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Sex differences in functional disability among older adults in India: a multivariate decomposition analysis from LASI survey, 2017-18

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Abstract

Objectives: To investigate the prevalence of sex disparities in ADL (Activities of Daily Living) and IADL (Instrumental Activities of Daily Living) limitations and explore the contributing factors among older adults in India.

Design: A cross-sectional study was conducted using a country representative survey data.

Setting and participants: The present study uses the data from the Longitudinal Aging Study in India conducted during 2017-18. Participants included 15,098 male and 16,366 female older adults aged 60 years and above in India.

Primary and secondary outcome measures: Difficulty in ADL and IADL were the outcome variables. Descriptive analysis along with bivariate analysis was carried out to present the preliminary results. A multivariate decomposition analysis was used to identify the contributions of covariates which explain the group differences to average predictions.

Results: There was significant gender differential in difficulty in ADL and IADL (4.6% $p<0.001$ and 17.3% $p<0.001$) respectively. The results show significant gender inequality in ADL-limitations (0.059; p-value<0.05) and 78% of the gender difference can be explained by the differences in distributions of characteristics (0.046; p-value<0.05) between the male and female older adults. The majority of the gender gap in ADL-limitation would be reduced if female had similar levels of formal education (15% reduction), work status (18% reduction) and marital status (13% reduction) respectively as in their male counterparts. Moreover, bringing the level of physical activity, health status and morbidity prevalence in female to the same levels as observed in male would reduce the gender gap by 9%, 8% and 5% respectively.

Conclusion: Due the rapidly increasing aging population, early detection and prevention of disability or preservation of daily functioning for older adults and women in particular, should be the highest priority for physicians and health decision makers.

Strengths and limitations:

- The study utilizes a country representative sample of the older individuals
- The study provides insights into the disability burden and the sex differentials and its contributing factors using an exhaustive survey information
- Self-reported measured functional health information has been used in the study
- The study design is cross-sectional and, therefore, we cannot establish any causality in the relationships between variables

Background

The 2030 agenda of sustainable development goals emphasize on the importance of achieving health for everyone without causing financial hardship to any. The goal of Health for all cannot be achieved without addressing the needs of the dramatically increasing world's old age population. The proportion of older adults is increasing at the rate of 3 percent every year and it is projected to almost double from 12 percent in 2015 to 21 percent in 2050, which makes it about 2.1 billion people [1, 2]. Predominantly, the population ageing was a phenomenon of high-income countries. However, today it is the middle- and low-income countries that experience the largest shift in population structure towards older population. According to World Health Organization , by 2050 about 80 percent of the world's older population is projected to be living in low and middle income countries [3]. The ageing population face physiological changes and, the major health concern will be the risk of chronic diseases and the physical disability that comes with it [4, 5].

Above 46 percent of the older adults live with disability and at the current rate of population ageing, by 2050 the older adults will become the world's biggest community with disability [6]. The major burden of disability in older adults are caused by loss in hearing, vision, or mobility, and various non-communicable diseases (NCDs) [7]. There is also evidence of a positive relationship between disability and economic poverty and it extends across all kinds of impairment [8]. Age-related functional difficulty is often worsened by the discrimination based on gender existing in the society. Even when disability increase with age irrespective of gender, older women, compared to similar aged men, face a relatively higher risk from it[9–12]. The rate of incidence as well as the duration of disability is often higher among them[13]. On assessing the Activities of Daily Living (ADL) and Instrumental Activities of Daily Living (IADL), women who have at least one difficulty in IADL and ADL were a higher percent that men [14].

Women have higher life expectancy than men, however, they are worse off at functional ability than men. This is called the male-female health- survival paradox [14, 15]. The sex difference in disability is likely to be contributed by a range of socioeconomic and demographic risk factors. The chronic disease and its prevalence is found to be higher among older women than men [9]. Education and marital status can to some extent explain the gender differences in ADL and IADL of older adults [16]. In a pooled analysis of 57 countries, approximately 45% of the disadvantage faced by older women is contributed by

their differences in working status, education level, marital status, income levels, age and country of residence. Of all the reasons mentioned in the 57 countries, differences in working status between the genders was the biggest contributor of inequality, i.e., higher proportion of men were involved in paid jobs than women [17]. The higher rate of incidence and retention of disability that older women encounter is sometimes pinned on their higher life expectancy (Dunlop et al., 1997). Nevertheless, [18] points out the little bearing life expectancy have on occurrence of disability. According to [19], disability in older adults can be because of their life style in earlier stages of living. For example, smoking, drinking, and being obese at early age has contributed to disability at older ages. However, there exists gender difference in the prevalence of smoking and drinking, as men are more prone to it than women. Had women started smoking and drinking at the levels men do, it would have had a further detrimental impact on them [16].

Like the rest of the world, the burden of disability is a chief concern for India. In 1 out of every 20 older adults in India over the age of 60,there is evidence of physical or mental disability [20]. In rural Haryana, more than disability, disadvantage based on sex was the primary problem women had to face. Thus disabled-women in India face the problem of 'double discrimination'[21]. Saikia et al [22] points out that age standardized disability prevalence (ASDP) is higher in women, rural people and those belonging to ethnic groups like SC/ST. In India, only about 1/3rd of older adults live without disabilities. Functional disability among older adults is predominant among women, people who have two or more chronic illnesses, and those who report hospitalization [23]. It is expected of the women to live longer with disability [24]. In India, 17.93% of older men and 26.21% of older women face mild or severe ADL disability [25]. A study on European region points out a variation in the impact of gender differences on disability across the regions in Europe, however, all over Europe, the older women are at a disadvantage and it worsens with the advancing age [14]. The same way, in India, a variation in intensity across northern and southern regions can be observed, with the former bearing the brunt of it. In both the regions, marital status of older women is associated with impairment levels, yet in the north, disability is higher among women who has no spouse and in the south, it is higher among currently unmarried women [26].

