Aging, Disability and Disease in India

1. Introduction

As per the 2011 Census, a total of 5,376,205 elderly individuals are disabled in India in, accounting for a disability rate of 5,178 per 100,000 elderly people (5.1%). It is therefore not surprising that a World Bank study has shown that a sizeable burden of disability exists in India (Awasthi et al, 2017).

Further given that disability increases with advancing age, detailed evidence on disabilities and their covariates is particularly relevant in the context of India. India's elderly population (60 years or more) is growing three times faster than its population as a whole. It is projected that the percentage of elderly people will climb from 8% in 2010 to 19% in 2050. By mid-century, their number is expected to be 323 million (United Nations, 2011). Even more significant in its implications for population aging is the dramatic rise in life expectancy at age 60, from about 12 years in 1950 to 18 years in 2015. This is projected to rise further to more than 21 years by 2050. Average Indian life expectancy at age 80 has likewise increased significantly, from about five years in 1950 to more than seven years at the present time. By the middle of this century, it is predicted to rise to 8.5 years (United Nations, 2015; Agarwal et al, 2016). This and the projected marked future shift in the share of older Indians in the population are taking place in the context of changing family relationships and severely limited old-age income public support, hence bringing with them a variety of social, economic and health-care policy challenges (Beard and Bloom, 2014).

Disability is neither purely medical nor purely social.[1] Rather, it is an outcome of the interplay of these factors. Non-communicable diseases (NCDs) such as asthma, cancer, cardiovascular disease and stroke are associated with impairments that are aggravated by stigma, discrimination over access to educational and medical services, and the job market. Higher disability rates among older people reflect an accumulation of health risks across a lifespan of disease, injury and chronic illness (WHO and World Bank, 2011). The co-occurrence of NCDs and disabilities poses a considerably higher risk of mortality relative to those people not suffering from either.

With increasing age, several physiological changes occur, and the risk of NCDs rises. By age 60, the major burdens of disability and death stem from age-related losses in hearing, seeing and moving, as well as from NCDs. This is especially so in low- and middle-income countries (WHO, 2015). Furthermore, aging takes place alongside other broad

[1]Jeffery and Singal (2008) also observe that the official discourse continues to perceive disability as purely a medical condition, to be certified and provided for through aids, appliances and concessions in education and employment. Framing the individual in isolation, without engaging with the wider social and physical context, is common in a medicalised approach.

social trends that will affect the lives of older people. Economies are globalising, people are more likely to live in cities and technology is evolving rapidly. Demographic and family changes mean there will be fewer older people with families to care for them.

Also, there is a bi-directional link between disability and poverty: disability may increase the risk of poverty, and poverty may increase the risk of disability. Households with a disabled member are more likely to experience material hardship – including food insecurity, poor housing, lack of access to safe water and sanitation, and inadequate access to health care. Poverty may increase the likelihood that a person with an existing health condition becomes disabled, for example, as the result of an inaccessible environment or lack of access to appropriate health and rehabilitation services. Although a two-way relationship between disability and poverty is often conjectured, a rigorous empirical validation has not been carried out so far[2].

Three demographic processes are at work: declining fertility rates, increasing longevity and large cohorts advancing to old age (Bloom et al, 2014; Agarwal et al, 2016). As both NCDs and disabilities tend to rise with age, often in tandem, the inadequacies of the present health systems, community networks and family support may magnify and render these support systems largely ineffective. If the costs in terms of productivity losses are added, the total cost burden of looking after the disabled elderly people may be enormously high in the near future. In addition, there are non-economic costs that include social isolation and stress that are difficult to quantify.

In the light of the above trends, the central goal of this study employing the most recent and suitable data is to throw light on the factors associated with the prevalence of self-reported disabilities and their forms.

Literature review

According to the World Health Organisation (WHO) (2015), the common age-related changes include decline in bone mass or density, causing chronic diseases such as osteoporosis, and reduced vision and hearing. Additionally, the effect of malnutrition in old age is more detrimental. It can take the forms of reduced muscle and bone mass, and increases the risk of frailty. Malnutrition is also associated with diminished cognitive function and ability to care for oneself, and a higher risk of becoming care-dependent. Hence the coexistence of both multiple disabilities and morbidities is pervasive, albeit the extent varies by social and economic status of elderly individuals, as corroborated by recent research.[3]

[2]There is documentation of poverty resulting in disability but not on impoverishment due to disability (Niessen et al. 2018).

[3]For a comprehensive review, see Chatterjee et al (2015).

In a detailed but largely descriptive study, Awasthi et al (2017) focus on trends and levels of disability at the district level, calculated from Census data for 2001 and 2011. It may be noted that disability is self-reported.

A district-level Disability Index is calculated by indexing districts, with computations done separately at the district level. The methodology of computation of the composite index is adopted from the Human Development Report. The district with the lowest prevalence of disabled people throughout the country is assigned the value 0, while the district with the highest prevalence is assigned the value 100.

In Census 2001, 110 districts have a Disability Index of more than 50, which increases to 130 districts in 2011, based on the same cut-off in both the Censuses. Most of the districts with a high Disability Index are concentrated in Orissa (13 out of 30 districts), Tamil Nadu (14 out of 32), Kerala (7 out of 14), Jammu and Kashmir (14 out of 22), Arunachal Pradesh (13 out of 16), Sikkim (2 out of 4), Madhya Pradesh (8 out of 51), and Rajasthan (4 out of 33).

The index for 2011 shows that high Disability Index districts are concentrated in Maharashtra (15 out of 35 districts), Orissa (25 out of 30), Andhra Pradesh (7 out of 23), Jammu & Kashmir (13 out of 22), Bihar (9 out of 38), Punjab (4 out of 20), and Rajasthan (6 out of 33). Most of the districts in Maharashtra and Andhra Pradesh have a Disability Index of less than 30 in 2001, but this changes in 2011, when most of the districts have a high Disability Index. By contrast, most of the districts in Kerala, Tamil Nadu and Arunachal Pradesh have a Disability Index of more than 40 in 2001, which in 2011 changes to most districts having a Disability Index of less than 30.

Another measure used in the study is the Disability Deprivation Index. It takes into account the disabled population's proportion of child labour, adult unemployment, illiteracy, beggars, vagrants, all expressed as percentages.

The Disability Deprivation Index reveals the living conditions of a disabled population. It shows that the most poorly performing states cover more than 80% of the disabled population of the country.

The majority of the disabled are non-working. This calls for effective rehabilitation measures that would facilitate employment and other opportunities for people with a disability to improve their quality of life.

Unfortunately, there is no analysis of factors associated with inter-district variation in these disability indices.

Another study (Velayutham et al, 2016), based on the 2011 Census data, offers a more disaggregated picture of variation across the states in type of disability by age, gender and rural population. (As these are already summarised in the Introduction, it is unnecessary to repeat the main findings.) As in the previous study, no attempt is made to analyse the factors associated with the variations in disabilities.

Turning to more analytical research in the United States, in a sample of individuals 60 years or more and resident in the US, Murtagh and Hubert (2004) found that the comorbidity conditions associated with disability among this cohort, which were predominantly musculoskeletal, neurodegenerative and psychological in origin, were generally more prevalent among women than among men, and served, along with greater prescription medication use, to explain the reported higher levels of overall disability in activities of daily living (ADLs), in instrumental activities of daily living (IADLs) and in mobility limitations among women.[4] The gender differences in disabilities persist even after controlling for income, alcohol consumption and Body Mass Index (BMI).

An investigation on India finds found that more than 50% of the elderly disabled population suffer from more than one disability and 10% have five or more (reported) disabilities Pou (2013). Such proportions/prevalence increase with age and decrease with education. The disabled elderly population with five or more disabilities is almost double among the lowest wealth quintile compared with the highest wealth quintile. The proportion among disadvantaged groups, such as Scheduled Castes (SCs) and Scheduled Tribes (STs), with multiple disabilities are almost double that among other castes, as also among Hindus and Muslims relative to other religions. Although not validated statistically, the links between living arrangements and social networks, and disability type are indicated. Half of those who are disabled do not belong to any social network and the majority live with their children. More than half don't work. Although government financial support makes a difference, it benefits fewer than 20% in six of eight disability dimensions or types.

A more recent study again on India examines the association between chronic diseases and disability, based on data obtained from the 'Building a Knowledge Base on Population Aging in India (BKPAI)' survey conducted by UNFPA in 2011[5] (Kumar et al, 2017). It is a multi-cohort survey of persons 60 years and older in seven states: Himachal Pradesh, Punjab, West Bengal, Odisha (formerly Orissa), Maharashtra, Kerala and Tamil Nadu. The authors distinguish between physical disability and functional disability as reported by the respondents. The former refers to respondents facing difficulties relating to vision, hearing, walking, chewing, speaking and memory. The latter focuses on whether respondents require help for ADLs such as bathing, dressing, going to the toilet, mobility, continence and feeding.

Binary logistic regression is carried out to capture the effects of chronic morbidities, life style and socio-economic and demographic covariates on physical and functional disability. The odds of reporting any functional disability are significantly higher among

[4]Functional tasks in the daily lives of older persons are divided into two parts, ADLs and IADLs. The former include activities such as walking, bathing, dressing and going to the toilet, while the latter comprise cooking, driving, using the telephone or computer, shopping and keeping track of finances.

[5]This survey relied on self-reported measures of physical and functional disability.

elderly people who had chronic diseases compared with those who didn't. Further, the odds of any functional disability are higher among older (80+years) people, among Muslims and among those who live with others, compared with their respective counterparts.

The likelihood of physical disability is also higher among those who suffer from chronic diseases. Those who smoke or chew tobacco daily are 1.5 times more likely to have any physical disability, compared with those who don't. The odds of any physical disability are lower among those who consume alcohol, as opposed to those who don't. Unlike functional disability, the odds of physical disability are significantly higher among elderly females, those aged 80+ years, those with 10 or more years of schooling and among the Muslims, as compared with their respective counterparts.

The significance of social networks for overcoming stress from morbidity and disability is corroborated by several studies. An innovative and insightful study by Seeman and Berkman (1988) distinguishes between instrumental and emotional support for the elderly. Their analysis shows that, while structural measures reflecting overall network size are positively associated with greater availability of instrumental and emotional support, relatively geographically proximate ties are more important, particularly with respect to the availability of instrumental support. Emotional support is less heavily dependent on geographic distance, being significantly related both to proximal and more distant ties. Furthermore, the evidence doesn't point to a threshold effect, which our analysis contradicts.

2. Data

Our analysis draws upon the two rounds of the nationally representative India Human Development Survey (IHDS) data conducted in 2005 and 2012. The IHDS is conducted jointly by University of Maryland and the National Council of Applied Economic Research. The first round (IHDS-1) comprises a survey of 41,554 households in 2004–05. The second round (IHDS-II) involves re-interviews with 83% of the original households as well as split households residing within the same locality, along with an additional sample of 2,134 households. The total for IHDS-II is therefore 42,152 households. The panel of individuals $\geq$60 years is10,473 individuals. The sample is spread across 33 (now 34) states and union territories, and covers rural as well as urban areas. Throughout the analysis, the computations are based on the 2005 age-distribution and other covariates. However, data constraints do not allow disaggregation of the elderly into 5- year intervals.

