

# Measuring the contributions of elderly and non-elderly age-groups to the disability burden in India: A Decomposition Analysis.

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## Research

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# Abstract

## Background

Disability has been an essential component of the health and development framework of India. Despite policy norms, a surge in disability across the population interrogates the role of the increasing elderly population in terms of chronic diseases led disabilities. The regional variation in demographic transitions possesses an unequal risk for the occurrence of disability in the population. The demographic and socio-economic factors can explain the inequality contributed by the elderly and non-elderly population.

## Methods

We have used the National Sample Survey-76th round (2018) to measure the risk difference of disability between elderly and non-elderly age-groups across selected background characteristics. Fairlie's decomposition technique has been adopted to measure the contribution made by the socio-economic factors in explaining the differences in the prevalence of disability. Distribution of states with respect to prevalence and risk difference of disability between elderly and non-elderly are plotted, to understand the regional inequality in the occurrence of disability in India.

## Results

The study calculates a risk difference of 68 per 1000 population in India, explaining a higher risk of disability among the elderly that varies across socio-economic factors. Belonging from the Central region of India represents a higher risk of disability at old age (risk difference 76.8 per 1000 population) than the rest of the regions in India. Gender, marital status, and education explain 72 percent of the gap in the occurrence of disability between two broad age-groups. Despite having a similar disability prevalence, Kerala and Odisha have risk differences of 32 and 85 per 1000 population, respectively.

## Conclusions

The gap in the disability prevalence is significantly explained by the marital status and educational status of the individuals. Disparity in the risk difference of disability among elderly and non-elderly across states suggests that large size of the elderly population is not the only reason for the increasing disability burden in India. Inadequate healthcare infrastructure and access also results into an unmet health care need pertaining to disability. Study suggests a policy relevance for disability-inclusive and geriatric centric healthcare and social supports in synchronisation with the demand realised by the states in India.

# Background

Disability is termed as a '*lense*' in perspective to broader health policies for the reason that disability-specific health issues can't be segregated from the general health of the population (1). Noticeably, disability is given a special provision by the high-level expert group in the agendas of Universal Health Coverage in India. It has been considered to deliver a cost-effective intervention to mitigate health-related

inequality for morbidity and disability, keeping consideration of the intensity of the disease burden (2). Inequities are mainly comprehended in a few fundamental dimensions mentioned in the policy framework. Strategies that define the action are broadened under the headings of social stratification, differential exposure/differential vulnerability, differential consequences, and macro-social conditions (3). The outcome of disability visualises as an interaction of society and bodily limitations. Disabled individuals suffer from several inequitable conditions due to differential social, cultural, and economic factors that pave for different role restrictions. Disability rehabilitation demands community-based rehabilitation in terms of better access, less social exclusion, more sustainable techniques adopted (4). In India, elderly population adds a considerable share of disabled in the population and face a health insufficiency in every sphere. It is also necessary to understand the contribution of age-groups in the disability burden which throws light on the geriatric centric health infrastructure in the present context. Hence, the importance of primary healthcare centres is realized to be necessary.

Health burden due to disability is substantial in developing countries (4). In India, the share of population having disability rovers around 2–8 percent according to the major sources (1, 5). The years living with disability (YLD) to total disease burden (DALY: Disability Adjusted life years) has increased significantly from 17 percent (1990) to 33 percent (2016) (6). The most prominent reason for the faster rise in disability can relate to an increase in the elderly population along with the growing incidence of chronic and non-communicable diseases in later ages (8, 9). It is evident that the prevalence of disability in India is increasing at a rate higher than that of the general population. Projection shows, disability among the elderly will be almost doubled in 2021 with respect to 2001, which is much greater than the non-elderly age-groups (9). However, this evidence can't confirm the equal priority for elderly focused allocation in India. Ageing in the Indian context confirms a regional dimensionality (10). Dissimilarity in health burden among the states undergoing a similar speed of ageing reflects an inequality in socio-economic and healthcare structure too (8). Moreover, it does not ensure that the proportional contribution of the elderly towards the health burden is related to morbidity and disabilities. Study finds that the Southern state of Tamil Nadu has 10.4 percent elderly population with 25 per 1000 elderly disabled, whereas, the Western state of Rajasthan has a 7.4 percent elderly population with 109 per 1000 elderly disabled (11). The dissimilar pattern of diseases is also observed in the non-elderly age-groups across India due to varying demographic and epidemiological transitory status. An improvement in health, as well as disability outcomes among children, has been noticed in recent decades (12). However, an increase in disability among working age-groups in states like Uttar Pradesh, Karnataka, Punjab has also been pointed out in the duration of 2001-11 (13). Disability contributed by those population is substantial to add longer years with disability in the population, and hence, creates a long-term burden on the healthcare system. A higher share of YLD than years of life lost (YLL) in recent decades is represented by the neuropsychiatric conditions, musculoskeletal conditions, vision, and other sensory loss, injuries, etc., as well as nutritional deficiencies and congenital anomalies (14). In tandem with the pattern of growth in disease, few distinct types of disability like, disability in movement and seeing have been growing in the population (15). Disabilities in mental health catch an attention in the policy formulation because of poor awareness, identification, taboos, and lesser research scope in the present context. It has been studied that old age

problematizes the mental well-being by reducing cognitions, stress due to poor health and other neurological degenerations. Addressing the mental healthcare need of the population is far from practical implementations. Additionally, a heterogeneity in healthcare expenditure and distress financing across India is growing evidence of disability intensifications.

Vulnerability faced by disabled individuals are far-fetched. Several literatures have established the association of disability, causing chronic diseases with the severity of stigma, discrimination, exclusion from social and economic processes (16, 17). In reverse, being in specific social, cultural, and economic conditions can enhance the risk of disability (18, 19). Farrowing growth in socio-economic inequality aggravates the risk of an increase in the unmet need for healthcare in developing countries (20). Noticeably, the incidence of disability pushes an individual as well as the households to economic vulnerability and depletes the decision-making power. It further reduces the access to healthcare (21) and intensifies the disabled conditions.

The impact of disability in a particular age-group premises upon the differential consequences faced by the individuals at the respective ages. The significance of the age in reference to the social and economic productivity of an individual explains the consequence of disability. For instance, disablement suffers by the elderly is the usual consequence of age-related degeneration of health that diminishes the remaining healthy life years. However, disability during younger ages has a prolonged effect on life-course. It disrupts several dimensions of development, for instance, education and employment, for a substantial duration of life. Compromising on opportunities for the subsequent generations is one of the most cited consequences of disability if occurs at younger ages (22). Since chronic diseases are rising to be a greater contributor for the burden of diseases and disabilities, a shift has been observed in the paradigm of development, worldwide. National Policy for Senior Citizens and national policy draft for Non-Communicable Diseases (NCDs) emphasises the health promotions and delivery to the targeted population. It aims to mitigate the effect of NCDs through primary healthcare. Even though, the priority for the NCD related healthcare has already been adopted in India much earlier than many developing countries (2, 23–25). Access to avail the services are disrupted by the lack of facilities at the primary healthcare structures (23).