The purpose of the present study is to investigate the prevalence of sex disparities in ADL and IADL limitations and explore the factors contributing to the sex differences in difficulties

in ADL and IADL functioning among older adults in India using a large country-representative survey data.

Methods

Data

This study used the baseline survey of Longitudinal Aging Study in India (LASI) conducted during 2017-19 [27]. The LASI, which is the Indian version of the Health and Retirement Studies (HRS), is a nationally representative survey conducted by the International Institute for Population Sciences (IIPS) in collaboration with the Harvard T.H. Chan School of Public Health, and the University of Southern California (USC) [27]. LASI provides vital information on demography, biomarkers, chronic health conditions, symptom-based health conditions, functional health, mental health (cognition and depression), household economic status, healthcare utilization and health insurance, family and social networks, work and employment, retirement and life expectations of 72,250 adults aged 45 and above across all the states and union territories of India [27]. LASI adopted a multistage stratified cluster sampling design intending to follow the sample biennially for 25 years. Further details regarding the sample design, survey instruments, fieldwork, data collection and processing, and response rates are publicly available in the LASI report [27]. The current study is based on a sample of 31,464 older adults (15,098 male and 16,366 female) in India. By older adults, this study refers to the population aged 60 years and above.

Variable description

Outcome variables

The outcome variable were binary in nature i.e., Difficulty in ADL (Activities of Daily Living) was coded as no and yes and Difficulty in IADL (Instrumental Activities of Daily Living) was coded as no and yes. The respondents who respondent to have no ADL's and IALD's were coded as 0 "no" otherwise "yes".

1. Activities of Daily Living (ADL) is a term used to refer to normal daily self-care activities (such as movement in bed, changing position from sitting to standing, feeding, bathing, dressing, grooming, personal hygiene etc.) The ability or inability to perform ADLs is used to measure a person's functional status, especially in the case of people with disabilities and the older adults [28, 29].

2. Instrumental activities of daily living that are not necessary related to fundamental functioning of a person, but they let an individual live independently in a community. The set ask were necessary for independent functioning in the community. Respondents were asked if they were having any difficulties that were expected to last more than three months, such as preparing a hot meal, shopping for groceries, making a telephone call, taking medications, doing work around the house or garden, managing money (such as paying bills and keeping track of expenses), and getting around or finding an address in unfamiliar places [28, 29].

Explanatory variables

1. Age was categorized as young old (60-69 years), old-old (70-79 years) and oldest old (80+ years).
2. Sex was categorized as male and female.
3. Educational status was categorized as no education/primary not completed, primary, secondary and higher.
4. Working status was categorized as currently working, retired and not working.
5. Marital status was coded currently married, widowed and others. Others included never married/divorced/separated.
6. Living arrangement was coded as living alone, living with spouse, living with children and spouse and living with others.
7. Tobacco and alcohol consumption was recoded as no and yes.
8. Overweight/obesity was coded as no and yes. The respondents having a body mass index of 25 and above were categorized as obese/overweight [30].
9. Physical activity status was recoded as frequent (every day), rare (more than once a week, once a week, one to three times in a month), and never. The question through which physical activity was assessed was "How often do you take part in sports or vigorous activities, such as running or jogging, swimming, going to a health center or gym, cycling, or digging with a spade or shovel, heavy lifting, chopping, farm work, fast bicycling, cycling with loads"? [27]

10. Self-rated health was coded as good which includes excellent, very good and good where as poor includes fair and poor [31].
11. Morbidity status was categorized as 0 “no morbidity”, 1 “any one morbid condition” and 2+ “co-morbidity”.
12. The monthly per capita consumption expenditure (MPCE) quintile was assessed using household consumption data [27]. Sets of 11 and 29 questions on the expenditures on food and non-food items, respectively, were used to canvas the sample households. Food expenditure was collected based on a reference period of seven days, and non-food expenditure was collected based on reference periods of 30 days and 365 days. Food and non-food expenditures have been standardized to the 30-day reference period. The monthly per capita consumption expenditure (MPCE) is computed and used as the summary measure of consumption. The variable was then divided into five quintiles i.e., from poorest to richest [27].
13. Religion was coded as Hindu, Muslim, Christian, and Others.
14. Caste was recoded as Scheduled Tribe, Scheduled Caste, Other Backward Class, and others. The Scheduled Caste include “untouchables”; a group of the population that is socially segregated and financially/economically by their low status as per Hindu caste hierarchy. The Scheduled Castes (SCs) and Scheduled Tribes (STs) are among the most disadvantaged socio-economic groups in India. The OBC is the group of people who were identified as “educationally, economically and socially backward”. The OBC’s are considered low in the traditional caste hierarchy but are not considered untouchables. The “other” caste category is identified as having higher social status.
15. Place of residence was categorized as rural and urban.
16. The region was coded as North, Central, East, Northeast, West, and South.

Statistical analysis

Descriptive analysis along with bivariate analysis was carried out to present the preliminary results. Proportion test was used evaluate the gender differentials and find the significance level [32]. A multivariate decomposition analysis [33] was used to identify the contributions of covariates which explain the group differences to average predictions. The aim of the decomposition analysis was to identify covariates that contributed to the change in difficulty in ADL and IADL by male and female sex.