Repeated interviewing of the same households at two points in time facilitates a richer understanding of which households are able to partake in the fruits of growth, what allows them to move forward, and the process through which they are incorporated into or left out of a growing economy. However, this is problematic because of lack of comparability of self-reported disabilities in 2005 and 2012. Given the greater reliability of disabilities in 2012, we are unable to use a panel model and use a specification that relies on 2005 covariates.

The topics covered by the IHDS relevant in the present context include short-term morbidity, major morbidity (including NCDs), limitations in ADLs, and access to medical care and insurance. The number of persons medically insured is very small.

The NCDs include cataracts, high blood pressure, heart disease, type 2 diabetes, leprosy, cancer, asthma, epilepsy, and mental disorders. The number of cases of mental disorder and cancer are very small for analysis.

An important issue is reliability of self-reported disabilities. Given better reporting in 2012, we focus on whether initial characteristics of individuals and households (i.e. age, assets, gender, marital status, NCDs, disabilities, participation in social networks in 2005) are significant covariates. This specification rules out use of a panel model with the 2005 and 2012 data alone.

Variables

The dependent variable measures the presence and number of disabilities and is specified as Y = 0 if no disability

= 1 I disability

= 2 or more disabilities

Disability is usually measured by a set of items on *self-reported* limitations, with severity of disability ranked by the number of positively answered items. Disabilities in ADLs show the dependence of an individual on others, with need for assistance in daily life.[6]

The (reported) disabilities include (1) difficulty walking; (2) difficulty using toilet facilities; (3) difficulty dressing; (4) difficulty with hearing; (5) difficulty speaking, (6) long sightedness/far sightedness; and (7) short sightedness.

The explanatory variables are a combination of socioeconomic and demographic factors such as age, gender, education, caste, asset quartile, social networks, household size.

In the interest of easier readability we present marginal associations to show the . have used a probit specification to obtain marginal associations of an explanatory variable upon a binary or ordered dependent variable, controlling for the effects of other explanatory variables. In the probit model, the inverse standard normal distribution of the probability is modelled as a linear combination of the predictors.

It may be noted that the dependent variables refer to *reported* disabilities in 2012 and the explanatory variables/covariates refer to 2005. We employ the **ordered probit (OP)** model which is a generalization of the widely used **probit** analysis to the case of more than two outcomes of an ordinal dependent variable (a dependent variable for which the potential values have a natural ordering, as in poor, fair, good, excellent, or, as in the present case, no disability, 1 disability, 2 or more disabilities).

[6]For a validation of self-reported health and morbidity, see Subramanian et al (2009).

In the interest of easier readibility, we present marginal effects/associations. As is known, both the sign and magnitude of marginal effects/associations vary with the ordered outcome.

Results

The OP results on (reported) disabilities by count are given in Table 1 and the marginal associations in Table 1a. The specification is validated by the Wald test of joint significance of all coefficients.

As the coefficients differ from the marginal associations, we concentrate on the latter.

Among the elderly persons (i.e. 60 years or older), the older persons (71 years or more) display a lower probability of no disability, and higher probabilities of a single disability, 2-4 disabilities and >4 disabilities, relative to the omitted group of 60-70 years.

State-dependence of disabilities in 2012 yields interesting insights. If an elderly person suffers from a single disability in 2005, it has no significant association with no disability, single disability, 2-4 disabilities and > 4 disabilities in 2012, relative to elderly people with no disability in 2005. In sharp contrast, 2-4 disabilities in 2005 are associated with a lower probability of no disability in 2012, and higher probabilities of suffering from a single disability, 2-4 disabilities and >4 disabilities in 2012, relative to elderly people with no disability in 2005. The extreme case of > 4 disabilities in 2005 yields one significant association: the probability of suffering from 1 disability is higher in 2012, relative to an elderly people with no disability in 2005.

Elderly males are more likely to experience no disability, and less likely to suffer from a single disability, 2-4 disabilities and >4 disabilities in 2012, compared with elderly females. What seems likely is that even when males engage in hazardous occupations and suffer accidents they are more likely to get medical care than elderly females.

Marital status of elderly people yields significant associations. As currently married elderly are the largest group, it is omitted. Relative to this group in 2005, widowed are associated with a lower probability of no disability, and higher probabilities of a single disability, 2-4 disabilities and > 4 disabilities in 2012. Others do not yield any significant marginal associations. Whether widowed –especially women-are more vulnerable to disabilities due to their social ostracization and lack of family support can't be dismissed out of hand. No comment can be made on the motley group of Others (including divorced/separated, never married).

Relative to the rural population in 2005, the urban population displays a higher probability of no disability, and lower probabilities of a single disability, 2-4 disabilities,

and > 4 disabilities in 2012. It is plausible that availability of assistive devices and better medical care in urban areas is associated with lower risks of disabilities.

Caste affiliation mirrors the socio-economic heirarchy. At the bottom are Scheduled Castes (SCs)/Scheduled Tribes (STs). The latter are largely located in remote areas and are thus socially excluded. Above them are Other Backward Castes (OBCs) and at the top are Others (who are also richer than OBCs). Relative to elderly OBCs in 2005, only STs possess significant marginal associations with disabilities: the probability of no disability is higher, and of a single disability is lower, as also probabilities of 2-4 disabilities and > 4 disabilities in 2012. STs are known to follow a healthy and active life-style and rely on their traditional/indigenous medical knowledge systems. These presumably contribute to their lower vulnerability to disabiity.

Asset quartiles are constructed using principal component analysis[7]. Relative to those in the first quartile (the least wealthy) in 2005, those in the fourth quartile (the wealthiest) display higher probability of no disability, and lower probabilities of a single disability, 2-4 disabilities and >4 disabilities in 2012. As the most affluent elderly people live more sedentary lives, tend to rely on unhealthy diets and consume more alcohol and tobacco, they are more likely to be vulnerable to NCDs and consequently disability. This sequence is echoed in recent studies (Academy of Medical Sciences, 2018, Beard and Bloom, 2014).

Educational attainments of elderly people in 2005 yield significant marginal associations with vulnerability to disabilities in 2012. As the illiterates (and with a few years of education) are the largest group, they are omitted. Relative to this group, those with primary education, display higher probability of no disability, and lower probabilities of a single disability, 2-4 disabilities and >4 disabilities. Similarly, those with middle to matriculation level of education (10-12 years of school education) in 2005 enjoy a higher probability of no disability, and lower probabilities of a single disability, 2-4 disabilities and > 4 disabilities in 2012. However, those above matriculation do not show any significant associations with disabilities. Presumably those with above matriculation level of education are also more affluent and thus more vulnerable to NCDs and accompanying disabilities that outweigh their advantage of easier access to expensive aids and surgery. These findings suggest that a few years of education are associated with significant reductions in disabilities presumably because they are better equipped with knowledge of risks and awareness of medical options.

The largest group is of elderly people who do not suffer from any NCD in 2005 and hence omitted. Relative to this group, elderly people who suffer from any NCD display a lower probability of no dsability, and higher probabilities of suffering from a single disability, 2-4 disabilities and >4 disabilities in 2012. This, however, captures the one-way relationship between NCDs and disabilities. An example may be helpful. Diabetes often leads to vision impairment and stroke limits mobility. But restricted mobility and unhealthy diets could result in greater vulnerability to diabetes.

[7]Details will be furnished upon request.

Relative to the largest group of households with 5 or more members in 2005, those living alone are not associated with disabilities in 2012. However, in sharp contrast, elderly persons living in households with 2-4 members display a lower probability of no disability, and higher probabilities of suffering from a single disability, 2-4 disabilities and >4 disabilities in 2012. This raises the concern that old, disabled persons are more likely to be neglected, if not abused, in small households due to financial and other constraints.

Participation of elderly people in social networks in 2005 is associated with the vulnerability to disabilities in 2012. As the largest category comprises those without any membership of a network, it is omitted. Those who belong to 1-3 networks are associated with higher probability of no disability, and lower probabilities of a single disability, 2-4 disabilities and >4 disabilities in 2012. However, the results on disabilities in 2012 are weak for households that belong to > 3 networks in 2005. Whether social networks are a substitute for family support needs more detailed investigation than feasible with IHDS. Nor do we know much about density of these networks (e.g, frequency of attendance and interactions in meetings) and geographical proximity..

Disability by Type

In order to avoid repetition, we have consolidated the results on 7 disability types in Table 2. Detailed results are given in Appendix Tables A.1 to A.7. As may be noted from the latter, all probit specifications are validated by the Wald test of joint significance of all coefficients. Since marginal associations with different disability types are more interesting than the probit coefficients, our remarks are confined to the former. In the interest of coherence, instead of the values of the marginal associations, we have used the signs of significant associations in Table 2.

State dependence of disability types is confirmed for difficulties in using toilet facilitie, dressing, hearing impairment and far sightedness. What this means is that those elderly people who suffered from these disabilities in 2005 continued to suffer from them in 2012. As persistence of disabilities requires longer periods of monitoring and medical care than short-term disabilities, this distinction is crucial to designing appropriate monitoring and medical care systems.

Elderly males experience lower walking difficulty than females. In all other cases, the differences are not significant. Whether elderly males are less prone to injuries and accidents is likely but calls for a more detailed investigation than feasible with the IHDS. Besides, they are less discriminated against in medical care than elderly women.

Widowhood is associated with higher probabilities of all 7 disabilities than currently married. In particular, elderly widows are not only subject to greater neglect within a household but also socially ostracized. Their lack of access to medical care makes them more vulnerable to different disabilities.

Location is associated with a significant difference. The elderly living in urban areas are less likely to suffer from hearing impairment, far sightedness and short sightedness,

compared with those living in rural areas. One likely reason is easier access to assistive devices and medical care in urban areas.

In the caste heirarchy, Others are generally most affluent while STs are most deprived and confined to remote regions. Others are less vulnerable to difficulties in using toilets and in dressing while STs are less vulnerable to these difficulties, relative to OBCs. Others are more likely to suffer from disabilities because of their sedentary life-styles and rich diets but this disadvantage is more than overcome by their affordability of more expensive treatments (eg, knee and hip transplants). In sharp contrast, although most deprived, STs are less likely to suffer from disabilities because of their wide range of physical activities, healthy diets and use of indigenous medical knowledge systems.

Somewhat surprisingly, asset quartiles are generally not associated with any disabilities except the third and fourth with significantly lower probabilities of far sightedness. Although the wealthier are more likely to suffer from NCDs because of their sedentary life styles and rich diets, in most cases this disadvantage is offset by their affordability of expensive assistive devices and medical care, relative to the least wealthy. If far sightedness requires expensive eye surgery, the wealthier groups are more likely to overcome this disability[8].

Education is associated with lower vulnerabilities to disabilities, relative to the illiterates. Even with primary education, there are lower probabilities of difficulty in dressing, hearing impairment, speech impairment, far sightedness and short sightedness. Higher levels of education (matriculation and above matricultation) are also associated with lower probabilities of certain disabilities. For example, matriculation is associated with lower probabilities of hearing impairment, speech impairment, far sightedness and short sightedness. The important point, however, is that even with a few years of education, awareness of assistive devices and medical care options is greater, and vulnerability to disabilities is lower. As higher levels of education are often associated with greater affluence, the disadvantage of greater vulnerability to NCDs and accompanying disabilities is more than offset by affordability of expensive assistive devices and medical care.