Until disability is not prioritised in the primary healthcare need, it will be a failure to promote the target-oriented approach at the grass-root level. Prevalence and patterns of disease across age-groups impart a difference in public health demand in a population. The disparity in disability prevalence in relation to regional and socio-economic conditions has been recognized before (18). Hence, to evoke a programmatic approach to disability, a contribution of the elderly and non-elderly population is essential to measure. There are limited number of studies that addresses the contribution of demographic and socio-economic factors to explain the gap in the prevalence of disability across two major age-groups i.e., elderly and non-elderly. In order to address that, this study has measured the risk difference across demographic and socio-economic factors among elderly and non-elderly in India. A decomposition analysis has been undertaken to measure the contribution of demographic and socio-economic determinants in the disability gap represented by those broad age-groups. Further, an illustration of

disparity in disability prevalence with risk difference has been portrayed across states of India. A deeper understanding of the regional difference has the potential to address the specific requirements in the purview of a reduction in disability in India.

## Methods

### Data

The present study has utilised the secondary data from the National Sample Survey (NSS)- 76th round, which is titled as the Survey of Person with Disability, 2018, India. It encompasses aspects related to disability classification, certification of disability, issues using public facilities/transportation, the arrangement of regular caregivers, out-of-pocket expenditure related to disability, education, unemployment, and information on skill development. This survey has made a provision to classify the persons with disabilities as per the classification used in the Rights of Persons with Disabilities Act (PWD Act) 2016. The Rights of Persons with Disabilities (PWD) Act, 2016, defines the persons with disability as a 'long term physical, mental, intellectual or sensory impairment which, in interaction with barriers, hinders his full and effective participation in society equally with others' (NSO-Gol, 2018, p. 11). To operationally define disability, a period of 12 months or more was considered as a 'long term'. However, some specific conditions like amputation of leg/arm, a victim of an acid attack, diagnosis of haemophilia, multiple sclerosis, and Parkinson's disease, even of recent origin, were considered as a disability; since their disability will last more than 12 months. Additionally, the classification and procedure adopted for collecting data on disabilities were also updated on the basis of the Right of Persons with Disabilities Act (2016). Table 1 provides a detailed description of the type of disability and their broad categorization adopted for the study.

Table 1

Description of types of disability and their related conditions mentioned in Persons with Disabilities Act (2016), India

Type of Disability	Conditions
Locomotor	Acid attack victims Leprosy cured person Polio Cerebral palsy Dwarfism Muscular dystrophy Other locomotor disability
Visual disability	Blindness Low vision
Hearing Disability	Hearing Disability
Speech and language disability	Speech and language disability
Mental retardation/ Intellectual disability	Specific learning disabilities Autism Spectrum Disorder Other mental retardation/intellectual disability
Mental illness	Mental Illness
Other Disabilities	(a) Chronic neurological conditions (i) Parkinson's disease (ii) Multiple Sclerosis (iii) Other Chronic neurological conditions (b) Blood Disorder (i) Thalassemia (ii) Haemophilia (iii) Sickle cell disease
Multiple Disabilities	More than one of the above specified disabilities including deafness or blindness
Source. The Rights of <i>Persons with Disabilities (PWD) Act, 2016</i> .	

NSS 76th round collected information on 1,18,152 households (81,004 in rural areas and 37,148 in urban areas) and 5,76,569 persons (4,02,589 in rural areas and 1,73,980 in urban areas). The survey was conducted by the Ministry of Statistics and Program Implementation (MoSPI), Government of India (GoI). This round survey collected information on 1,06,894 persons (74,946 in rural areas and 31,948 in urban areas) with a disability in India (except some parts of Andaman and Nicobar Islands). For this study, we have utilised the total sample collected during the survey. The survey utilized a stratified two-stage sampling procedure, where villages/UFS blocks/sub-units and households were treated as First Stage Units (FSU) and Ultimate Stage Unit (USU), respectively, for both urban and rural areas. The sampling method adopted to select a first stage stratum (FSU) is probability proportion to size with replacements as per Census 2011 population size and simple random sampling with replacement for other rural and urban sub-strata. Further, categories of disabilities have been considered to form second stage stratum (SSS) formation. A detailed description of the survey sampling can be found using the link: <http://www.mospi.gov.in/unit-level-data-report-nss-75th-round-july-2017-june-2018-schedule-250social-consumption-health>.

## Measurement Of Variables

### Outcome Variable

The outcome variable used throughout the study was the prevalence of disability. Additionally, the entire analysis was stratified between two sets of population, i.e., elderly refers to 60 and above, and non-elderly refers to the age-group of below 60 years.

### Explanatory Variables

Present study included background information like gender (Males; Females/Trans-genders), religion (Hindu; Others), social group (Unreserved; Reserved), level of education (No education; Primary; Secondary and above), marital status (Never married; Currently married; Others), the region of residence (Northern; Western; North-eastern; Eastern; Central; Southern) and household size (Up to 4; 5–8; 9 or more). We have merged the category of gender females with the transgenders, as both of them are exposed to deprivation much higher than males in India (Bhagat, 2015). Economic status was measured using the usual monthly per capita consumer expenditure (MPCE) (in Indian National Rupees). MPCE was computed by dividing the household's usual monthly expenditure by the household size (total number of individuals in the family) and was further categorised into three tertile, namely, lower, middle, and upper. Different states and Union Territories (UTs) were grouped to form regions in India, detailed information on the formation of the geographical region can be found in Appendix 1. In order to select the explanatory variables, the World Health Organizations framework of Commission of Social determinants of health (CSDH) was utilized to study the inequality between disability burden between the elderly and non-elderly population in the country (3).

## Statistical Analysis

To describe the sample under consideration, firstly, unweighted frequency, and weighted percentage distribution were computed. The burden of disability by background characteristics was calculated using the prevalence rates (per 1000 population). According to the Centers for Disease Control and Prevention (CDC) (<https://www.cdc.gov/csels/dsepd/ss1978/lesson3/section2.html>), prevalence rate (PR) per 1000 population is defined as:

$$PR = \frac{\# \text{ current cases (new and pre - existing) over a specified period of time}}{\text{Mid - interval population}} \times 1000$$

Furthermore, to explore the disparities in the burden of disability between elderly and non-elderly, risk difference (per 1000 population) was utilized. Risk Difference was calculated as the difference between the prevalence of disability between elderly and non-elderly sub-groups for the total population and by the selected background characteristics (27). A positive risk difference suggests that the prevalence of disability is higher among the elderly sub-group and vice versa.