The multivariate decomposition analysis has two contribution effects namely compositional differences (endowments) 'E' and the effects of characteristics that are the difference in the coefficients or behavioural change 'C' responses for the selected predictor variables [34]. The observed differences in difficulty in ADL and IADL thus can be additively decomposed into characteristics (or endowments) component and a coefficient (or effects of characteristics) component [35]. In the non-linear model, the dependent variable is a function of a linear combination of predictors and regression coefficients:

$Y = F\,(X\beta) = logit\,(Y) = X\beta$, where Y denotes the n*1 dependent variable vector, X an n*K matrix of independent variables and β a K*1 vector of coefficients

The proportion difference in Y between male A and female B of difficulty in ADL and IADL can be decomposed as:

$$Y_A - Y_B = F(X_A\beta_A) - F(X_B\beta_B)$$

For the log odds of difficulty in ADL and IADL, the proportion of the model is written as

$$Logit\,(Y_A) - logit\,(Y_B) = F(X_A\beta_A) - F(X_B\beta_B) = \underbrace{F(X_A\beta_A) - F(X_B\beta_A)}_{E} + \underbrace{F(X_B\beta_A) - F(X_B\beta_B)}_{C}$$

The component 'E' is the difference attributable to endowment change, usually called the explained component. The 'C' component is the difference attributable to coefficient (behavioural) change, usually called the unexplained component.

The model structure for the decomposition analysis was:

$Logit\,(A) - Logit\,(B) = [\beta_{0A} - \beta_{0B}] + \sum\beta_{ijA}[X_{ijA} - X_{ijB}] + \sum X_{ijB}[\beta_{ijA} - \beta_{ijB}]$, where

- β_{0A} is the intercept in the regression equation for male
- β_{0B} is the intercept in the regression equation for female
- β_{ijA} is the coefficient of the j^{th} category of the i^{th} determinant for male
- β_{ijB} is the coefficient of the j^{th}category of the i^{th} determinant for female
- X_{ijA} is the proportion of the j^{th}category of the i^{th} determinant for male
- X_{ijB} is the proportion of the j^{th}category of the i^{th} determinant for male

The command *mvdcmp* was used to carry out multivariate decomposition analysis in STATA 14 [36].

Patient and Public Involvement

No patient involved

3. Results

3.1 Background characteristics

Table 1 shows the biodemographic and socioeconomic characteristics of 15,098 male and 16,366 female older adults in India. We observed that six in every ten older adults of either gender were in the young-old age group. There were 53%, 44% and 16% of male older adults with no formal education, working status and widowed status. Further, among female older adults, 82% had no formal education, 19% were working and 54% were widowed. While 16% of males were overweight or obese the same was higher (23%) in female older adults. Six in ten female and three-fourth of older male never experienced physical activity. Among older adults of either gender, nearly, half had poor self-rated health and a quarter had two and more morbidities. Moreover, the majority (more than 80%) of older adults followed Hinduism and more than 26% belonged to the SC/ST caste. While four in every ten older adults belonged to the lowest 40% wealth quintile, seven in ten older adults lived in a rural community respectively.

3.2 Bivariate analysis

Table 2 gives the bivariate distribution of male and female older adults with physical limitations concerning the biodemographic and socioeconomic characteristics. There was significant gender differential in difficulty in ADL and IADL (4.6% $p<0.001$ and 17.3% $p<0.001$) respectively. In the case of ADL significant gender differences are observed in the case of individual, household and community characteristics. Among individuals with ADL, a higher proportion of female had no formal schooling (28%), were widowed (30%), never had physical activity (29%), had poor health (34%) and had two or more morbidities (35%) in comparison to their male counterparts (25%, 24%, 27%, 28% and 30% respectively). In the oldest-old age group, a higher proportion of female (47%) suffered from ADL-limitations in comparison to male (41%). Coming to IADL, we observed that the gender differences were more pronounced. On the other hand, a higher proportion of older female population with IADL-limitations had no formal schooling (60% in female vs 48% in male), were widowed (63% vs 48%), never had physical activity (59% vs 45%), had poor health (66% vs 40%) and

had two or more morbidities (66% vs 47%). Moreover, these differences were statistically significant at the 5% level.

3.3 Decomposition of gender difference in ADL

Table 3 shows the contribution of bio-demographic and socioeconomic characteristics to gender inequality in ADL-related limitations. Here, females and males were the high-risk and low-risk group respectively. The results show significant gender inequality in ADL-limitations (0.059; p-value<0.05) and 78% of the gender difference can be explained by the differences in distributions of characteristics (0.046; p-value<0.05) between the male and female older adults. The majority of the gender gap in ADL-limitation would be reduced if female had similar levels of formal education (15% reduction), work status (18% reduction) and marital status (13% reduction) respectively as in their male counterparts. Moreover, bringing the level of physical activity, health status and morbidity prevalence in female to the same levels as observed in male would reduce the gender gap by 9%, 8% and 5% respectively. Additionally, 2% of the ADL-related gender gap was accounted for by the gap among the six regions of India. Coming to differences due to coefficients, if older females had the same degree of risk of work status as older males, then the male-female gap would be expected to increase by about 25%.