Elderly suffering from NCDs in 2005 are more likely to suffer from walking disability, far sightedness and short sightedness, compared with those who do not suffer from any NCD. Strokes, hypertension and diabetes are associated with these disabilities.

Among the elderly persons, 71 years+ are more likely to suffer from all disabilities in 2012, relative to 60-69 years old. The reasons lie in physiological changes, and reduction in bone and muscle densities that accompany aging.

[8]The most common type of laser eye **surgery** used to correct **hyperopia** is LASIK, which stands for laser in situ keratectomies.

Among the elderly people, membership of social networks is associated with lower vulnerability to disabilities, relative to those who do not belong to any network. Membership of 1-3 networks is associated with lower vulnerability to hearing impairment while membership of >3 networks is associated with lower vulnerability to far sightedness and short sightedness. Depending on the density and geographical proximity of these networks, the elderly benefit from both financial support and easier access to medical care.

Elderly people living alone and in small households (2-4 members) are associated with greater vulnerability to disabilities, compared with large households (5 or more members). If living alone, an elderly person is more likely to suffer from speech impairment, while an elderly person in a small household is more likely to suffer from far sightedness and short sightedness, compared to elderly persons in large households. The reasons are likely to differ. Elderly people living alone are likely to be destitutes and thus unable to afford medical care while those living in small househols are likely to be neglected and may not receive any medical help because of limited resources.

Multiple Disabilities

As in the previous case, we have consolidated the OP results on *(reported)* multiple disabilities in Table 3. Detailed OP results are given in Appendix Tables A. 8 to A. 14, and the corresponding marginal associations in Appendix Tables A.8a to A.14a. As the overall specifications are validated by the Wald test of joint significance of all coefficients, we confine our comments to the marginal associations in the consolidated Table 3. As before, only signs of significant marginal associations are given in the interest of coherence of our comments. All explanatory variables are for 2005 and outcomes for 2012.

probability of no disability and higher probabilities of either disability and both in 2012, relative to those who do not suffer from any disability. Besides, both disabilities are associated with lower probability of no disability and higher probabilities of either and both in 2012, implying state dependence of multiple disabilities.

The fourth case of multiple disabilities includes difficulties in walking and dressing. The elderly persons who suffer from either in 2005 have lower probability of no disability and higher probabilities of either and both in 2012, relative to those who do not suffer from any disability. However, if an individual suffers from both disabilities, it has no significant marginal association with any outcome.

The fifth combination includes difficulty in walking and vision impairment. An elderly suffering from either disability in 2005 is less likely to experience no disability and higher probabilities of either disability and both in 2012, relative to those who do not suffer from any disability. However, when an elderly suffers from both disabilities, there is no significant difference in the outcomes.

The last combination comprises difficulty in speaking and vision impairment. With either difficulty among the elderly in 2005, there is a lower probability of no disability and higher probabilities of either disability and both in 2012, relative to those with no disability. Both disabilities in 2005 do not yield significant effects in 2012.

In brief, there is state dependence of multiple disabilities in 3 cases out of the 7.

In the first case of difficulties in walking and using toilets, elderly males are more likely to experience no disability and less likely to suffer from either disability and both in 2012, relative to elderly females. Elderly males are less likely to be discriminated against in the provision of assistive devices and medical care than elderly females.

In the second case of difficulties in walking and dressing, elderly males are less disadvantaged than elderly females. Elderly males are more likely to experience no disability and less likely to have difficulties in either and both activities, pointing again to their more favoured treatment than elderly females.

In the third case of difficulties in walking and hearing, elderly males do not show significant marginal associations with any outcome in 2012.

In the fourth case of difficulties in walking and speaking, elderly males, relative to females, are more likely to experience no disability and less likely to suffer from either disability and both in 2012.

In the fifth case of difficulty in walking and vision impairment, elderly males are more likely to experience no disability and less likely to suffer from either disability and both in 2012, relative to elderly females..

In the sixth case, elderly males do not show significant marginal associations with any outcome in 2012.

Under marital status, the largest and omitted group is that of elderly currently married. Relative to this group, elderly widowed are less likely to experience no disability and more likely to suffer from either difficulty in walking or using toilets and both in 2012. As widows in general suffer from a social stigma, they get little support from the community. Their fate within the household is just as grim as they experience utter neglect and not infrequently ill-treatment.

A similar set of effects is found in the context of walking and dressing difficulties. Specifically, widowed are less likely to experience no disability and more likely to suffer from either disability and both in 2012, relatively to currently married.

This set of effects is reproduced in the case of difficulties in walking and hearing. Relative to elderly currently married, widowed are less likely to experience no disability and more likely to experience either disability and both in 2012.

The case of walking and speaking disabilities is similar in terms of the three outcomes in 2012, as well as that of walking disability and vision impairment. The only exception is

the case of difficulty in speaking and vision impairment in which widowhood is unrelated to any of the three outcomes.

Arguably widowhood among the elderly- largely widows-is associated with grim prospects of most multiple disabilities.

Urban location has significant marginal associations in two cases of multiple disabilities: difficulty in walking and vision impairment, and difficulty in speaking and vision impairment. As the effects are similar in both cases, our comments are limited to the case of difficulty in walking and vision impairment. Elderly living in urban areas are more likely to experience no disability and less likely to suffer from either disability and both in 2012, relative to the elderly in rural areas. As availability of assistive devices and medical care is better in urban areas, these outcomes are not surprising.

Elderly belonging to Others and SCs in 2005 are unrelated to any outcome in 2012, relative to OBCs. However, STs possess significant marginal associations with all multiple disabilities except speech and vision impairment. As the associations are similar in most cases of multiple disabilities, we will comment only on the combination of difficulties in walking and speaking. Elderly STs are more likely to experience no disability and less likely to suffer from either disability and both in 2012, relative to OBCs. As noted earlier, and applicable to this and other cases of significant marginal associations, STs are confined to locations with little environmental stress, lead healthy and physically active lives, and extensively rely on indigenous medical knowledge. So their lower probabilities of single and multiple disabilities are not surprising.

In all cases other than two of multiple disabilities, difficulty in walking and vision impairment, and in speaking and vision impairment, asset quartiles are not significantly associated with any outcome in 2012. Confining ourselves to difficulty in walking and vision impairment, the wealthiest /fourth quartile is associated with higher probability of no disability and lower probabilities of either disability and both in 2012, relative to the least wealthy/first quartile. Similar marginal associations are obtained for speaking and vision impairment. Two observations are pertinent. One is that wealthier elderly are likely to be more vulnerable to NCDs primarily because of their sedentary life styles and rich diets, and thus more prone to disabilities. However, given their affluence, they are better able to afford expensive walking aids, knee and hip transplants and eye surgery and thus overcome these disabilities. Similar observations are pertinent to the second case of speaking and vision disabilities.

Education in 2005 and disabilities in 2012 among the elderly are inversely related in all cases. We will comment on three different combinations of multiple disabilities as the results are similar. The first case is that of difficulties in walking and using toilet facilities. Elderly with primary education in 2005 are more likely to experience no disability and lower probabilities of either disability and both in 2012, relative to illiterates. The next case is that of difficulties in walking and hearing. Elderly with primary education are more likely to experience no disability and lower probabilities of either disability and both in 2012, relative to the omitted illiterates. Similarly, in the case of difficulty in

speaking and vision impairment, elderly with primary education in 2005 are more likely to experience no disability and less likely to suffer from either disability and both in 2012, relative to the omitted group. Thus even a few years of education imparts greater awareness of how to prevent and mitigate multiple disabilities.

At the higher level of matriculation, similar results are obtained for multiple disabilities in 2012. However, at the highest level of education (i.e. above matriculation) of the elderly persons in 2005, we get mixed results. In the first case of difficulties in walking and using toilets, elderly persons with this level of education are associated with lower probability of suffering from both disabilities in 2012, relative to illiterates. Similarly, at this level of education, elderly persons are associated with lower probability of both walking and dressing disabilities, relative to the omitted illiterates. In the case of difficulty in walking and vision impairment, elderly with above matriculation education in 2005 experience higher probability of no disability and lower probabilities of either disability and both in 2012, relative to the omitted group. It may seem somewhat intriguing that at the highest level of education there are fewer significant associations with multiple disabilities, since awareness of risks of disabilities and how to deal with them are likely to be at least as high as among elderly persons with primary education. However, if we make an allowance for the fact that those with highest level of education are likely to be more affluent with consequently higher risks of NCDs, it can't be ruled out that their ability to afford more expensive treatments for some multiple disabilities is more than outweighed by their greater propensity for these disabilities.

Elderly with NCD in 2005 are associated with higher probabilities of multiple disabilities in 2012, relative to those without NCD. Indeed, the results are similar for all multiple disabilities. Three are considered here to avoid much repetition. Consider first the case of walking and dressing disabilities. Elderly persons suffering from an NCD in 2005 are less likely to experience any disability and more likely to suffer from either disability and both in 2012, relative to those without any NCD. Another case with similar results is that of walking and speaking disabilities. Elderly suffering from an NCD in 2005 are less likely to experience no disability and more likely to suffer from either disability and both in 2012, relative to those without any NCD. A third case with similar results is that of difficulty in speaking and vision impairment. Eldelry persons with an NCD in 2005 are less likely to experience no disability and more likely to suffer from either disability and both in 2012, relative to the elderly persons without any NCD. Diabetes and hypertension are associated with high risk of a stroke and consequently physical paralysis and vision impairment.

Somewhat surprisingly, elderly membership of social networks (>3) in 2005 is associated with significant effects only in the case of speech and vision disabilities in 2012. Specifically, an elderly person's membership of > 3 networks is associated with a higher probability of not experiencing any disability and lower probability of suffering from both disabilities in 2012, relative to elderly people without membership of any social network. There are two reasons which seem relevant: one is density and another is geographical proximity of social networks. If frequency of interaction is low and the networks are

small, and geographically dispersed, elderly persons with disabilities may not benefit much.

Somewhat surprisingly, elderly persons living alone in 2005 are not associated with disabilities in 2012, unless of course they receive help from friends and other in the local community. However, those living in small households (2-4 members) in 2005 are likely to suffer from some multiple disabilities in 2012: walking and hearing, walking and vision impairment, and speaking and vision impairments. In all cases, the marginal associations are similar. To avoid much repetition, we will comment on the first two cases of multiple disabilities. Elderly persons living in small households are associated with lower probability of no disability and higher probabilities of either walking or hearing disability and both in 2012, compared with elderly persons in large households (5 or more members). Elderly persons with disability in small households are frequently neglected in terms of medical or general care for lack of adequate resources.

3. Discussion

We have investigated the socio-demographic –economic factors that are associated with variation in disability by count and type among the elderly in India. A special feature of our analysis is that we examine not just individual disabilities but also their *joint* occurrence/multiple disabilities. As stated earlier, disabilities are not just a medical problem but also associated with social, demographic and economic factors. Our analysis, based on the IHDS for 2005 and 2012, corroborates this. It focuses on the elderly people in 2005. The reason for this focus is their neglect in the policy discourse. Using probit and ordered probit models, we have examined the relationship between disabilities in 2012 and their covariates in 2005. The reason for analysing the prevalence of disabilities in 2012 (as opposed to using a panel model) is the fact that disabilities in 2012 are more comprehensively measured.