Finally, the study aimed to explore the disparity in the burden of disability among elderly and non-elderly in India. Existing literature suggests the use of the Blinder-Oaxaca decomposition to detect and measure the contribution of group differences (in the present case: elderly and non-elderly) by the selected socio-economic and demographic factors. However, as the outcome of interest, i.e. disability is a dichotomous variable, the present study used a non-linear extension of the Blinder-Oaxaca decomposition approach, suggested by Fairlie (2006). The non-linear equation for decomposition suggested by Fairlie (2006), is as follows:

$$\bar{Y}^E - \bar{Y}^{NE} = \left[ \sum_{i=1}^{N^E} \frac{F(x_i^E \hat{\beta}^{NE})}{N^E} - \sum_{i=1}^{N^{NE}} \frac{F(x_i^{NE} \hat{\beta}^E)}{N^{NE}} \right] + \left[ \sum_{i=1}^{N^{NE}} \frac{F(x_i^{NE} \hat{\beta}^E)}{N^{NE}} - \sum_{i=1}^{N^{NE}} \frac{F(x_i^{NE} \hat{\beta}^{NE})}{N^{NE}} \right] \quad (2)$$

Where,

$\bar{Y}^j$  = The average probability of the binary outcome of the interest group  $j$  (in present case: elderly and non-elderly)

F = Cumulative distribution function from the logistic distribution

E = Elderly group (60 years or more)

NE = Non-elderly group (less than 60 years)

Furthermore, Fairlie suggested the following equation to calculate the individual contribution of a factor, say  $X_j$

$$\frac{1}{N^{NE}} \sum_{i=1}^{NE} F(\hat{\alpha}^* + X_{ji}^E \hat{\beta}_1^* + X_{2i}^E \hat{\beta}_2^*) - \sum_{i=1}^{NE} F(\hat{\alpha}^* + X_{ji}^{NE} \hat{\beta}_1^* + X_{2i}^{NE} \hat{\beta}_2^*)$$

Where,

$\hat{\beta}_1^*$ =Coefficient estimates from a logit regression for a pooled sample (including both elderly and non-elderly)

The analysis and data visualization were done using STATA version 15.0 (StataCorp, Texas) and R Studio version 1.1.463 (R Studio, Inc.), respectively. The generated estimates are derived by applying appropriate sampling weights contributed by the National Sample Survey, India, 2017-18.

## Results

### Description of the study population

Table 2 describes the sample distribution and prevalence of disability by the selected background characteristics. The result suggests that the gender-wise difference in sample distribution was insignificant. The findings show that 70 percent of the respondents resided in the rural areas and belonged to the Hindu religion. Nearly 73 percent of respondents belonged to the reserved social groups, and half of the total sampled population were currently married. Level of education represents that 27 percent of the respondents were not educated, 42 and 30 percent received primary education, and secondary and above education, respectively. On an average, approximately 40 percent of individuals were residing in a household having a size of up to 4 members, and another 50 percent were residing in a 5-8-member household. The quintile of MPCE shows around 29 percent sample belonged to upper wealth strata. Around 26 percent of respondents belonged to the Central region, 22 percent belonged to the Eastern region, and four percent to the North-eastern region of India.

Table 2

Sample distribution, prevalence, and risk difference of disability between elderly and non-elderly in India, National Sample Survey, 2018

Characteristics	Sample Distribution (Weighted Percentage)	Prevalence of Disability (per 1000 population)			Risk Difference (per 1000 population)
		Total	Elderly	Non-Elderly	
<b>Gender</b>					
Male	295545 (51.93)	24.4 (24.3–24.5)	84.9 (84.8–85.0)	18.4 (18.3–18.5)	66.5 (66.5–66.5)
Female and transgender	281024 (9.07)	19.5 (19.4–19.6)	82.3 (82.2–82.4)	13.0 (12.9–13.1)	69.3 (69.3–69.3)
$\chi^2$ p-value = 0.000					
<b>Place of Residence</b>					
Rural	402589 (69.60)	22.9 (22.8–23.0)	84.4 (84.2–84.9)	16.8 (16.7–16.8)	67.6 (67.5–68.1)
Urban	173980 (30.40)	19.6 (19.5–19.7)	80.9 (80.8–81.0)	13.6 (13.5–13.7)	67.3 (67.3–67.3)
$\chi^2$ p-value = 0.000					
<b>Religion</b>					
Hindu	445535 (69.60)	22.2 (22.1–22.3)	82.9 (82.8–83.0)	15.8 (15.7–15.9)	67.1 (67.1–67.1)
Others	131034 (30.40)	20.9 (20.9–21.0)	87.5 (87.4–87.6)	15.8 (15.6–15.9)	71.6 (71.7–71.8)
$\chi^2$ p-value = 0.000					
<b>Social Group</b>					
Unreserved	150003 (26.90)	21.2 (21.1–21.3)	76.2 (76.0–76.2)	14.5 (14.4–14.6)	61.7 (61.6–61.8)
Reserved	426566 (73.10)	22.2 (22.2–22.3)	87.2 (87.1–87.3)	16.3 (16.3–16.4)	70.9 (70.8–70.9)
$\chi^2$ p-value = 0.003					

Characteristics	Sample Distribution (Weighted Percentage)	Prevalence of Disability (per 1000 population)			Risk Difference (per 1000 population)
		Total	Elderly	Non-Elderly	
<b>Marital Status</b>					
Never married	254957 (44.69)	15.4 (15.4–15.5)	206.5 (205.5–207.5)	15.2 (15.1–15.3)	191.3 (190.4–192.2)
Currently married	280811 (49.90)	21.5 (21.4–21.5)	68.6 (68.5–68.7)	15.1 (15.0–15.2)	53.5 (53.4–53.6)
Others	40801 (5.41)	8.0 (7.9–8.4)	110.6 (110.4–110.6)	40.7 (40.6–40.8)	69.9 (69.7–69.8)
$\chi^2$ p-value = 0.000					
<b>Level of Education</b>					
No education	179698 (26.72)	40.3 (40.2–40.4)	94.2 (94.1–94.3)	27.46 (27.44–27.48)	66.7(66.6–66.8)
Primary	246155 (42.97)	17.39 (17.38–17.40)	78.6 (78.5–78.8)	13.7 (13.6–13.8)	64.9 (64.8–64.9)
Secondary and above	150715 (30.31)	12.35 (12.34–12.37)	55.9 (55.8–56.1)	10.1 (10.0–10.2)	45.8 (45.7–45.9)
$\chi^2$ p-value = 0.000					
<b>Monthly Consumer Expenditure</b>					
Lower	195503 (38.65)	25.9 (25.8–25.9)	95.7 (95.6–95.8)	18.9 (18.8–19.0)	76.8 (76.7–76.9)
Middle	188880 (32.57)	20.0 (20.0–20.1)	79.3 (79.2–79.4)	14.9 (14.8–14.9)	64.4 (64.3–64.5)
Upper	192186 (28.77)	18.9 (18.8–18.9)	73.1 (72.9–73.2)	12.7 (12.7–12.8)	60.4 (60.2–60.4)
$\chi^2$ p-value = 0.000					
<b>Household Size</b>					