3.4 Decomposition of gender difference in IADL

Table 4 shows the contribution of bio-demographic and socioeconomic characteristics to the IADL-related gender gap. Here, older female and male were the high-risk and low-risk group respectively. We observed a significant gender gap in IADL-limitations (0.171; p-value<0.01) and 30% of the gender inequality can be explained by the differences in characteristics (0.046; p-value<0.05) between the male and female older adults. Bringing the level of formal education (28% reduction), marital status (10%), health status (4%) and morbidity prevalence (2%) among female to the levels similar in male would significantly reduce the gender gap in IADL-limitations respectively. Moreover, if female started alcohol consumption by levels similar to male that would increase the gender gap by 9%. Coming to differences due to coefficients, if older females had the same degree of risk of work status as older males, then the male-female gap would be expected to increase by about 17%.

Discussion

The present study of sex differences in functional difficulties demonstrated that the proportion of older people with at least one ADL and IADL limitation increased with age for both sexes. In the total study population, 5% more women than men had at least one ADL limitation, whereas for IADL, 17% more women than men had at least one limitation. The sex difference in ADL and IADL limitations observed in the present study was in line with the previous studies [37–39]. A recent study by Crimmins et al. (2019) found that the likelihood of having difficulties in ADL and IADL was about twofold higher for women than for men around the world [38]. The results of the present study also agree with female disability disadvantage reported in earlier studies showing that women have lower grip strength, slower gait speed, take longer to rise from a sitting position and have worse physical functioning compared to men [39–41].

The decomposition of contributing factors to sex differences showed that lack of education among older women substantially contributed to differences in ADL and IADL limitations. Several studies showed an independent association between education and disability in older women, suggesting that low education may be regarded as a risk factor for accelerating decline [42, 43]. Also, female gender and lower levels of education were found to be the risk factors of functional difficulties in multiple studies [44, 45]. As documented, ADL and IADL require a range of physically demanding capabilities, and in addition, IADL requires cognitive capacity which is known to be related with educational level and older women are found to be mostly disadvantaged [46, 47]. Longitudinal studies are needed to determine how education influences the progression of disability in specific subgroups of older people and older women in particular on their daily activities.

An individual-level analysis of SRH by gender based on the World Health Survey showed that some of the differences between older men and women could be attributed to education and employment levels [48]. Consistently, the working status mostly retirement explained the sex differences in ADL and IADL limitations in our study greatly. However, differences in lifestyle habits such as tobacco and alcohol consumption did not explain the gender gap in functional limitations in the present study.

Further, women had a higher chances of suffering from disability due to physiological differences such as lower muscle strength or bone density or lifestyle factors like sedentary life and obesity [44, 49], suggesting a female disadvantage in overall physical and associated functional health. Although a few studies have shown no gender differences in physical and

functional health , the current analysis observes an 8 and 5 percent overall contribution of self-rated health and morbidity status to the greater sex differences in functional health among older individuals. This can be partially attributed to the survival bias which may result in a selection effect with the strongest men surviving to the older age groups [50, 51]. Thus, women's generally weaker physique compared with men might influence sex differences in ADL and IADL. Concordantly, an American study found that older women had a worse inflammatory index majorly contributing to a worse overall functioning [52]. Thus, effective interventions are urgently needed to prevent or delay the onset of disability in older adults especially women who are suffering from any morbidity or have poor physical health.

Moreover, socioeconomic disadvantages such as poor household living conditions and a high proportion of the population who are members of deprived STs generally contribute to a higher disability prevalence [22]. The findings of our study also show that the proportion the population who are from households of poorest wealth quintile or members of SCs has no relationship to disability levels. This is also compatible with the findings of previous studies in India and other developed countries [53, 54]. In the present study, we also found a large sex disparity explained by rural place of residence in comparison to urban areas. The poor ADL and IADL statuses for rural women might be a reflection of inadequate healthcare and health infrastructure [55]. Since higher economic status tends to be associated with better health status, access to health care, healthy food and housing [56], the current results indicate that preventive interventions should focus on the heterogeneous groups of older adults, particularly those belonging to socioeconomically vulnerable groups. Two hypotheses of differential exposure and differential vulnerability have been stated in multiple studies to explain the role of social factors in gender–health associations [57, 58], suggesting that due to the different access to material resources and other social conditions of life, men and women are exposed to different levels of risk, resulting in different health outcomes and women's biological vulnerability make them at increased health risks. Since sex differences in health are huge, such hypotheses need to be further examined in poor resource settings including India.

Since there has been nearly no systematic study of the sex differences in the prevalence of disability in India that examined in detail the contribution of various health, demographic, and socioeconomic characteristics of the older population with disabilities, we believe that this study adds important information to the existing literature. The analyses provide insights into the disability burden and the sex differentials and its contributing factors in India based

on the recent survey data with exhaustive information of the aging population. However, there are several limitations of the present study to be acknowledged. The data used are cross-sectional and use multivariate decomposition for analysis and, therefore, we cannot establish any causality between functional limitations and different socioeconomic and health-related variables. Also, the dependent variables in our study two functional health measures, which are combinations of multiple functional task items; and current findings may not be generalizable to individual measures of functional health. Similarly, our data on functional health are based on self-reports, thus, it is possible that some of the sex differences we find are due to different ways in which men and women respond to related questions and mild forms of disability could be underestimated. Hence, future studies may wish to address these issues by using more objective and follow-up data with more analytical tools.

Conclusion

Due the rapidly increasing aging population, early detection and prevention of disability or preservation of daily functioning for older adults and women in particular, should be the highest priority for physicians and health decision makers. Evidence-based tools need to be developed to help them adequately identify those at high risk of disability. Moreover, the gendered pathways to functional disability need to be further investigated that would inform policymakers on measures of successful aging both for older men and women.