We comment on the main findings from a broad policy perspective here.

One of the main findings is that whether it is disability by count or by type there is, with a few exceptions, a strong state dependence of single or multiple disabilities between 2005 and 2012 among the elderly people in 2005. Persistence of disabilities is a major policy concern. A policy issue is that not just currently disabled but also those whose disabilities have persisted over time get adequate medical attention.

Aging is associated with important physiological changes, and the risk of NCDs rises. By age 60, the major burdens of disability and death stem from age-related losses in hearing, seeing and moving, as well as from NCDs. This is especially so in low- and middle-income countries (WHO, 2015). Furthermore, aging takes place alongside other broad social trends that will affect the lives of older people. Economies are globalising, people are more likely to live in cities and technology is evolving rapidly. Demographic and family changes mean there will be fewer older people with families to care for them. It is therefore worrying that the older persons (71 years +) are more vulnerable to single and multiple disabilities by count and type. That they-especially older women- are often treated as a burden and discriminated against in small households raises the concern that

availability of medical care alone is not likely to be effective unless there is easier access of the elderly men and women to it[9].

A particularly glaring case is greater vulnerability of elderly widowed-especially widows- to single and multiple disabilities arising from their economic deprivation, social ostracization, and limited family support. Not being able to perform the activities of daily living and being dependent on others - especially of widows and other aged individuals- is often humiliating. To some extent, this lack of family support is compensated for by social networks (such as self-help groups, women's associations and other informal groups). If an elderly person belongs to a few of such networks which are closely knit, he/she is less likely to suffer from a single and multiple morbidities. A policy challenge is to ensure that such networks expand and become more inclusive. This is of course a daunting prospect in a caste –ridden society. We must, however, know more about their geographical proximity and density.

It is surprising that, except in a few cases, an elderly individual's household wealth is of little consequence. It helps in cases that require expensive treatment (knee and hip replacement, cataract surgery). A priority is to ensure that such treatments become more accessible and affordable for the elderly people. Two observations are pertinent here: one in some cases of multiple disabilities, the elderly affluent are able to mitigate their disabilities through expensive assistive devices and surgery while in other cases this advantage is more than offset by their greater propensity to NCDs and consequent disabilities.

Educated elderly are better informed about medical and other options and enjoy easier access to them and are thus less liable to suffer from single and multiple disabilities in 2012, relative to illiterates in 2005. Educational expansion must go hand in hand with health system reforms that ensure better coordination between treatment of disabilities and NCDs and greater equity in accessing the services-especially of aged women. This is corroborated by our robust finding that NCDs and disabilities are closely associated. NCDs such as asthma, cancer, cardiovascular disease and stroke are associated with impairments that are aggravated by stigma, discrimination over access to educational and medical services, and the job market. Higher disability rates among older people reflect an accumulation of health risks across a lifespan of disease, injury and chronic illness (WHO and World Bank, 2011). The co-occurrence of NCDs and disabilities poses a considerably higher risk of mortality relative to those people not suffering from either.

Life-style changes with physically more demanding activities, healthy diets and lower consumption of alcohol and smoking are imperative. As aging makes the population more

[9]An important contribution is Berkman et al. (2014) who are emphatic that older men and women are not only on the receiving end of support, but also contribute to the dynamic and interdependent aspects of social institutions. This bidirectional force is often less emphasized as societies begin to have larger older populations with a consequent undue emphasis on how burdensome they are in rapidly evolving societies such as India.

susceptible to NCDs, and since the aged population has increased rapidly and is likely to continue to increase rapidly, the risks arising from sedentary lifestyles, unhealthy diets and obesity must be addressed early on. As these behavioural changes are not easy to achieve, high taxation of energy dense processed food, tobacco and cigarettes, and alcohol

[10]There is in fact a two-way relationship between NCDs and disabilities. What we have shown here is the relationship from NCDs to disabilities. In another study (Yadav et al. 2018), the relationship from disabilities to NCDs is corroborated

could produce desired results (Beard and Bloom, 2014, Yadav et al. 2018). Lower risks of NCDs are associated with lower risks of disabilities[10].

Urban-rural disparities are stark, with significantly lower probabilities of single and multiple disabilities in the former. Lacking in basic health care, elderly rural population experiences an appalling discrimination. Neither educational nor medical care facilities have improved much in the last two decades despite a plethora of new policy initiatives which remain under-funded.

In order to better capture the aging effects, it is worthwhile to work with 5- year intervals among the old. The IHDS is, however, not amenable to such disaggregation. Another extension is to capture the effects of proximity of medical services, health insurance and pension on prevalence of disabilities. Unfortunately, the IHDS data are patchy with small samples. Yet another data limitation is that smoking and alcohol consumption are reported by a tiny fraction of the sample. Finally, inability to use a panel model is limiting as unobservable individual heterogeneity is not taken into account.

8. Concluding observations

It is the co-occurrence of NCDs and disabilities among the elderly that is most likely to be fatal. This calls for a major overhaul of the health system.

Along with the expansion of old age pensions and health insurance, and public spending on programmes targeted at health care for the elderly, careful attention must be given to reorienting health systems to accommodate the needs for prevention and control of NCDs by enhancing the skills of health-care providers and equipping health-care facilities to provide services related to health promotion, risk detection and risk reduction. An important suggestion by Beard and Bloom (2014) is to employ old people with necessary training in rehabilitation centres, as they are likely to be more sensitive to old patients. Geriatric care in India is still in its infancy.

[11]There is in fact a two-way relationship between NCDs and disabilities. What we have shown here is the relationship from NCDs to disabilities. In another study (Yadav et al. 2018), the relationship from disabilities to NCDs is corroborated.

The majority of health-care systems-including India's-are geared to treat single conditions. For patients with multi-morbidity and multiple disabilities, it involves interfacing with multiple health-care providers, **increased risk of inappropriate polypharmacy**, and potentially sub-optimal care. Another shift required is patient technology to support self-management of conditions-especially for the old. Integration of care in creative ways such as treatment centres for multi-morbidity and disability clusters is thus a priority (Editorial, *Lancet*, 2018).In this context, The Rights of Persons with Disabilities Act 2016 is laudable in its intent and procedural detail. Yet it is largely silent on disabilities among the elderly. Indeed, primarily for this reason, it is arguable that its overarching goal -- "The appropriate Government shall ensure that the persons with disabilities enjoy the right to equality, life with dignity and respect for his or her integrity equally with others"(Ministry of Law and Justice, 2016, p 4) – is mere rhetoric, if not a pipe dream.

A mega health insurance scheme, announced by Prime Minister Narendra Modi on India's Independence day (15th August, 2018), will be launched nationwide on Sept 25. The scheme aims to provide up to 100 million poor families with approximately INR500 000 (US$7100) in annual health insurance coverage to pay for secondary or tertiary hospital care. It is one of the components of a flagship initiative known as *Ayushman Bharat* or "India blessed with long life", which includes developments in primary health services and health promotion (Editorial, *Lancet* 2018 a).

Critics of the scheme, alarmed by the huge cost to the Government(US$1·7 billion in the first 2 years), fear doctors and hospitals responsible for delivering treatments will be **left out of pocket**. They point out that current Government tariffs stipulated for specialised operations and procedures—including coronary stenting—are unrealistically low. Even the proponents realise that such an ambitious scheme will take a long time to deliver the benefits. That this is a mere election rhetoric can't be ruled out as financing details have not been announced.

In conclusion, a multidimensional approach comprising a strategy to overcome disabling barriers, some of which are due to family and social attitudes, as well as prevention and treatment of underlying health conditions, is required.

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Table 1: OP Results on Factors associated with Disability by Count in 2012

Socio-demographic Dummy variables	Number of obs = 9,577 Wald chi2(40) = 670.85 Prob> chi2 = 0.0000 Log pseudo likelihood= -55624897 Pseudo R2 = 0.0485	
	Coefficient	**Robust Std. Error**
Gender		
Male	-0.0839*	-0.044
Marital Status		
Widowed	0.160***	-0.041
Others	0.0285	-0.109
Sector		
Urban	-0.103***	-0.038
Caste		
Others	-0.0463	-0.045
SC	-0.0385	-0.0527
ST	-0.230***	-0.0844
Asset Quartile - 2005		
Q2	-0.0798	-0.052
Q3	-0.0593	-0.055
Q4	-0.132**	-0.06
Education		
Primary	-0.140***	-0.049
Martric	-0.165***	-0.059
>Matric	-0.106	-0.081
Any NCD - 2005		
Yes	0.169***	-0.045
Age Group		
71 years +	0.443***	-0.047
Social Networks - 2005		
1-3	-0.0820*	-0.042
>3	-0.145	-0.089
Household Size - 2005		
1	0.159	-0.148
2-4	0.0972**	-0.0401
States	Yes	
cut1	0.592	-0.13
cut2	0.867	-0.131

Note: *** p<0.01, ** p<0.05, * p<0.1

Table 1a : Marginal Associations with Disability by Count in 2012

Socio-demographic variables	Outcome 1		Outcome 2		Outcome 3		Outcome 4	
	Dy/Dx	Std. Error	Dy/Dx	Std. Error	Dy/Dx	Std. Error	Dy/Dx	Std. Error
Gender								
Male	0.0294*	-0.015	-0.00340*	-0.002	-0.0142*	-0.007	-0.0118*	-0.006
Marital Status								
Widowed	-0.0565***	-0.015	0.00649***	-0.002	0.0273***	-0.007	0.0227***	-0.006
Others	-0.00981	-0.038	0.00126	-0.005	0.00486	-0.019	0.00368	-0.014
Sector								
Urban	0.0357***	-0.013	-0.00429***	-0.002	-0.0173***	-0.006	-0.0141***	-0.005
Caste								
Others	0.0163	-0.016	-0.00184	-0.002	-0.00781	-0.008	-0.00661	-0.006
SC	0.0135	-0.019	-0.00152	-0.002	-0.0065	-0.009	-0.00553	-0.008
ST	0.0780***	-0.028	-0.0103**	-0.004	-0.0386***	-0.014	-0.0291***	-0.01
Asset Quartile - 2005								
Q2	0.0281	-0.018	-0.0031	-0.002	-0.0134	-0.009	-0.0116	-0.008
Q3	0.021	-0.02	-0.00227	-0.002	-0.00998	-0.009	-0.00873	-0.008
Q4	0.0463**	-0.021	-0.00535**	-0.003	-0.0223**	-0.01	-0.0186**	-0.008
Education								
Primary	0.0486***	-0.017	-0.00581***	-0.002	-0.0236***	-0.008	-0.0192***	-0.007
Martric	0.0573***	-0.02	-0.00701**	-0.003	-0.0280***	-0.01	-0.0223***	-0.008
>Matric	0.037	-0.028	-0.0043	-0.004	-0.0179	-0.014	-0.0148	-0.011
Any NCD - 2005								
Yes	-0.0602***	-0.016	0.00621***	-0.002	0.0284***	-0.008	0.0256***	-0.007
Age Group								

