019**(0.009)	-0.127***(0.009)
Below Primary Education: dummy	-0.061***(0.023)	-0.024***(0.009)	-0.212***(0.004)
Rural: dummy	-0.103***(0.028)	-0.04***(0.011)	-0.331***(0.005)
Unmarried: dummy	0.855***(0.054)	0.322***(0.017)	0.297***(0.066)
Widow: dummy	0.507***(0.016)	0.189***(0.006)	0.119***(0.040)
Divorced/Separated: dummy	0.655***(0.079)	0.254***(0.028)	0.133**(0.056)
Land possessed by household	-		0.000***(0.000)
Size of household	-0.092***(0.003)	-0.036***(0.001)	-0.063***(0.006)
Constant	2.157***(0.612)		6.969***(0.056)
Number of observations	41475	-	41475
LR $chi^2(89)$	5837	-	-
Pseudo R^2	0.1026***	-	-
Log pseudo likelihood	-25527.296	-	-
F(89, 41385)	-	-	332.71

Note: estimates are adjusted for sampling weight and controlled for 78 NSS region dummies. ***, **, * indicates significance at 1%, 5%, 10% level of significance.

VII.Concluding observations

The relation between poverty and disability is commonly accepted as a vicious circle and it is widely hypothesised that it is a two way relationship i.e. disability increases the risk of poverty and conditions of poverty increase the risk of disability. The objective of this analysis was mainly to understand the relationship between poverty and disability in the elderly population of India.

Based on different indices of poverty and inequality, our analysis suggests that as compared to non-disabled elderly, the poverty and income inequality level is higher for disabled elderly. Further, t-test and ANOVA results show that there are significant differences in the income levels of different age groups within elderly population, their gender, residence location, social groups and educational status. It was found that in general, being male, age beyond 60 years and its square, higher level of education, being unmarried, widowed, separated or divorced in comparison to being currently married are positively and significantly associated with disability of elderly whereas living in rural areas; being ST or SC as compared with OBC and others and household size are negatively associated with the likelihood of being disabled. Though the paper is not able to answer why it is the case, we suspect that apart from other reasons, reporting biasness and being not aware about the disability due to lack of health care facilities in rural areas and for the economically backward social classes could be possible explanations for this.

Further investigation focused on the relationship between disability and poverty using two stage estimation methods confirms the causal relationship between poverty and disability in case of Indian elderly. Results suggest that disability is positively associated with the poor standard of living. At the same, poverty is positively associated with likelihood of being disabled.

In conclusion, if our analysis has any validity, it has far many policy implications. There is immediate need to strengthen social security safety nets to uplift poor elderly's economic conditions in one hand and on the other hand, it is also essential to provide sufficient health care facilities to reduce the risk of disability among elderly.

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