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Table-1. Socio-demographic profile of older adults in India, 2015-16

Background characteristics	Male		Female	
	Sample	Percentage	Sample	Percentage
Age				
Young-old	8,730	57.8	9,678	59.1
Old-old	4,702	31.1	4,803	29.4
Oldest-old	1,666	11.0	1,886	11.5
Education				
Not educated/primary not completed	8,019	53.1	13,314	81.4
Primary	2,235	14.8	1,297	7.9
Secondary	3,096	20.5	1,297	7.9
Higher	1,748	11.6	458	2.8
Working status				
Working	6,613	43.8	3,108	19.0
Retired	7,907	52.4	5,593	34.2
Not working	578	3.8	7,665	46.8
Marital status				
Currently married	12,242	81.1	7,211	44.1
Widowed	2,489	16.5	8,837	54.0
Others	366	2.4	318	2.0
Living arrangement				
Living alone	380	2.5	1,397	8.5
Living with spouse	3,929	26.0	2,485	15.2
Living with children and spouse	10,205	67.6	11,268	68.9
Living with others	583	3.9	1,216	7.4
Tobacco consumption				
No	6,197	41.1	12,706	77.6
Yes	8,901	59.0	3,660	22.4
Alcohol consumption				
No	10,939	72.5	15,943	97.4
Yes	4,159	27.6	423	2.6
Obesity/overweight				
No	12,755	84.5	12,568	76.8
Yes	2,343	15.5	3,798	23.2
Physical activity				
Frequent	3,706	24.6	1,966	12.0
Rarely	2,360	15.6	1,672	10.2
Never	9,031	59.8	12,729	77.8
Self-rated health				
Good	8,253	54.7	8,335	50.9
Poor	6,845	45.3	8,031	49.1
Morbidity				
No morbidity	7,507	49.7	7,274	44.5
1	4,240	28.1	4,928	30.1
2+	3,351	22.2	4,164	25.4
Wealth index				
Poorest	3,145	20.8	3,681	22.5
Poorer	3,219	21.3	3,611	22.1
Middle	3,262	21.6	3,331	20.4
Richer	2,902	19.2	3,136	19.2
Richest	2,570	17.0	2,607	15.9
Religion				
Hindu	12,386	82.0	13,484	82.4
Muslim	1,769	11.7	1,781	10.9
Christian	388	2.6	511	3.1

Others	555	3.7	590	3.6
Caste				
Scheduled Caste	2,836	18.8	3,113	19.0
Scheduled Tribe	1,166	7.7	1,389	8.5
Other Backward Class	6,925	45.9	7,308	44.7
Others	4,172	27.6	4,556	27.8
Place of residence				
Rural	10,879	72.1	11,322	69.2
Urban	4,219	28.0	5,044	30.8
Region				
North	1,863	12.3	2,096	12.8
Central	3,395	22.5	3,202	19.6
East	3,713	24.6	3,729	22.8
Northeast	437	2.9	497	3.0
West	2,457	16.3	2,941	18.0
South	3,233	21.4	3,900	23.8
Total	15,098	100.0	16,366	100.0

Table-2. Percentage of older male and females reported difficulty in ADL and IADL in India, 2017-18

Background characteristics	ADL				IADL			
	Male	Female	Differences	p-value	Male	Female	Differences	p-value
Age								
Young-old	16.1	19.8	3.7	0.001	31.3	49.7	18.4	0.001
Old-old	25.8	32.1	6.3	0.001	46.8	64.3	17.5	0.001
Oldest-old	41.3	47.1	5.8	0.001	63.1	75.3	12.1	0.001
Education								
Not educated/primary not completed	24.8	28.2	3.4	0.001	47.8	60.1	12.3	0.001
Primary	18.7	22.4	3.7	0.023	35.9	41.6	5.7	0.001
Secondary	19.6	16.4	-3.2	0.001	31.0	49.8	18.8	0.001
Higher	16.8	19.4	2.5	0.001	22.5	28.6	6.1	0.001
Working status								
Working	12.6	16.8	4.2	0.001	28.4	50.0	21.6	0.001
Retired	29.3	32.9	3.6	0.001	48.8	63.0	14.2	0.001
Not working	27.7	25.9	-1.8	0.121	42.8	55.3	12.5	0.001
Marital status								
Currently married	21.4	21.9	0.6	0.001	37.6	49.5	11.9	0.001
Widowed	24.5	30.3	5.8	0.001	48.1	63.1	15.0	0.001
Others	23.0	26.2	3.3	0.144	50.8	55.4	4.7	0.084
Living arrangement								
Living alone	23.8	28.5	4.7	0.147	48.1	62.8	14.7	0.001
Living with spouse	25.7	21.5	-4.2	0.494	42.6	49.5	6.9	0.001
Living with children and spouse	20.3	26.8	6.5	0.001	37.7	56.9	19.2	0.001
Living with others	24.4	32.8	8.4	0.007	49.0	66.2	17.2	0.001
Tobacco consumption								
No	21.9	25.6	3.6	0.001	37.1	56.0	18.9	0.001
Yes	21.9	29.9	8.0	0.001	41.4	60.2	18.8	0.001
Alcohol consumption								
No	23.0	26.7	3.7	0.001	39.8	57.0	17.2	0.001
Yes	19.1	21.4	2.3	0.008	39.2	55.1	15.8	0.001
Obesity/overweight								
No	22.1	27.8	5.6	0.001	40.9	58.1	17.2	0.001
Yes	20.8	22.5	1.8	0.001	33.0	53.1	20.2	0.001
Physical activity								