71 years +	-0.162***	-0.017	0.0137***	-0.001	0.0739***	-0.008	0.0743***	-0.009
Social Networks - 2005								
1-3	0.0285**	-0.015	-0.00334*	-0.002	-0.0138*	-0.007	-0.0114**	-0.006
>3	0.0498*	-0.03	-0.00615	-0.004	-0.0243	-0.015	-0.0194*	-0.011
Household Size - 2005								
1	-0.0564	-0.054	0.00596	-0.005	0.0267	-0.025	0.0237	-0.024
2-4	-0.0342**	-0.014	0.00384**	-0.002	0.0164**	-0.007	0.0139**	-0.006
States	Yes							

Note: *** p<0.01, ** p<0.05, * p<0.1

Table 2: Marginal Associations of Covariates of Type of Disability in 2012

Socio-demographic Variables	Difficulty in Walking	Difficulty in Using Toilet	Difficulty in Dressing	Hearing Impairment	Speech Impairment	Far Sightedness	Short Sightedness
Some Disability 2005							
Yes	NS	+***	+**	+***	NS	+**	NS
Gender							
Male	-***	NS	NS	NS	NS	NS	NS
Marital Status							
Widowed	+***	+***	+***	+***	+**	+*	+***
Others	NS	NS	-**	NS	NS	NS	NS
Sector							
Urban	NS	NS	NS	-**	NS	-***	-**
Caste							
Others	NS	-*	-**	NS	NS	NS	NS
SC	NS	NS	NS	NS	NS	NS	NS
ST	-***	-**	-**	-*	NS	NS	NS
Asset Quartile – 2005							
Q2	NS	NS	NS	NS	NS	NS	NS
Q3	NS	NS	NS	NS	NS	-*	NS

Q4	NS	NS	NS	NS	NS	-***	NS
Education							
=< Primary	NS	NS	-**	-*	-**	-**	-**
=<Martric	-**	NS	NS	-**	-*	-***	-***
>Matric	NS	-**	-**	NS	NS	-***	-**
Any NCD – 2005							
Yes	+***	NS	NS	NS	NS	+***	+***
Age Group							
70 + years	+***	+***	+***	+***	+***	+***	+***
Social Networks – 2005							
1-3	NS	NS	NS	-**	NS	NS	NS
>3	NS	NS	NS	NS	NS	-**	-***
Household Size – 2005							
1	NS	NS	NS	NS	+*	NS	NS
2-4	+**	NS	NS	NS	NS	+***	+*
States							
Constant							

Note: all explanatory variables are for 2005; NS denotes that variable is not significant and *** p<0.01, ** p<0.05, * p<0.1

Table 3: Marginal Associations of Covariates of Type of Disability in 2012

Socio-demographic Variables	Walking and using Toilet Facilities			Walking and Dressing			Walking and Hearing		
	Outcome1	Outcome2	Outcome3	Outcome1	Outcome2	Outcome3	Outcome1	Outcome2	Outcome3
Some Disability 2005									
One	NS	NS	NS	NS	NS	NS	-***	+***	+***
Both	-**	+**	+**	-**	+**	+**	-**	+***	+**
Gender									
Male	+***	-**	-***	+***	-**	-***	NS	NS	NS
Marital Status									
Widowed	-***	+***	+***	-***	+***	+***	-***	+***	+***
Others	NS	NS	NS	NS	NS	NS	NS	NS	NS
Sector									
Urban	NS	NS	NS	NS	NS	NS	+**	-**	-**
Caste									
Others	NS	NS	NS	NS	NS	NS	NS	NS	NS
SC	NS	NS	NS	NS	NS	NS	NS	NS	NS
ST	+***	-***	-***	+***	-***	-***	+**	-**	-***
Asset Quartile - 2005									

Q2	NS	NS	NS	NS	NS	NS	NS	NS	NS
Q3	NS	NS	NS	NS	NS	NS	NS	NS	NS
Q4	NS	NS	NS	NS	NS	NS	NS	NS	NS
Education									
=< Primary	+**	-**	-**	+**	-**	-**	+**	-**	-**
=<Martric	+**	-**	-**	+**	-**	-**	+***	-**	-***
>Matric	NS	NS	-*	NS	NS	-*	NS	NS	NS
Any NCD - 2005									
Yes	-***	+***	+***	+***	+***	+***	-**	+**	+**
Age Group									
70 + years	-***	+***	+***	-***	+***	+***	-***	+***	+***
Social Networks - 2005									
1-3	NS	NS	NS	NS	NS	NS	NS	NS	NS
>3	NS	NS	NS	NS	NS	NS	NS	NS	NS
Household Size - 2005									
1	NS	NS	NS	NS	NS	NS	NS	NS	NS
2-4	NS	NS	NS	NS	NS	NS	-*	+*	+*
States									
Constant									

Note: all explanatory variables are for 2005; NS represents that variables is not significant; and *** p<0.01, ** p<0.05, * p<0.1

Table 3: Marginal Associations of Covariates of Multiple Disability in 2012 (contd.)

Socio-demographic Variables	Walking and Speaking			Walking and Vision			Speaking and Vision		
	Outcome1	Outcome2	Outcome3	Outcome1	Outcome2	Outcome3	Outcome1	Outcome2	Outcome3
Some Disability 2005									
One	-*	+*	+*	-***	+***	+***	-**	+**	+**
Both	NS	NS	NS	NS	NS	NS	NS	NS	NS
Gender									
Male	+**	-**	-**	+**	-**	-**	NS	NS	NS
Marital Status									
Widowed	-***	+***	+***	-***	+***	+***	-**	+**	+**
Others	NS	NS	NS	NS	NS	NS	NS	NS	NS
Sector									
Urban	NS	NS	NS	+***	-**	-***	+**	-**	-**
Caste									
Others	NS	NS	NS	NS	NS	NS	NS	NS	NS
SC	NS	NS	NS	NS	NS	NS	NS	NS	NS

ST	+**	-**	-**	+**	-**	-***	NS	NS	NS
Asset Quartile - 2005									
Q2	NS	NS	NS	NS	NS	NS	NS	NS	NS
Q3	NS	NS	NS	NS	NS	NS	NS	NS	NS
Q4	NS	NS	NS	+**	-**	-**	+***	-***	-***
Education									
=< Primary	+**	-**	-**	+**	-**	-**	+***	-***	-***
=<Martric	+**	-**	-**	+***	-**	-***	+***	-***	-***
>Matric	NS	NS	NS	+**	-**	-**	+**	-***	-***
Any NCD - 2005									
Yes	-***	+***	+***	-***	+***	+***	-***	+***	+**
Age Group									
70 + years	-***	+***	+***	-***	+***	+***	-***	+***	+***
Social Networks - 2005									
1-3	NS	NS	NS	NS	NS	NS	NS	NS	NS
>3	NS	NS	NS	NS	NS	NS	+*	NS	-*
Household Size - 2005									
1	NS	NS	NS	NS	NS	NS	NS	NS	NS
2-4	NS	NS	NS	-***	+***	+***	-**	+**	+**
States									
Constant									

Note: all explanatory variables are for 2005; NS represents that variables is not significant; and *** p<0.01, ** p<0.05, * p<0.1

Table A.1: Probit Results on Factors associated with Walking Difficulty in 2012

Socio-demographic Dummy variables	Number of obs= 9,577 Wald chi2(41) = 571.95 Prob> chi2 = 0.0000 Log pseudo likelihood= -31072258 Pseudo R2 = 0.0775			
	Coefficient	**Std. Error**	**Margins**	**Std. Error**
Walking1km Disability 2005				
Yes	0.128	-0.0787	0.0409	-0.0258
Gender				
Male	-0.131***	-0.0474	-0.0406***	-0.0147
Marital Status				
Widowed	0.198***	-0.0459	0.0621***	-0.0144
Others	-0.0361	-0.141	-0.0106	-0.0407
Sector				
Urban	-0.0595	-0.0416	-0.0182	-0.0127
Caste				
Others	-0.0489	-0.0503	-0.0153	-0.0157

SC	-0.0607	-0.0559	-0.0189	-0.0173
ST	-0.244***	-0.0913	-0.0719***	-0.0254
Asset Quartile - 2005				
Q2	0.0241	-0.058	0.00749	-0.018
Q3	-0.000758	-0.0614	-0.000234	-0.0189
Q4	-0.015	-0.0654	-0.00461	-0.0201
Education				
Primary	-0.0889	-0.0553	-0.0274	-0.0169
Martric	-0.131**	-0.0652	-0.0399**	-0.0195
>Matric	-0.117	-0.0914	-0.0357	-0.0273
Any NCD - 2005				
Yes	0.197***	-0.0527	0.0631***	-0.0175
Age Group				
71 years +	0.425***	-0.0527	0.142***	-0.0185
Social Networks - 2005				
1-3	-0.0272	-0.045	-0.00838	-0.0138
>3	-0.0696	-0.105	-0.0212	-0.0314
Household Size - 2005				
1	0.121	-0.14	0.0379	-0.0454
2-4	0.0944**	-0.0444	0.0294**	-0.014
States	Yes			
Constant	-0.837	-0.145		

Note: *** p<0.01, ** p<0.05, * p<0.1;

Table A.2: Probit Results on Factors associated with Difficulty in using Toilet Facilities in 2012

Socio-demographic Dummy variables	Number of obs= 9,577 Wald chi2(41) = 362.30 Prob> chi2 = 0.0000 Log pseudo likelihood= -19298040 Pseudo R2 = 0.0690			
	Coefficient	**Std. Error**	**Margins**	**Std. Error**
Toilet Disability 2005				
Yes	0.481***	-0.116	0.112***	-0.0328
Gender				
Male	-0.0731	-0.0573	-0.0135	-0.0106
Marital Status				
Widowed	0.182***	-0.0548	0.0340***	-0.0103
Others	-0.103	-0.149	-0.0163	-0.0222

Sector				
Urban	0.00754	-0.0486	0.0014	-0.00903
Caste				
Others	-0.100*	-0.0609	-0.0184*	-0.011
SC	-0.0116	-0.0655	-0.00225	-0.0126
ST	-0.222**	-0.111	-0.0382**	-0.0172
Asset Quartile - 2005				
Q2	-0.0162	-0.066	-0.00297	-0.0121
Q3	0.0398	-0.0727	0.00751	-0.0138
Q4	-0.0131	-0.0783	-0.0024	-0.0143
Education				
Primary	-0.0393	-0.0637	-0.00733	-0.0118
Martric	-0.0757	-0.0812	-0.0138	-0.0145
>Matric	-0.221*	-0.113	-0.0372**	-0.0172
Any NCD - 2005				
Yes	0.091	-0.0596	0.0174	-0.0118
Age Group				
70 + years	0.472***	-0.059	0.103***	-0.0151
Social Networks - 2005				
1-3	-0.0686	-0.0562	-0.0126	-0.0102
>3	-0.17	-0.116	-0.0295	-0.0185
Household Size - 2005				
1	0.104	-0.176	0.0202	-0.036
2-4	0.0224	-0.0526	0.00415	-0.0098
States	Yes			
Constant	-1.542	-0.169		

Note: *** p<0.01, ** p<0.05, * p<0.1

Table A. 3: Probit Results on Factors associated with Difficulty in Dressing in 2012