Characteristics	Sample Distribution (Weighted Percentage)	Prevalence of Disability (per 1000 population)			Risk Difference (per 1000 population)
		Total	Elderly	Non-Elderly	
Upto 4	168468 (39.26)	24.9 (24.8–24.9)	93.9 (93.8–93.9)	17.9 (17.8–17.9)	76.0 (75.9–76.1)
5–8	320922 (50.75)	20.5 (20.4–20.6)	78.8 (78.7–78.9)	14.8 (14.8–14.9)	64.0 (63.9–64.0)
9+	87179 (9.99)	17.6 (17.5–17.7)	66.6 (66.4–66.7)	12.8 (12.7–12.8)	53.3 (53.2–53.9)
$\chi^2$ p-value = 0.000					
<b>Region of Residence</b>					
Northern	84754 (13.95)	21.8 (21.7–21.9)	88.1 (87.9–88.2)	15.5 (15.4–15.6)	72.6 (72.5–72.6)
Western	73325 (13.67)	19.8 (19.7–19.9)	69.9 (69.7–70.0)	14.0 (13.9–14.0)	55.9 (54.8–56.0)
North-eastern	52401 (3.83)	16.0 (15.9–16.1)	74.4 (74.1–74.7)	11.9 (11.8–12.0)	62.5 (62.3–62.7)
Eastern	121656 (22.49)	21.3 (21.2–21.4)	74.3 (74.2–74.4)	16.6 (16.5–16.8)	57.7 (57.6–57.7)
Central	138713 (25.13)	22.7 (22.6–22.8)	92.7 (92.6–92.9)	15.9 (15.8–16.0)	76.8 (76.7–76.9)
Southern	105720 (20.94)	24.3 (24.2–24.4)	90.3 (90.2–90.4)	15.9 (15.8–16.0)	74.4 (74.3–74.8)
$\chi^2$ p-value = 0.000					
<b>Total</b>	<b>576569 (100.00)</b>	<b>576569</b> (21.9–22.0)	<b>78379</b> [83.7–83.8]	<b>498190</b> [15.9–15.9]	<b>67.8 (67.7–67.8)</b>

### Magnitude and variations in elderly and non-elderly inequality in disability

Disability prevalence and risk difference between elderly and non-elderly samples are presented in Table 2. The disability prevalence was found to be 21.9 per thousand 1000 population. The disability prevalence was found to be higher among males (24 per 1000 population), and in the sample who belonged to rural areas (23 per 1000 population), religious group of Hindus (22 per 1000 population), reserved social group (22 per 1000 population), Southern India (24 per 1000 population). The lower monthly consumer expenditure category (26 per 1000 population), and who were not educated (40 per 1000 population), currently married (21 per 1000 population), and whose household size was up to 4 members (25 per 1000 population) represents a higher prevalence of disability.

The gross value for risk difference between elderly and non-elderly is found to be 67.8 per 1000 population. The risk difference between elderly and non-elderly factor suggests that the risk difference was higher for females and transgender (69 per 1000 population) and those who belonged to the religious group of Hindu. The risk difference is almost equal in both the rural and urban areas (67 per 1000 population). A risk difference of 71 per 1000 population was found for the reserved social group. The respondents with no education had a higher risk difference (67 per 1000 population) than educated respondents. In the case of marital status, the risk difference was found to be lowest for the currently married respondents (53 per 1000 population) and highest for the never married sample (191 per 1000 population). Among all the regions of the country, the Central region had the highest risk difference (77 per 1000 population). Nuclear families (family size up to 4 members) had the highest risk difference (76 per 1000 population) than their counterparts. Lower MPCE had the highest risk difference (77 per 1000 population) compared to other categories.

### **Distribution of nature and type of disability among elderly and non-elderly**

The percentage distribution of type of disability among the non-elderly and elderly population is shown in Fig. 1. As the figure depicts, among non-elderly highest share of disability was contributed by the locomotion followed by multiple disabilities, and mental retardation. Similar to the non-elderly, the share of locomotion related disability was found to be highest for the elderly sub-group of the population followed by hearing, visual, and multiple disabilities. As age progresses towards 60 years and above, the population acquire more disabilities in form of hearing (from 5.8 to 14.2), visual (from 6.9 to 12.7), and locomotor (from 54.8 to 58.8). On the other hand, among elderly population disabilities such as mental illness (from 6.5 to 2.6), speech and language (from 6.3 to 1.1), mental retardation shows a lesser prevalence as compared to the non-elderly. Categories for multiple and others disabilities do not show any significant difference in total share among the non-elderly and elderly population in India.

It can be discerned from the Fig. 2 that the prevalence of disability sharply rises in the elderly age-groups. The acquired disabilities become the common etiology of disability among the elderly. Among acquired disabilities, elderly shows the highest prevalence than non-elderly, which reverses in case of congenital disabilities.

### **Decomposition of the elderly and Non-Elderly in burden of disability**

Table 3 illustrates the details of the decomposition of disability risk gaps between the elderly and non-elderly. It shows a total gap of 6.7 percent, out of which about 72 percent (4.88 percent) is explained by the selected covariates. The significant contribution is shown by gender, education, and marital status. Covariates such as gender have contributed negatively, which means that they tend to reduce the elderly and non-elderly disability risk-gap (11.3%). Conversely, factors like marital status and education which contributed positively to widen the disability risk-gap. The individual contribution of selected covariates on reducing the gap between the non-elderly and the elderly in disability prevalence. Being widowed and divorced increases the elderly and non-elderly gap in disability by 64 percent whereas, the primary education reduced the gap by 26 percent, and the secondary education reduced the same gap by 20 percent.