Frequent	14.2	19.2	4.9	0.001	30.6	51.0	20.3	0.001
Rarely	15.1	19.0	3.9	0.004	32.0	51.5	19.5	0.001
Never	26.9	28.7	1.8	0.001	45.3	58.6	13.2	0.001
Self-rated health								
Good	16.5	18.9	2.4	0.001	31.1	47.9	16.7	0.001
Poor	28.4	34.5	6.0	0.001	49.9	66.4	16.5	0.001
Morbidity								
No morbidity	17.7	21.4	3.7	0.001	35.5	51.5	16.0	0.001
1	23.2	26.8	3.5	0.001	41.3	57.1	15.9	0.001
2+	29.7	35.3	5.6	0.001	46.9	66.3	19.4	0.001
Wealth index								
Poorest	22.8	28.4	5.6	0.001	42.6	57.1	14.4	0.001
Poorer	20.8	27.0	6.2	0.001	41.3	57.4	16.1	0.001
Middle	24.6	26.4	1.8	0.001	38.7	55.1	16.4	0.001
Richer	20.0	24.8	4.7	0.001	37.9	58.6	20.8	0.001
Richest	21.0	25.7	4.7	0.001	37.2	56.5	19.3	0.001
Religion								
Hindu	21.0	26.3	5.2	0.001	38.8	57.3	18.5	0.001
Muslim	28.0	30.0	2.0	0.001	43.3	58.2	14.9	0.001
Christian	26.1	23.4	-2.8	0.010	37.0	47.9	10.9	0.001
Others	20.2	25.7	5.5	0.049	49.1	53.7	4.6	0.001
Caste								
Scheduled Caste	22.1	29.0	6.9	0.001	42.6	58.2	15.7	0.001
Scheduled Tribe	19.7	20.8	1.1	0.001	37.8	51.4	13.6	0.001
Other Backward Class	22.9	25.0	2.1	0.001	41.6	60.0	18.4	0.001
Others	20.8	29.0	8.2	0.001	34.9	52.9	18.0	0.001
Place of residence								
Rural	21.9	27.1	5.2	0.001	42.7	60.1	17.4	0.001
Urban	21.9	25.2	3.3	0.001	31.8	49.8	18.0	0.001
Region								
North	12.9	15.2	2.3	0.001	32.5	49.6	17.1	0.001
Central	18.1	23.3	5.2	0.001	35.4	53.1	17.7	0.001
East	25.6	32.3	6.7	0.001	42.8	59.6	16.7	0.001
Northeast	13.5	20.1	6.6	0.001	32.1	48.3	16.3	0.001
West	28.5	36.6	8.1	0.001	35.6	54.3	18.7	0.001

South	23.0	23.1	0.0	0.001	48.7	64.6	15.9	0.001
Total	21.9	26.5	4.6	0.001	39.7	56.9	17.3	0.001

Difference: Female-Male; p-value based on proportion test; ADL: Activities of daily living; IADL: Instrumental activities of daily living

Table-3. Multivariate logistic regression decomposition estimates for gender differentials in difficulty in ADL among older adults in India, 2017-18

Background characteristics	Due to difference in characteristics					Due to difference in coefficients				
	Coef.	Standard error	p-value	Percent contribution		Coef.	Standard error	p-value	Percent contribution	
Age										
Young-old										
Old-old	-0.002	0.000	0.000	-2.5		0.006	0.003	0.034	9.9	
Oldest-old	0.001	0.000	0.000	1.1	-1.4	0.004	0.001	0.008	6.4	16.3
Education										
Not educated/primary not completed	0.012	0.005	0.014	20.2		-0.014	0.009	0.126	-23.2	
Primary	-0.001	0.001	0.536	-1.2		-0.005	0.003	0.074	-9.0	
Secondary	-0.002	0.003	0.384	-3.9		-0.002	0.004	0.681	-2.8	
Higher					15.2					-35.1
Working status										
Working										
Retired	-0.014	0.002	0.000	-24.2		-0.013	0.005	0.016	-21.1	
Not working	0.025	0.004	0.000	41.9	17.7	-0.002	0.001	0.003	-3.9	-25.0
Marital status										
Currently married										
Widowed	0.008	0.003	0.004	12.7		0.002	0.002	0.299	2.6	
Others	0.000	0.000	0.021	-0.1	12.6	0.001	0.001	0.183	1.5	4.1
Living arrangement										
Living alone										
Living with spouse	0.000	0.001	0.800	-0.6		-0.001	0.005	0.852	-1.7	
Living with children and spouse	0.000	0.000	0.217	0.1		0.014	0.014	0.298	24.0	
Living with others	0.001	0.001	0.129	1.4	0.9	0.000	0.001	0.858	-0.3	22.1
Tobacco consumption										
No										
Yes	0.003	0.002	0.251	4.4	4.4	-0.001	0.005	0.748	-2.5	-2.5
Alcohol consumption										
No										
Yes	0.004	0.004	0.372	6.1	6.1	-0.003	0.004	0.559	-4.2	-4.2
Obesity/overweight										
No										
Yes	-0.001	0.001	0.066	-1.6	-1.6	0.000	0.002	0.774	0.8	0.8
Physical activity										
Frequent										
Rarely	-0.001	0.001	0.122	-1.7		-0.001	0.002	0.668	-1.6	
Never	0.006	0.002	0.000	10.4	8.7	-0.005	0.007	0.476	-8.5	-10.1