Socio-demographic Dummy variables	Number of obs= 9,577 Wald chi2(41) = 308.06 Prob> chi2 = 0.0000 Log pseudo likelihood= -15748168 Pseudo R2 = 0.0716			
	Coefficient	**Std. Error**	**Margins**	**Std. Error**
Dressing Disability 2005				
Yes	0.383***	-0.13	0.0713**	-0.0291
Gender				
Male	-0.0797	-0.0631	-0.0118	-0.00935

Marital Status				
Widowed	0.224***	-0.06	0.0339***	-0.00917
Others	-0.333*	-0.177	-0.0342**	-0.0144
Sector				
Urban	0.077	-0.053	0.0118	-0.00822
Caste				
Others	-0.139**	-0.0659	-0.0206**	-0.00954
SC	-0.0429	-0.0728	-0.00672	-0.0113
ST	-0.225*	-0.122	-0.0315**	-0.0153
Asset Quartile - 2005				
Q2	-0.053	-0.0701	-0.00762	-0.0101
Q3	0.0338	-0.0754	0.00514	-0.0115
Q4	0.0285	-0.0816	0.00431	-0.0124
Education				
Primary	-0.156**	-0.0705	-0.0225**	-0.00974
Martric	-0.124	-0.086	-0.0183	-0.0121
>Matric	-0.218*	-0.12	-0.0303**	-0.0149
Any NCD - 2005				
Yes	0.0907	-0.061	0.014	-0.00978
Age Group				
70 + years	0.483***	-0.0628	0.0867***	-0.0135
Social Networks - 2005				
1-3	-0.0938	-0.0601	-0.0138	-0.00871
>3	-0.133	-0.124	-0.019	-0.0166
Household Size - 2005				
1	0.124	-0.187	0.0199	-0.0323
2-4	-0.0149	-0.0558	-0.0022	-0.00824
States	Yes			
Constant	-1.491	-0.171		

Note: *** p<0.01, ** p<0.05, * p<0.1

Table A. 4: Probit Results on Factors associated with Hearing Impairment in 2012

Socio-demographic variables	Number of obs= 9,577 Wald chi2(41) = 301.08 Prob> chi2 = 0.0000 Log pseudo likelihood= -21961993 Pseudo R2 = 0.0613			
	Coefficient	**Std. Error**	**Margins**	**Std. Error**
Hearing Disability 2005				

Yes	0.603***	-0.105	0.165***	-0.0343
Gender				
Male	0.0588	-0.054	0.0125	-0.0115
Marital Status				
Widowed	0.193***	-0.0524	0.0413***	-0.0114
Others	0.103	-0.187	0.0211	-0.0403
Sector				
Urban	-0.124**	-0.05	-0.0256**	-0.0102
Caste				
Others	-0.0415	-0.0584	-0.00891	-0.0125
SC	-0.0416	-0.0646	-0.00895	-0.0138
ST	-0.16	-0.104	-0.0324*	-0.0197
Asset Quartile - 2005				
Q2	-0.00895	-0.0632	-0.00199	-0.014
Q3	-0.0799	-0.0685	-0.0171	-0.0146
Q4	-0.108	-0.0664	-0.0229	-0.014
Education				
Primary	-0.117*	-0.0647	-0.0244*	-0.0131
Martric	-0.171**	-0.0758	-0.0347**	-0.0146
>Matric	0.103	-0.119	0.024	-0.0287
Any NCD - 2005				
Yes	-0.00633	-0.0615	-0.00134	-0.0131
Age Group				
71 years+	0.343***	-0.0558	0.0812***	-0.0144
Social Networks - 2005				
1-3	-0.116**	-0.0526	-0.0242**	-0.0108
>3	-0.0553	-0.114	-0.0119	-0.0241
Household Size - 2005				
1	0.217	-0.165	0.0504	-0.0419
2-4	0.0371	-0.0512	0.00791	-0.011
States	Yes			
Constant	-1.408	-0.166		

Note: *** p<0.01, ** p<0.05, * p<0.1

Table A.5: Probit Results on Factors associated with Speech Impairment in 2012

Socio-demographic variables	Number of obs= 9,524 Wald chi2(41) = 205.06 Prob> chi2 = 0.0000 Log pseudo likelihood= -13618997

	Pseudo R2 = 0.0599			
	Coefficient	**Std. Error**	**Margins**	**Std. Error**
Speaking Disability 2005				
Yes	0.174	-0.161	0.025	-0.0257
Gender				
Male	-0.00351	-0.0667	-0.00045	-0.00854
Marital Status				
Widowed	0.138**	-0.0628	0.0178**	-0.00814
Others	-0.154	-0.153	-0.0161	-0.0144
Sector				
Urban	0.0535	-0.0553	0.00699	-0.00731
Caste				
Others	-0.0399	-0.0696	-0.00524	-0.00907
SC	-0.12	-0.0756	-0.015	-0.00911
ST	-0.0691	-0.13	-0.0089	-0.0161
Asset Quartile - 2005				
Q2	-0.0546	-0.0737	-0.00717	-0.00967
Q3	-0.066	-0.0786	-0.00861	-0.0102
Q4	-0.0791	-0.0785	-0.0102	-0.0101
Education				
Primary	-0.168**	-0.0779	-0.0207**	-0.00903
Martric	-0.149*	-0.0891	-0.0186*	-0.0105
>Matric	-0.13	-0.131	-0.0164	-0.0154
Any NCD - 2005				
Yes	0.0875	-0.067	0.0117	-0.00926
Age Group				
71 years +	0.379***	-0.0661	0.0569***	-0.0116
Social Networks - 2005				
1-3	-0.0515	-0.0647	-0.00653	-0.00813
>3	-0.0097	-0.137	-0.00126	-0.0177
Household Size - 2005				
1	0.390**	-0.189	0.0650*	-0.0387
2-4	-0.0432	-0.0611	-0.00539	-0.00753
States	Yes			
Constant	-1.689	-0.199		

Note: *** p<0.01, ** p<0.05, * p<0.1

Table A.6:Probit Results on Factors associated with Far Sightedness in 2012

Socio-demographic variables	Number of obs= 9,577 Wald chi2(41) = 505.09 Prob> chi2 = 0.0000 Log pseudo likelihood= -28523400 Pseudo R2 = 0.0721			
	Coefficient	**Std. Error**	**Margins**	**Std. Error**
FarSight Disability 2005				
Yes	0.165**	-0.0707	0.0489**	-0.0218
Gender				
Male	-0.0377	-0.0537	-0.0106	-0.0152
Marital Status				
Widowed	0.0928*	-0.0531	0.0263*	-0.015
Others	0.000467	-0.17	0.000128	-0.0466
Sector				
Urban	-0.144***	-0.0447	-0.0394***	-0.0121
Caste				
Others	0.00381	-0.0653	0.00108	-0.0185
SC	0.00772	-0.0593	0.00219	-0.0168
ST	-0.136	-0.0955	-0.0365	-0.0248
Asset Quartile - 2005				
Q2	-0.109	-0.0662	-0.0318	-0.0195
Q3	-0.117*	-0.0687	-0.0341*	-0.0202
Q4	-0.241***	-0.0782	-0.0675***	-0.022
Education				
Primary	-0.144**	-0.0591	-0.0405**	-0.0163
Martric	-0.204***	-0.0719	-0.0560***	-0.019
>Matric	-0.265***	-0.0991	-0.0712***	-0.0248
Any NCD - 2005				
Yes	0.204***	-0.0668	0.0603***	-0.0207
Age Group				
71 years +	0.349***	-0.0616	0.106***	-0.0201
Social Networks - 2005				
1-3	-0.0713	-0.0475	-0.02	-0.0132
>3	-0.214**	-0.103	-0.0569**	-0.0254
Household Size - 2005				
1	0.129	-0.144	0.0368	-0.0427
2-4	0.137***	-0.0508	0.0392***	-0.0149
States	Yes			
Constant	-1.106	-0.16		

Note: *** p<0.01, ** p<0.05, * p<0.1

Table A.7: Probit Results on Factors associated with Short Sightedness in 2012

Socio-demographic variables	Number of obs= 9,577 Wald chi2(41) = 426.22 Prob> chi2 = 0.0000 Log pseudo likelihood= -26319459 Pseudo R2 = 0.0685			
	Coefficient	**Std. Error**	**Margins**	**Std. Error**
ShortSight Disability 2005				
Yes	0.120	-0.0809	0.0323	-0.0227
Gender				
Male	-0.0175	-0.0503	-0.00452	-0.013
Marital Status				
Widowed	0.153***	-0.0497	0.0399***	-0.013
Others	-0.155	-0.125	-0.0356	-0.0269
Sector				
Urban	-0.101**	-0.0446	-0.0256**	-0.0112
Caste				
Others	-0.0748	-0.0535	-0.0192	-0.0137
SC	-0.0119	-0.0614	-0.00314	-0.0162
ST	-0.0771	-0.0996	-0.0198	-0.025
Asset Quartile - 2005				
Q2	-0.064	-0.0593	-0.0168	-0.0155
Q3	-0.042	-0.0633	-0.0111	-0.0167
Q4	-0.103	-0.0686	-0.0266	-0.0176
Education				
Primary	-0.133**	-0.0589	-0.0345**	-0.0149
Martric	-0.258***	-0.0711	-0.0635***	-0.0164
>Matric	-0.190*	-0.098	-0.0481**	-0.0234
Any NCD - 2005				
Yes	0.150***	-0.0556	0.0404***	-0.0155
Age Group				
70 + years	0.285***	-0.0542	0.0792***	-0.0161
Social Networks - 2005				
1-3	-0.0389	-0.0487	-0.0101	-0.0126
>3	-0.362***	-0.106	-0.0819***	-0.0206
Household Size - 2005				
1	0.135	-0.147	0.036	-0.041
2-4	0.0833*	-0.0473	0.0218*	-0.0125
States	Yes			
Constant	-1.104	-0.159		

Note: *** p<0.01, ** p<0.05, * p<0.1

Table A.9: OP Results on Factors associated with Difficulty in Walking and using Toilet Facilities in 2012

Socio-demographic Dummy variables	Number of obs= 9,577 Wald chi2(42) = 603.60 Prob> chi2 = 0.0000 Log pseudo likelihood= -42105316 Pseudo R2 = 0.0576	
	Coefficient	**Robust Std. Error**
Walking & Toilet 2005		
One	0.0339	-0.0998
Both	0.330***	-0.107
Gender		
Male	-0.117**	-0.0459
Marital Status		
Widowed	0.194***	-0.044
Others	-0.067	-0.126
Sector		
Urban	-0.039	-0.0391
Caste		
Others	-0.0685	-0.0483
SC	-0.0475	-0.0536
ST	-0.225***	-0.087
Asset Quartile - 2005		
Q2	0.0146	-0.0546
Q3	0.00981	-0.0596
Q4	-0.0153	-0.0637
Education		
Primary	-0.0726	-0.0524
Martric	-0.122*	-0.0648
>Matric	-0.141	-0.0858
Any NCD - 2005		
Yes	0.162***	-0.0486
Age Group		
71 years +	0.439***	-0.0506
Social Networks - 2005		
1-3	-0.0403	-0.0438
>3	-0.0984	-0.095
Household Size - 2005		
1	0.118	-0.136
2-4	0.0750*	-0.0423
States	Yes	

cut1	0.845	-0.133
cut2	1.508	-0.134

Note: *** p<0.01, ** p<0.05, * p<0.1

Table A.9a: Marginal Associations of Covariates of Difficulty in Walking and using Toilet Facilities in 2012