Table 3  
Decomposition of elderly and non-elderly gap in the risk of disability in India

Characteristics	Coefficients	Percent Contribution
Female	-0.0055***	-11.25
Urban	0.0001***	0.20
Non-Hindu	0.0000***	0.00
Reserved	0.0001***	0.20
Currently Married	0.0000***	0.00
Widowed/Divorced	0.0314***	64.21
Primary Education	0.0126***	25.77
Secondary Education	0.0099***	20.25
Middle Class	0.0002**	0.00
Upper Class	-0.0002***	-0.41
5–8 members	0.0000**	0.00
9 or more members	-0.0000**	0.00
Western Region	-0.0002***	-0.41
North-eastern Region	0.0002***	0.41
Eastern Region	0.0002***	0.41
Central Region	0.0000**	0.00
Southern Region	-0.0001**	-0.20
<b>Disability Rate below 60 years</b>		0.02
<b>Disability rates 60 years or more</b>		0.08
<b>Gap</b>		0.07
<b>Explained gap</b>		0.05
<b>Number of Observation</b>		576568
<b>Percent Explained</b>		71.99

## Relationship Between Disability Prevalence And Magnitude Of Inequality

A scatter plot has been drawn between the prevalence of disability (per 1000 population) and risk difference for disability among the elderly and non-elderly for all the states and Union Territories (UTs) (Fig. 3). We find a positive correlation in the graph among the states of India. It is noticeable that states are mostly plotted in the low-low and high-high region of the graph. Two arguments can be formed from this graph. Firstly, states in the low-low region depicts that they have lower disability prevalence as well as the risk of disability remains mostly among the non-elderly population. Secondly, states in the high-high region of the plot indicates a high prevalence of disability and a higher risk of disability among the elderly population. For instance, the states that comes under the low-low category are mainly from North-eastern regions, Bihar, Tamil Nadu, and Jammu-Kashmir. Whereas, high-high region has been found among the states from the Northern, Western, and Central region of India, along with major Southern states like Kerala, Karnataka, and Telangana.

## Discussions

This study primarily aims to decompose the differential in the elderly and non-elderly age groups in the occurrence of disability in India. Adding to that we tried to measure the contribution demographic and socio-economic factors to explain the above-mentioned differential in the occurrence of disability. The prevalence of disability among the elderly and non-elderly is 84 and 16 per thousand population, viz. The study supports the fact that the elderly is facing a significant health disadvantages due to degenerative and chronic morbid conditions much more than the non-elderly. The increase in the prevalence of diseases related to disability is significant and extensive among the elderly in low-and-middle-income countries (Sousa *et al.*, 2009). This indicates that the focus on disability as well as geriatric care, in particular, has not been strengthened in the existing healthcare system in India. Healthcare must address the need of population as elderly in developing countries have a greater chance to suffer from chronic diseases and related disabilities (28).

Socio-economic conditions become precursors to the incidence of disability as it promotes barrier in the major dimensions of life. The risk difference in disability prevalence across demographic and socio-economic determinants predicts that those factors develops a higher risk of disability among elderly (29). A larger set of socio-economic factors determines participation of an individual. Being from rural areas, currently married, belonging from a reserved community, no educational achievements, lower wealth quintile, and smaller household size represents higher disability prevalence in India. Globally, better education and wealth status act as a modifier for health behaviour, practices and purchasing power of health services among individuals. Inadequate public health infrastructure, higher medical expenses at the private health sectors and lack of adequate rehabilitation facilities at the primary healthcare centres are probably few important reasons that results into a higher disability prevalence among the lower category of MPCE. Disabled individuals are more prone to suffer from physical inaccessibility in different services and facilities (30). Moreover, reduction in the functional capacities at the older ages significantly deteriorate the scope to access healthcare facilities and other services (31). Therefore, it contributes towards the disability burden, which is squarely manifested as a reason to limit the barrier-free infrastructural inclusivity in the facilities.

Few types of disability are more common in India, for instance, locomotor, hearing, and visual disability proclaims a top most share in total disability. The elderly shows a higher share of disability in the particular categories in compared to the non-elderly. Results demand a higher focus on the reduction of burden of morbidities that causes the disabling conditions. It is noticeable, that disability in speech and language, mental retardation, and mental illness are sharing a sizeable proportion of disability among non-elderly. Developmental disorders, due to nutritional deficiency in relation to maternal and child health, in the younger age-groups continue to persist in the population (12). It is to be mentioned, transitions in disease pattern is negatively associated with the social gradients. Studies already showed the speed of growing incidence of non-communicable morbid conditions like diabetes, cardiovascular diseases etc., among higher wealth quintiles in India. A higher disability prevalence and risk difference among educational categories predicts that the impact on disability is much severe among elderly in the selective categories. Study shows non-elderly age-groups have a growing disability burden from a range of conditions that includes communicable diseases, NCDs and injuries (13). Besides, the trend in the incidence of injuries, atrocities in childhood, malnourishment at the early ages, and violence among children and younger age adults are also seeking an attention in the context of India for upcoming decades.

Decomposition analysis supports that males are potential contributor to the gap in disability. Being elderly male is likely to pronounce the chance of occurrence of disabled conditions at older ages. Gender attributes 11.3 percent of the gap in the disability prevalence. Males are more exposed to outer environment and shows more severe incidence of fatal chronic diseases like stroke, hypertension, injuries etc. However, policy analysts suggest that varying gender roles exposes them to various morbid conditions and injuries. The implication on health utilization is biased towards males in the resource-poor developing countries (32, 33). Under representation of female in the society might be a cause of concern as it under-reports the health complications and increases the incidence of disability in the later ages in such setups. Easier and accessible approach to the health centres must be fortified with the local community health workers to address the unmet needs of population (28). This study shows that marital status acts as a negative factor for decompositions. Being widowed and divorced uplifts the gap in disability between elderly and non-elderly. The longer life expectancy of elderly females and early demise of spouse becomes critical to the health and economic conditions, since, loss of financial security is likely to intensify the deprivation at later ages (33, 34). Major informal caregiving for the disabled is provided by the family members, for older ages the importance of the family and kin has been highly emphasised in India. Being disabled in older ages seeks an intensive care and support from its caregivers. It can also derive that introduction of elderly specific agendas in policies, and activities of non-governmental organizations is far reaching to safeguard the well-being of the widowed or divorced. Higher education contributes positively to the disability gaps due to a remarkable contribution of NCD related morbid conditions across better socio-economic groups. At older ages, absence of an adequate healthcare infrastructure at the community level and inaccessible financial protections, and distressed financing can deteriorate the extent of disability, too. It is important to mention, access to healthcare at primary health facilities becomes critical (35, 36), as rehabilitation facilities are more concentrated in the bigger cities

and private facilities in India. Moreover, interventions for disabilities in mental health at community-level is needed to be strengthened since, individuals suffers from heightened barriers like stigma, avoidance, lack of care-receiving and discrimination against healthcare (37). Availability and accessibility of treatment and assistive devices in low cost can be easily achieved if community-based interventions are offered. It would complement a better participation by reducing the barriers.