Self-rated health										
Good										
Poor	0.005	0.000	0.000	8.0	8.0	-0.002	0.003	0.482	-3.6	-3.6
Morbidity										
No morbidity										
1	0.001	0.000	0.000	1.2		-0.001	0.002	0.760	-1.3	
2+	0.003	0.000	0.000	4.2	5.4	-0.001	0.002	0.816	-0.8	-2.1
Wealth index										
Poorest	0.000	0.000	0.769	0.0		-0.001	0.002	0.896	-1.3	
Poorer	0.000	0.000	0.223	-0.1		-0.001	0.002	0.187	-1.8	
Middle	0.000	0.000	0.406	0.0		-0.004	0.002	0.463	-6.4	
Richer	0.000	0.000	0.725	0.0		0.001	0.002	0.749	1.5	
Richest					-0.1					-7.9
Religion										
Hindu										
Muslim	0.000	0.000	0.252	0.0		0.002	0.001	0.209	2.9	
Christian	0.000	0.000	0.119	-0.2		-0.002	0.002	0.144	-3.7	
Others	0.000	0.000	0.198	0.0	-0.2	0.000	0.001	0.604	0.8	0.0
Caste										
Scheduled Caste										
Scheduled Tribe	0.000	0.000	0.233	-0.1		-0.001	0.002	0.674	-1.6	
Other Backward Class	0.000	0.000	0.053	0.3		-0.006	0.004	0.180	-9.4	
Others	0.000	0.000	0.986	0.0	0.1	-0.001	0.003	0.792	-1.5	-12.5
Place of residence										
Rural										
Urban	0.000	0.000	0.441	-0.1	-0.1	0.003	0.003	0.226	5.7	5.7
Region										
North										
Central	-0.001	0.000	0.000	-1.3		0.001	0.002	0.460	2.5	
East	-0.001	0.000	0.000	-1.9		-0.001	0.002	0.666	-1.7	
Northeast	0.000	0.000	0.478	0.0		0.004	0.002	0.086	6.0	
West	0.002	0.000	0.000	4.0		0.003	0.002	0.108	4.9	
South	0.001	0.000	0.000	0.9	1.8	0.004	0.003	0.156	7.2	18.9
Constant						0.031	0.032	0.339	51.2	
Total	0.046	0.006	0.000	77.5		0.013	0.007	0.066	22.5	

Table-4. Multivariate logistic regression decomposition estimates for gender differentials in difficulty in IADL among older adults in India, 2017-18

Background characteristics	Due to difference in characteristics					Due to difference in coefficients				
	Coef.	Standard error	p-value	Percent contribution		Coef.	Standard error	p-value	Percent contribution	
Age										
Young-old										
Old-old	-0.002	0.000	0.000	-1.2		0.002	0.004	0.549	1.2	
Oldest-old	0.001	0.000	0.000	0.5	-0.7	-0.001	0.002	0.546	-0.7	0.6
Education										
Not educated/primary not completed	0.065	0.006	0.000	37.6		0.004	0.013	0.774	2.2	
Primary	-0.006	0.002	0.000	-3.6		-0.001	0.004	0.875	-0.4	
Secondary	-0.010	0.004	0.007	-5.6		0.001	0.006	0.911	0.4	
Higher					28.4					2.2
Working status										
Working										
Retired	-0.012	0.002	0.000	-6.8		-0.029	0.008	0.000	-16.5	
Not working	0.006	0.005	0.283	3.2	-3.5	-0.001	0.001	0.248	-0.7	-17.2
Marital status										
Currently married										
Widowed	0.018	0.003	0.000	10.4		0.000	0.002	0.839	0.3	
Others	0.000	0.000	0.062	0.0	10.4	-0.001	0.001	0.295	-0.6	-0.3
Living arrangement										
Living alone										
Living with spouse	-0.002	0.002	0.283	-1.1		-0.007	0.008	0.385	-4.0	
Living with children and spouse	0.000	0.000	0.029	0.1		-0.013	0.020	0.531	-7.4	
Living with others	0.002	0.001	0.003	1.3	0.3	0.000	0.001	0.985	0.0	-11.5
Tobacco consumption										
No										
Yes	-0.005	0.003	0.145	-2.6	-2.6	-0.010	0.007	0.135	-5.9	-5.9
Alcohol consumption										
No										
Yes	-0.015	0.005	0.005	-8.6	-8.6	0.012	0.006	0.049	7.2	7.2
Obesity/overweight										
No										
Yes	-0.002	0.001	0.000	-1.4	-1.4	0.002	0.002	0.428	1.1	1.1
Physical activity										
Frequent										
Rarely	-0.001	0.001	0.432	-0.3		-0.003	0.003	0.374	-1.5	
Never	0.003	0.002	0.106	1.9	1.5	-0.017	0.009	0.076	-9.7	-11.2