Socio-demographic variables	Outcome 1		Outcome 2		Outcome 3	
	Dy/Dx	Std. Error	Dy/Dx	Std. Error	Dy/Dx	Std. Error
Walking & Toilet 2005						
One	-0.0455	-0.032	0.0238	-0.016	0.0217	-0.016
Both	-0.0874**	-0.04	0.0436**	-0.018	0.0438**	-0.022
Gender						
Male	0.0374***	-0.014	-0.0204**	-0.008	-0.0169***	-0.007
Marital Status						
Widowed	-0.0654***	-0.014	0.0357***	-0.008	0.0297***	-0.006
Others	0.0282	-0.035	-0.0168	-0.021	-0.0114	-0.014
Sector						
Urban	0.00714	-0.012	-0.00389	-0.007	-0.00325	-0.006
Caste						
Others	0.0234	-0.015	-0.0127	-0.008	-0.0108	-0.007
SC	0.0188	-0.017	-0.0101	-0.009	-0.00867	-0.008
ST	0.0695***	-0.025	-0.0393***	-0.015	-0.0302***	-0.01
Asset Quartile - 2005						
Q2	-0.00233	-0.017	0.00126	-0.009	0.00107	-0.008
Q3	-0.0019	-0.018	0.00103	-0.01	0.000869	-0.008
Q4	0.00135	-0.02	-0.00073	-0.011	-0.00062	-0.009
Education						
Primary	0.0336**	-0.016	-0.0184**	-0.009	-0.0152**	-0.007
Martric	0.0423**	-0.019	-0.0234**	-0.011	-0.0190**	-0.008
>Matric	0.0427	-0.026	-0.0236	-0.015	-0.0191*	-0.011
Any NCD - 2005						
Yes	-0.0523***	-0.016	0.0275***	-0.008	0.0248***	-0.008
Age Group						
70 + years	-0.150***	-0.018	0.0744***	-0.008	0.0754***	-0.01

Social Networks - 2005						
1-3	0.0137	-0.014	-0.00745	-0.007	-0.00625	-0.006
>3	0.0273	-0.029	-0.0151	-0.016	-0.0123	-0.013
Household Size - 2005						
1	-0.0408	-0.047	0.0216	-0.024	0.0192	-0.023
2-4	-0.0212	-0.013	0.0114	-0.007	0.00973	-0.006
States	Yes					

Note:*** p<0.01, ** p<0.05, * p<0.1

Table A.10: OP Results on Factors associated with Difficulties in Walking and Dressing in 2012

Socio-demographic Dummy variables	Number of obs = 9,577 Wald chi2(42) = 594.47 Prob> chi2 = 0.0000 Log pseudo likelihood= -41165863 Pseudo R2 = 0.0579	
	Coefficient	**Robust Std. Error**
Walking & Dressing 2005		
One	0.14	-0.0959
Both	0.262**	-0.115
Gender		
Male	-0.119***	-0.0458
Marital Status		
Widowed	0.205***	-0.0439
Others	-0.0972	-0.122
Sector		
Urban	-0.0228	-0.0395
Caste		
Others	-0.0741	-0.0479
SC	-0.0592	-0.0541
ST	-0.230***	-0.0877
Asset Quartile - 2005		
Q2	0.00742	-0.0539
Q3	0.00605	-0.0583
Q4	-0.00431	-0.0632
Education		
Primary	-0.108**	-0.0519

Martric	-0.137**	-0.0633
>Matric	-0.138	-0.0864
Any NCD - 2005		
Yes	0.162***	-0.0481
Age Group		
71 years +	0.442***	-0.0504
Social Networks - 2005		
1-3	-0.0438	-0.0434
>3	-0.0885	-0.0947
Household Size - 2005		
1	0.127	-0.142
2-4	0.067	-0.0417
States	Yes	
cut1	0.775	-0.132
cut2	1.635	-0.133

Note: *** p<0.01, ** p<0.05, * p<0.1

Table A10a: Marginal Associations of Covariates of Difficulties in Walking and Dressing in 2012

Socio-demographic variables	Outcome 1		Outcome 2		Outcome 3	
	Dy/Dx	Std. Error	Dy/Dx	Std. Error	Dy/Dx	Std. Error
Walking & Dressing 2005						
One	-0.0455	-0.032	0.0238	-0.016	0.0217	-0.016
Both	-0.0874**	-0.04	0.0436**	-0.018	0.0438**	-0.022
Gender						
Male	0.0374***	-0.014	-0.0204**	-0.008	-0.0169***	-0.007
Marital Status						
Widowed	-0.0654***	-0.014	0.0357***	-0.008	0.0297***	-0.006
Others	0.0282	-0.035	-0.0168	-0.021	-0.0114	-0.014
Sector						
Urban	0.00714	-0.012	-0.00389	-0.007	-0.00325	-0.006
Caste						
Others	0.0234	-0.015	-0.0127	-0.008	-0.0108	-0.007
SC	0.0188	-0.017	-0.0101	-0.009	-0.00867	-0.008
ST	0.0695***	-0.025	-0.0393***	-0.015	-0.0302***	-0.01
Asset Quartile - 2005						

Q2	-0.00233	-0.017	0.00126	-0.009	0.00107	-0.008
Q3	-0.0019	-0.018	0.00103	-0.01	0.000869	-0.008
Q4	0.00135	-0.02	-0.00073	-0.011	-0.00062	-0.009
Education						
Primary	0.0336**	-0.016	-0.0184**	-0.009	-0.0152**	-0.007
Martric	0.0423**	-0.019	-0.0234**	-0.011	-0.0190**	-0.008
>Matric	0.0427	-0.026	-0.0236	-0.015	-0.0191*	-0.011
Any NCD - 2005						
Yes	-0.0523***	-0.016	0.0275***	-0.008	0.0248***	-0.008
Age Group						
70 + years	-0.150***	-0.018	0.0744***	-0.008	0.0754***	-0.01
Social Networks - 2005						
1-3	0.0137	-0.014	-0.00745	-0.007	-0.00625	-0.006
>3	0.0273	-0.029	-0.0151	-0.016	-0.0123	-0.013
Household Size - 2005						
1	-0.0408	-0.047	0.0216	-0.024	0.0192	-0.023
2-4	-0.0212	-0.013	0.0114	-0.007	0.00973	-0.006
States	Yes					

Note:*** p<0.01, ** p<0.05, * p<0.1

Table A.11: OP Results on Factors associated with Difficulties in Walking and Hearing in 2012

Socio-demographic Dummy variables	Number of obs = 9,577 Wald chi2(42) = 595.75 Prob> chi2 = 0.0000 Log pseudo likelihood= -44289299 Pseudo R2 = 0.0559	
	Coefficient	**Robust Std. Error**
Walking & Hearing 2005		
One	0.289***	-0.0848
Both	0.270**	-0.109
Gender		
Male	-0.0597	-0.0449
Marital Status		
Widowed	0.199***	-0.0425
Others	0.0227	-0.135
Sector		

Urban	-0.0929**	-0.0391
Caste		
Others	-0.0444	-0.0469
SC	-0.0515	-0.0531
ST	-0.217**	-0.0901
Asset Quartile - 2005		
Q2	0.0153	-0.0549
Q3	-0.0198	-0.0573
Q4	-0.0463	-0.0586
Education		
Primary	-0.103**	-0.0508
Martric	-0.157**	-0.062
>Matric	-0.0301	-0.0882
Any NCD - 2005		
Yes	0.114**	-0.0492
Age Group		
71 years+	0.412***	-0.0468
Social Networks - 2005		
1-3	-0.0638	-0.0432
>3	-0.0691	-0.0963
Household Size - 2005		
1	0.176	-0.148
2-4	0.0782*	-0.0415
States	Yes	
cut1	0.776	-0.135
cut2	1.579	-0.136

Note: *** p<0.01, ** p<0.05, * p<0.1

Table A.11a: Marginal Associations of Covariates of Difficulties in Walking and Hearing in 2012

Socio-demographic variables	Outcome 1		Outcome 2		Outcome 3	
	Dy/Dx	Std. Error	Dy/Dx	Std. Error	Dy/Dx	Std. Error
Walking & Hearing 2005						
One	-0.101***	-0.031	0.0429***	-0.012	0.0577***	-0.019
Both	-0.0938**	-0.04	0.0404***	-0.015	0.0535**	-0.025
Gender						
Male	0.0197	-0.015	-0.00939	-0.007	-0.0103	-0.008
Marital Status						
Widowed	-0.0664***	-0.014	0.0317***	-0.007	0.0347***	-0.008

Others	-0.00726	-0.044	0.0037	-0.022	0.00356	-0.022
Sector						
Urban	0.0303**	-0.013	-0.0146**	-0.006	-0.0157**	-0.007
Caste						
Others	0.0147	-0.016	-0.00694	-0.007	-0.0078	-0.008
SC	0.0171	-0.018	-0.00807	-0.008	-0.00901	-0.009
ST	0.0690**	-0.027	-0.0346**	-0.015	-0.0345***	-0.013
Asset Quartile - 2005						
Q2	-0.00508	-0.018	0.00238	-0.009	0.00271	-0.01
Q3	0.00653	-0.019	-0.0031	-0.009	-0.00344	-0.01
Q4	0.0152	-0.019	-0.00726	-0.009	-0.00791	-0.01
Education						
Primary	0.0338**	-0.017	-0.0162**	-0.008	-0.0175**	-0.008
Martric	0.0509***	-0.02	-0.0249**	-0.01	-0.0260***	-0.01
>Matric	0.0101	-0.029	-0.00471	-0.014	-0.00537	-0.016
Any NCD - 2005						
Yes	-0.0383**	-0.017	0.0177**	-0.008	0.0206**	-0.009
Age Group						
71 years+	-0.144***	-0.017	0.0618***	-0.007	0.0826***	-0.011
Social Networks - 2005						
1-3	0.0209	-0.014	-0.01	-0.007	-0.0109	-0.007
>3	0.0226	-0.031	-0.0108	-0.015	-0.0118	-0.016
Household Size - 2005						
1	-0.0597	-0.052	0.0271	-0.022	0.0327	-0.03
2-4	-0.0259*	-0.014	0.0122*	-0.006	0.0137*	-0.007
States	Yes					

Note: *** p<0.01, ** p<0.05, * p<0.1

Table A.12: OP Results on Factors associated with Difficulty in Walking and Speaking in 2012

Socio-demographic Dummy variables	Number of obs = 9,577 Wald chi2(42) = 591.41 Prob> chi2 = 0.0000 Log pseudo likelihood= -40199209 Pseudo R2 = 0.0575	
	Coefficient	**Robust Std. Error**