Disability is a long-term phenomenon that brings permanent damage to health. This diverse consequence of disability can be addressed by integrating to a multidimensional approach not only in the health policy but policies that are intended for the socio-economic development like, financial inclusion and offering satisfactory social safety nets. Previous research on inequality in the health-seeking behaviour and health financing would be helpful to explain the fact on unaffordable healthcare cost in private hospitals, skewed utilisation of benefits to the upper socio-economic groups at the expense of disadvantageous one, growing size of lower socio-economic groups in the elderly population with adverse health conditions as individuals, especially from lower wealth quintile, tries to avoid treatment (32, 38, 39). Besides, lack of community-level health facilities is reiterated to generate an inevitable barrier among population.

A larger household size shows a negative contribution to the disability gaps explains that the presence of more number of members in the family can escalate the chance of support and caregiving. It has been clear that the disintegration of the families in the Indian context induces a higher chance of being disabled at older ages in the absence of traditional caregiving and support. Thus, promoting a provision for caregiving to the disabled, and more importantly, to the elderly disabled, can enhance the health utilization and reduce the vulnerability caused by disability. Lack of support from the close network members at the household level can be correlated with the occurrence of mental retardations and multiple disabilities. Dearth in cognitive and social capital can alleviate the chance of disability by keeping an individual less active and poorly informed, as reported in a study (33).

Relative deprivation negatively affects health behaviour in developing countries. States with higher social and income inequality can have more unsatisfactory health outcomes in terms of disability. Our study shows that Southern region of India has the highest prevalence of disability, followed by Central regions of India. A higher value for risk difference presented by the population living in the Central part of the country (76.8 per 1000 people). It explains the fact that being elderly in the Central region of India has a higher likelihood of disability than the rest of the regions. However, at a same level of disability prevalence, there remains a wide heterogeneity in risk difference across the states in India.

Decomposition shows in the Eastern and North-eastern regions of India; elderly population is more prone to be disabled than non-elderly. Besides, a better healthcare infrastructure does not ensure the lesser prevalence of disability and a low-risk difference. For instance, despite Kerala and Odisha are two states ranking far away in terms of health indicators in India, they secure same position in graph at the high-high region; and explaining a higher disability prevalence and risk difference. Higher horizontal inequality of the elderly in terms of healthcare utilization can explain the socio-economic inequity in the country (40). Lesser utilization, as a matter of inequity, can intensify the morbidities and disabilities in a

population. The extent of disability among the elderly is fatal in the states designated as high-high in Fig. 3.

Besides, states like Punjab, Rajasthan, Karnataka are yet to finish the demographic transitions, also explain lesser share of the elderly population and are facing a threat of worsen health outcomes among the elderly than non-elderly population. It should also take into consideration that low-high states of Chandigarh, Assam, and Arunachal Pradesh needs to be focused on geriatric care and rehabilitation, even though it shows a lower disability prevalence. It accelerates a thought that lack of disease preparedness in the health system would worsen the experience of ageing among the population, if not acted now. The promotion of healthcare demands a priority for the non-elderly in the high-low set of states like West Bengal, Himachal Pradesh, and Andhra Pradesh. The positive correlation suggests for promoting the healthcare to be geriatric-centric, although a large chunk of the population still need a non-elderly care. Strengthening of the preventing measures for chronic diseases is suggested in the developing countries, which can serve to elderly and non-elderly by mitigating the risk factors (36, 41). Joe et al. (2015) suggests that moderation in no-need driven factors for healthcare utilization like, education and wealth through investing in social and economic dimensions is an equivocal policy approach for both the elderly and non-elderly population. In that context, a meagre amount of disability pension and lack of consistency in pension delivery across states must be considered to promote health equity. To achieve an optimal health, it is suggested to promote universal access to primary healthcare and population specific interventions, in respect to health promotion in the infrastructure as well as in home and community care (12, 28). Elderly in Indian context occupies a remarkable position in regard to health and well-being. In next few decades, the elderly will grow at a significant rate with a decline in potential support ratios and increase in a health burden (42). To cater the tumultuous challenge, it is necessary to promote the disability inclusive component as a vital component of universal health coverage in India. Through this study, we support the importance of building a framework that reduces the inequality between different demographic and socio-economic gradients and finally, to provide preventive, curative, palliative and rehabilitative care to the disabled population affected due to a varied health conditions (3).

## **Limitation Of The Study:**

Limitation of the study acknowledges that we are unable to segregate in a distinct age-groups which would give a better understanding of age specific disability and its implications of society. We are also limited to include the healthcare utilisation and responsiveness of public health structure in the study. Treatment seeking behaviour of an individual imparts an explanation for the gap observed in the disability estimation. Moreover, as non-communicable diseases are major reasons that contributes to the disability burden, however, we could not include in the study due to data limitations. To evoke a sustainable health infrastructure, it is suggested to address those relationships in the future research.

## **Conclusions**

This study has emphasised the need to ameliorate the disability addressing both elderly and non-elderly population. Policy must be formulated in coherence with the disability prevalence, stage of demographic transitions the states belong to and healthcare infrastructure that caters to the population at risk. Fostering the concept of inclusive development at the community level, it is suggested to control the incidence of fatal diseases and disabilities with more investment and action oriented approach essentially in primary healthcare. It is important to invest in the rehabilitation work and building man power in the paramedical sectors along with primary healthcare to cater the significant need at present. Study is exemplary in the perspective of measurement of the obvious role of socio-economic factors, and its contribution to the disability gaps. Hence, it has also been recommended to highlight the issues pertaining to reduce the gap in the dimensions of socio-economic status through an inclusive policy and programmatic approach.

## **Abbreviations**

### **CSDH**

Commission of Social Determinants of Health

### **FSU**

First Stage Units

### **GoI**

Government of India

### **MoSPI**

Ministry of Statistics and Program Implementation

### **MPCE**

Monthly Per Capita Income Expenditure

### **NCD**

Non-communicable Disease

### **NSS**

National Sample Survey

### **OBC**

Other Backward Classes

### **SC**

Scheduled Caste

### **ST**

Scheduled Tribes

### **USU**

Ultimate Stage Unit

### **YLD**

Years Living with Disability

### **YLL**

Years of Life Lost

# Declarations

## Availability of data and material

The data has been archived in the public repository of the Ministry of Statistics and Program Implementation (MoSPI), Government of India. The data can be retrieved using the link:

<http://www.mospi.gov.in/download-tables-data>

## Competing interest

Authors declare no competing interest.