Walking & Speaking 2005		
One	0.173*	-0.0909
Both	0.109	-0.115
Gender		
Male	-0.0986**	-0.0456
Marital Status		
Widowed	0.186***	-0.0434
Others	-0.0568	-0.121
Sector		
Urban	-0.0345	-0.0388
Caste		
Others	-0.0457	-0.0473
SC	-0.0734	-0.0531
ST	-0.201**	-0.0915
Asset Quartile - 2005		
Q2	0.00454	-0.0547
Q3	-0.0161	-0.0576
Q4	-0.0328	-0.0602
Education		
Primary	-0.108**	-0.0505
Martric	-0.142**	-0.0627
>Matric	-0.128	-0.0887
Any NCD - 2005		
Yes	0.164***	-0.0489
Age Group		
71 years+	0.420***	-0.0482
Social Networks - 2005		
1-3	-0.0327	-0.0439
>3	-0.057	-0.0985
Household Size - 2005		
1	0.219	-0.161
2-4	0.0654	-0.0415
States	Yes	
cut1	0.795	-0.136
cut2	1.865	-0.138

Note: *** p<0.01, ** p<0.05, * p<0.1

Table A.12a: Marginal Associations of Covariates of Difficulty and Walking and Speaking in 2012

	Outcome 1	**Outcome 2**	**Outcome 3**

Socio-demographic variables	Dy/Dx	Std. Error	Dy/Dx	Std. Error	Dy/Dx	Std. Error
Walking & Speaking 2005						
One	-0.0573*	-0.031	0.0358*	-0.019	0.0215*	-0.013
Both	-0.0357	-0.039	0.0227	-0.024	0.013	-0.015
Gender						
Male	0.0315**	-0.015	-0.0206**	-0.01	-0.0109**	-0.005
Marital Status						
Widowed	-0.0601***	-0.014	0.0393***	-0.009	0.0208***	-0.005
Others	0.0171	-0.036	-0.0118	-0.025	-0.00526	-0.011
Sector						
Urban	0.011	-0.012	-0.00716	-0.008	-0.0038	-0.004
Caste						
Others	0.0147	-0.015	-0.00951	-0.01	-0.00519	-0.005
SC	0.0235	-0.017	-0.0153	-0.011	-0.00818	-0.006
ST	0.0620**	-0.027	-0.0415**	-0.019	-0.0204**	-0.008
Asset Quartile - 2005						
Q2	-0.00146	-0.018	0.000941	-0.011	0.000515	-0.006
Q3	0.00513	-0.018	-0.00333	-0.012	-0.0018	-0.006
Q4	0.0104	-0.019	-0.0068	-0.013	-0.00362	-0.007
Education						
Primary	0.0344**	-0.016	-0.0226**	-0.011	-0.0119**	-0.005
Martric	0.0446**	-0.019	-0.0294**	-0.013	-0.0151**	-0.006
>Matric	0.0403	-0.027	-0.0266	-0.018	-0.0138	-0.009
Any NCD - 2005						
Yes	-0.0538***	-0.017	0.0341***	-0.01	0.0197***	-0.006
Age Group						
71 years+	-0.144***	-0.017	0.0875***	-0.01	0.0561***	-0.008
Social Networks - 2005						
1-3	0.0104	-0.014	-0.00676	-0.009	-0.00362	-0.005
>3	0.018	-0.031	-0.0118	-0.02	-0.0062	-0.01
Household Size - 2005						
1	-0.0728	-0.056	0.0453	-0.033	0.0275	-0.023
2-4	-0.0209	-0.013	0.0136	-0.009	0.00733	-0.005
States	Yes					

Note: *** p<0.01, ** p<0.05, * p<0.1

Table A.13: OP Results on Factors associated with Difficulty in Walking and Vision Impairment in 2012

Socio-demographic Dummy variables	Number of obs = 9,577 Wald chi2(42) = 682.13 Prob> chi2 = 0.0000 Log pseudo likelihood= -47332988 Pseudo R2 = 0.0601	
	Coefficient	**Robust Std. Error**
Walking & Vision 2005		
One	0.261***	-0.078
Both	0.0814	-0.0826
Gender		
Male	-0.102**	-0.0445
Marital Status		
Widowed	0.146***	-0.0427
Others	-0.0205	-0.118
Sector		
Urban	-0.101***	-0.0387
Caste		
Others	-0.0218	-0.0469
SC	-0.0288	-0.0533
ST	-0.215**	-0.0888
Asset Quartile - 2005		
Q2	-0.0536	-0.0547
Q3	-0.0569	-0.0564
Q4	-0.129**	-0.062
Education		
Primary	-0.118**	-0.0517
Martric	-0.158***	-0.0602
>Matric	-0.173**	-0.0823
Any NCD - 2005		
Yes	0.194***	-0.0502
Age Group		
71 years+	0.405***	-0.0485
Social Networks - 2005		
1-3	-0.0539	-0.0427
>3	-0.133	-0.0953
Household Size - 2005		
1	0.123	-0.133
2-4	0.116***	-0.0417
States	Yes	
cut1	0.664	-0.131
cut2	1.243	-0.131

Note: *** p<0.01, ** p<0.05, * p<0.1

Table A.13a: Marginal Associations of Covariates of Difficulty in Walking and Vision Impairment in 2012

Socio-demographic variables	Outcome 1		Outcome 2		Outcome 3	
	Dy/Dx	Std. Error	Dy/Dx	Std. Error	Dy/Dx	Std. Error
Walking & Vision 2005						
One	-0.0923***	-0.028	0.0238***	-0.006	0.0685***	-0.022
Both	-0.0281	-0.029	0.00817	-0.008	0.0199	-0.021
Gender						
Male	0.0349**	-0.015	-0.0105**	-0.005	-0.0243**	-0.011
Marital Status						
Widowed	-0.0502***	-0.015	0.0151***	-0.004	0.0352***	-0.01
Others	0.0068	-0.039	-0.00223	-0.013	-0.00457	-0.026
Sector						
Urban	0.0339***	-0.013	-0.0104**	-0.004	-0.0235***	-0.009
Caste						
Others	0.00747	-0.016	-0.00221	-0.005	-0.00526	-0.011
SC	0.00986	-0.018	-0.00292	-0.005	-0.00693	-0.013
ST	0.0707**	-0.028	-0.0231**	-0.01	-0.0476***	-0.018
Asset Quartile - 2005						
Q2	0.0184	-0.019	-0.00534	-0.005	-0.0131	-0.013
Q3	0.0196	-0.019	-0.00568	-0.006	-0.0139	-0.014
Q4	0.0437**	-0.021	-0.0132**	-0.006	-0.0305**	-0.015
Education						
Primary	0.0400**	-0.017	-0.0122**	-0.005	-0.0279**	-0.012
Martric	0.0532***	-0.02	-0.0166**	-0.007	-0.0367***	-0.014
>Matric	0.0580**	-0.027	-0.0182**	-0.009	-0.0398**	-0.018
Any NCD - 2005						
Yes	-0.0676***	-0.018	0.0187***	-0.005	0.0489***	-0.013
Age Group						
71 years+	-0.145***	-0.018	0.0368***	-0.004	0.108***	-0.014
Social Networks - 2005						
1-3	0.0183	-0.014	-0.00549	-0.004	-0.0128	-0.01
>3	0.0444	-0.031	-0.0139	-0.01	-0.0304	-0.021
Household Size - 2005						
1	-0.0423	-0.047	0.0124	-0.013	0.0299	-0.034
2-4	-0.0399***	-0.014	0.0117***	-0.004	0.0282***	-0.01
States	Yes					

Note: *** p<0.01, ** p<0.05, * p<0.1

Table A.14: OP Results on Factors associated with Speech and Vision Impairment in 2012

Socio-demographic Dummy variables	Number of obs = 9,577 Wald chi2(42) = 560.54 Prob> chi2 = 0.0000 Log pseudo likelihood= -37923888 Pseudo R2 = 0.0568	
	Coefficient	**Robust Std. Error**
Speaking & Vision 2005		
One	0.152**	-0.0657
Both	0.0439	-0.123
Gender		
Male	-0.0356	-0.0493
Marital Status		
Widowed	0.100**	-0.0473
Others	-0.0725	-0.148
Sector		
Urban	-0.0821**	-0.0406
Caste		
Others	-0.00947	-0.0555
SC	-0.0224	-0.0545
ST	-0.126	-0.0936
Asset Quartile - 2005		
Q2	-0.0943	-0.0588
Q3	-0.0997	-0.0608
Q4	-0.188***	-0.067
Education		
Primary	-0.163***	-0.053
Martric	-0.198***	-0.0652
>Matric	-0.247***	-0.0946
Any NCD - 2005		
Yes	0.158***	-0.0582
Age Group		
71 years+	0.362***	-0.0529
Social Networks - 2005		
1-3	-0.0715	-0.0449
>3	-0.155	-0.098
Household Size - 2005		
1	0.239	-0.153

2-4	0.0921**	-0.044
States	Yes	
cut1	0.949	-0.146
cut2	1.949	-0.148

Note: *** p<0.01, ** p<0.05, * p<0.1

Table A.14a: Marginal Associations of Covariates of Speech and Vision Impairment in 2012

Socio-demographic variables	Outcome 1		Outcome 2		Outcome 3	
	Dy/Dx	Std. Error	Dy/Dx	Std. Error	Dy/Dx	Std. Error
Speaking & Vision 2005						
One	-0.0477**	-0.021	0.0298**	-0.013	0.0178**	-0.008
Both	-0.0134	-0.038	0.0086	-0.024	0.00476	-0.014
Gender						
Male	0.0107	-0.015	-0.00694	-0.01	-0.00378	-0.005
Marital Status						
Widowed	-0.0304**	-0.014	0.0197**	-0.009	0.0107**	-0.005
Others	0.0208	-0.042	-0.014	-0.028	-0.00679	-0.013
Sector						
Urban	0.0244**	-0.012	-0.0159**	-0.008	-0.00848**	-0.004
Caste						
Others	0.00287	-0.017	-0.00185	-0.011	-0.00102	-0.006
SC	0.00677	-0.016	-0.00438	-0.011	-0.0024	-0.006
ST	0.0368	-0.027	-0.0243	-0.018	-0.0125	-0.009
Asset Quartile - 2005						
Q2	0.0292	-0.018	-0.0185	-0.012	-0.0106	-0.007
Q3	0.0308	-0.019	-0.0196	-0.012	-0.0112	-0.007
Q4	0.0566***	-0.02	-0.0367***	-0.013	-0.0198***	-0.007
Education						
Primary	0.0488***	-0.016	-0.0319***	-0.01	-0.0169***	-0.005
Martric	0.0586***	-0.019	-0.0386***	-0.013	-0.0200***	-0.006
>Matric	0.0719***	-0.026	-0.0478***	-0.018	-0.0241***	-0.008
Any NCD - 2005						
Yes	-0.0492***	-0.019	0.0311***	-0.012	0.0181**	-0.007
Age Group						
71 years+	-0.117***	-0.018	0.0715***	-0.011	0.0452***	-0.008

Social Networks - 2005						
1-3	0.0214	-0.013	-0.0139	-0.009	-0.00754	-0.005
>3	0.0452*	-0.027	-0.0298	-0.019	-0.0154*	-0.009
Household Size - 2005						
1	-0.0755	-0.051	0.0469	-0.03	0.0286	-0.021
2-4	-0.0280**	-0.014	0.0181**	-0.009	0.00993**	-0.005
States	Yes					

Note: *** p<0.01, ** p<0.05, * p<0.1