## Funding

No funds were available for conducting the study.

## Author's Contribution

SC conceived the idea. SC and PP designed the experiment. PP and RY analysed the data and interpreted the results. SC prepared the first draft of manuscript, and PP and RY edited the final version of the manuscript. All the authors read and approved the final manuscript.

## Acknowledgement

Ministry of Statistics and Program Implementation (MoSPI), Government of India (GoI) is responsible for collecting, assembling and publishing the nationally representative data on disabilities in India.

## Ethical declaration:

## Ethical Approval

The study is based on a publically available data from the repository established by the Ministry of Statistics and Program Implementation, Government of India. The data can be retrieved using: <http://www.mospi.gov.in/download-tables-data>. This data does not provide any identifiable information on the study subjects thus, there is no requirement for a separate ethical clearance for conducting the present study.

## Consent for publication:

Not applicable

## Conflict of interest statement

Authors' declare no conflict of interest.

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## Figures

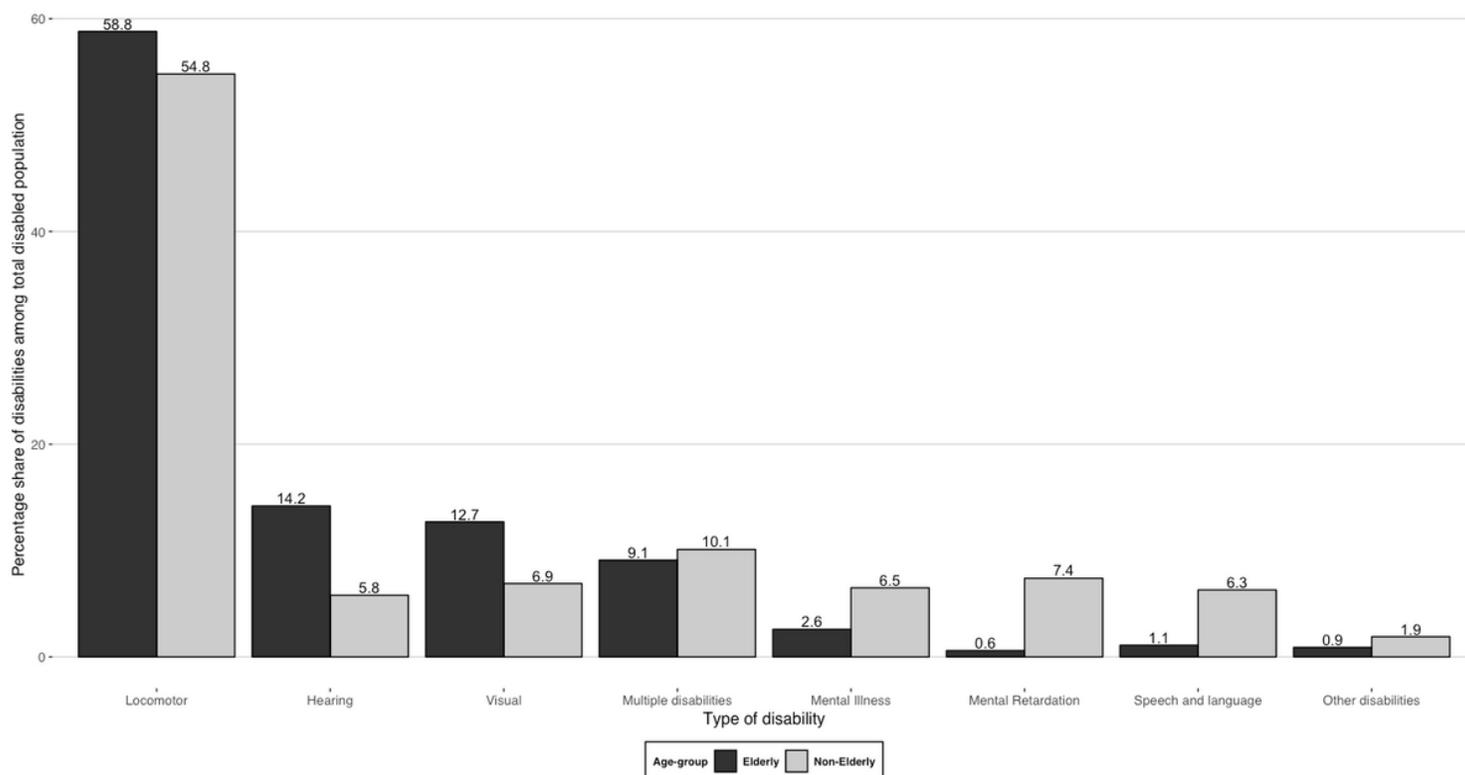
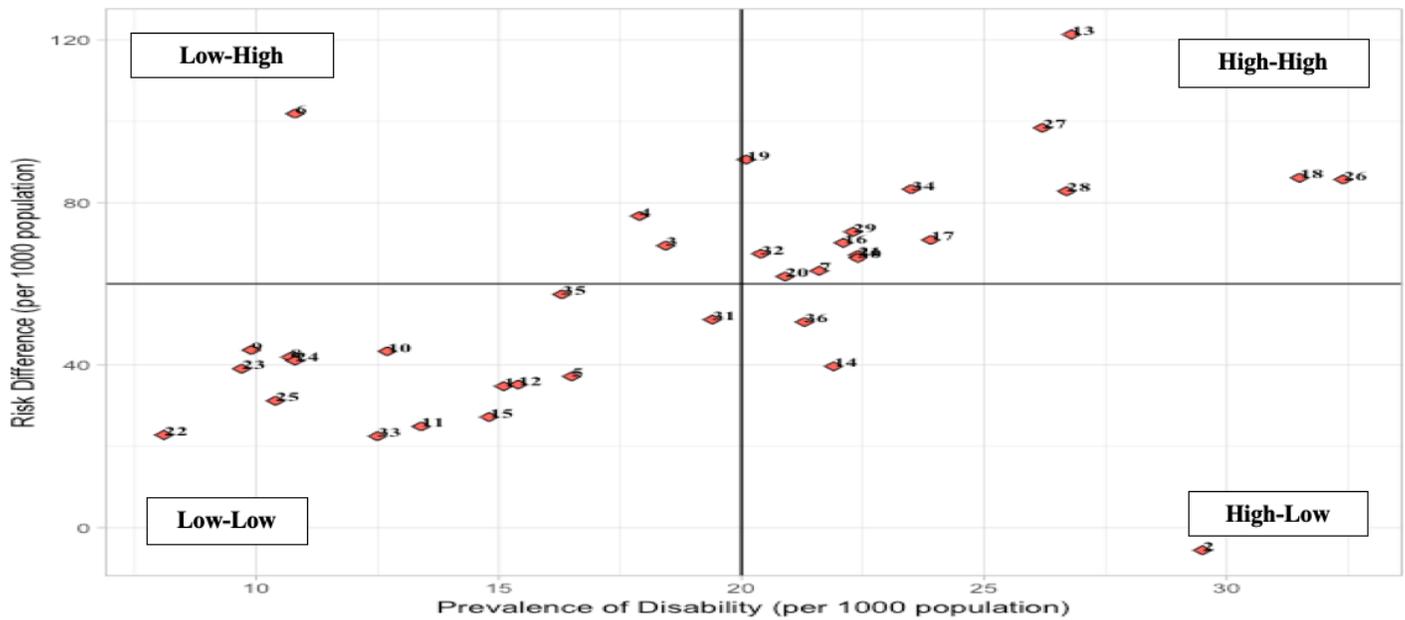


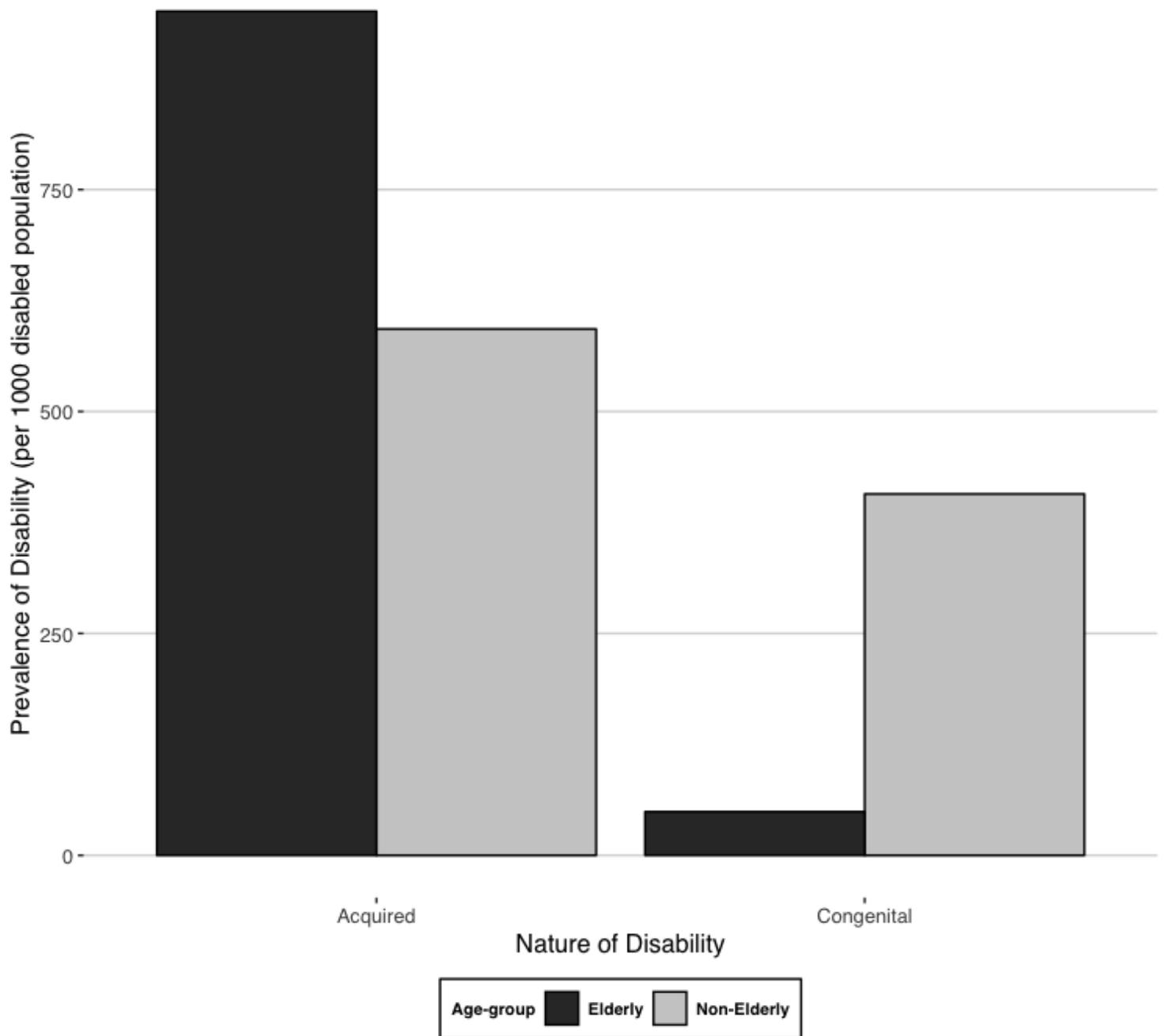
Figure 1

Percent distribution of type of disability among elderly (aged 60 years or more) and non-elderly (less than 60 years of age) population in India (2017-18).



**Figure 2**

Scatter plot for prevalence of disability and risk difference between elderly and non-elderly samples in disability prevalence across States and Union Territories (UT) in India. Note. In the above figure 1. Andaman and Nicobar Islands, 2. Andhra Pradesh, 3. Arunachal Pradesh, 4. Assam, 5. Bihar, 6. Chandigarh, 7. Chhattisgarh, 8. Dadra and Nagar Haveli, 9. Daman and Diu, 10. Delhi, 11. Goa, 12. Gujarat, 13. Haryana, 14. Himachal Pradesh, 15. Jammu and Kashmir, 16. Jharkhand, 17. Karnataka, 18. Kerala, 19. Lakshadweep, 20. Madhya Pradesh, 21. Maharashtra, 22. Manipur, 23. Meghalaya, 24. Mizoram, 25. Nagaland, 26. Odisha, 27. Puducherry, 28. Punjab, 29. Rajasthan, 30. Sikkim, 31. Tamil Nadu, 32. Telangana, 33. Tripura, 34. Uttar Pradesh 35. Uttarakhand, 36. West Bengal.



**Figure 3**

Prevalence of disability by aetiology among elderly and non-elderly age-groups in India.

## Supplementary Files

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- [supplement6.docx](#)