Self-rated health										
Good										
Poor	0.007	0.000	0.000	4.2	4.2	-0.001	0.005	0.889	-0.4	-0.4
Morbidity										
No morbidity										
1	0.001	0.000	0.000	0.6		0.002	0.004	0.613	1.0	
2+	0.003	0.000	0.000	1.7	2.3	-0.001	0.003	0.655	-0.9	0.2
Wealth index										
Poorest	0.000	0.000	0.602	0.0		-0.003	0.004	0.445	-1.6	
Poorer	0.000	0.000	0.592	0.0		-0.002	0.003	0.584	-1.1	
Middle	0.000	0.000	0.629	0.0		0.002	0.003	0.528	1.3	
Richer	0.000	0.000	0.804	0.0		0.005	0.003	0.164	2.7	
Richest					-0.1					1.3
Religion										
Hindu										
Muslim	0.000	0.000	0.033	0.0		0.005	0.002	0.025	2.6	
Christian	0.000	0.000	0.001	-0.2		0.002	0.002	0.331	1.2	
Others	0.000	0.000	0.353	0.0	-0.2	-0.003	0.001	0.005	-2.0	1.8
Caste										
Scheduled Caste										
Scheduled Tribe	0.000	0.000	0.102	0.1		0.000	0.003	0.890	-0.3	
Other Backward Class	0.000	0.000	0.925	0.0		-0.002	0.006	0.731	-1.2	
Others	0.000	0.000	0.469	0.0	0.1	0.000	0.005	0.927	0.3	-1.2
Place of residence										
Rural										
Urban	-0.001	0.000	0.000	-0.6	-0.6	0.007	0.004	0.094	4.0	4.0
Region										
North										
Central	0.000	0.000	0.516	0.1		-0.001	0.003	0.702	-0.6	
East	0.000	0.000	0.008	-0.3		-0.006	0.003	0.084	-3.4	
Northeast	0.000	0.000	0.007	0.1		-0.006	0.003	0.026	-3.5	
West	0.001	0.000	0.009	0.3		0.000	0.002	0.946	0.1	
South	0.001	0.000	0.000	0.6	0.7	-0.003	0.004	0.434	-1.9	-9.2
Constant						0.175	0.047	0.000	101.2	
Total	0.051	0.008	0.000	29.6		0.122	0.010	0.000	70.4	

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Multivariate decomposition analysis of sex differences in functional difficulty among older adults based on Longitudinal Ageing Study in India 2017-18

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Abstract

Objectives: This study investigates the gender disparities in difficulty in ADL (Activities of Daily Living) and IADL (Instrumental Activities of Daily Living) and explores its contributing factors among older adults in India.

Design: A cross-sectional study was conducted using country representative survey data.

Setting and participants: The present study uses the data from the Longitudinal Aging Study in India, 2017-18. Participants included 15,098 male and 16,366 female older adults aged 60 years and above in India.

Primary and secondary outcome measures: Difficulty in ADL and IADL were the outcome variables. Descriptive statistics and bivariate analysis were carried out to present the preliminary results. Multivariate decomposition analysis was used to identify the contributions of covariates that explain the group differences to average predictions.

Results: There was a significant gender differential in difficulty in ADL (Difference: 4.6%; p-value<0.001) and IADL (Difference: 17.3%; p-value<0.001). The multivariate analysis also shows significant gender inequality in difficulty in ADL (Coefficient: 0.046; p-value<0.001) and IADL (Coefficient: 0.051; p-value<0.001). The majority of the gender gap in difficulty in ADL was accounted by the male-female difference in levels of work status (18%), formal education (15% contribution), marital status (13%), physical activity (9%), health status (8%) and chronic morbidity prevalence (5%) respectively. Equivalently, the major contributors to the gender gap in difficulty in IADL were the level of formal education (28% contribution), marital status (10%), alcohol consumption (9%), health status (4% contribution), and chronic morbidity prevalence (2% contribution).

Conclusion: Due to the rapidly increasing ageing population, early detection and prevention of disability or preservation of daily functioning for older adults and women in particular, should be the highest priority for physicians and health decision-makers.

Strengths and limitations:

- The study utilises a country representative sample of the older individuals
- The study provides insights into the disability burden and the sex differentials and its contributing factors using an exhaustive survey information
- Self-reported measure of functional health information has been used in the study
- The study design is cross-sectional and, therefore, we cannot establish any causality in the relationships between variables

1. Background

The 2030 agenda of sustainable development goals emphasise the importance of achieving health for everyone without causing financial hardship. The goal of health for all cannot be achieved without addressing the needs of the dramatically increasing world's old age population. The proportion of older adults is increasing by 3% annually, and it is projected to double from 12% in 2015 to 21% in 2050 [1, 2]. Predominantly, population ageing was a phenomenon in high-income countries. However, today, the middle- and low-income countries experience the most significant shift in population structure towards the older population. According to World Health Organization (WHO), by 2050, about 80% of the world's older population is projected to be living in low- and middle-income countries [3]. The ageing population face physiological changes, and the primary health concern will be the risk of chronic diseases and physical disabilities [4, 5].

The significant burden of disability in older adults are caused by a loss in hearing, vision, or mobility, and various non-communicable diseases (NCDs) [6]. There is also evidence of a positive relationship between disability and economic poverty, and it extends across all kinds of impairment [7]. The age-related functional difficulty is often worsened by the discrimination based on gender existing in society. Even when disability increases with age irrespective of gender, older women, compared to similar-aged men, face a relatively higher risk from it [8–11]. The rate of incidence and the duration of disability is often higher among women than in men [12]. On assessing the activities of daily living (ADL) and instrumental activities of daily living (IADL), the proportion of women who have at least one difficulty in IADL and ADL were higher than men [13].

The sex difference in disability is likely to be contributed by a range of socioeconomic and demographic risk factors. Chronic disease prevalence is higher among older women than men

[8]. Education and marital status can explain the gender differences in ADL and IADL of older adults [14]. In a pooled analysis of 57 countries, approximately 45% of the disadvantage faced by older women is contributed by their differences in working status, education level, marital status, income levels, age and country of residence. Of all the reasons mentioned in the 57 countries, differences in working status between the genders were the most significant contributor to inequality, i.e., a higher proportion of men were involved in paid jobs than women [15]. The higher rate of incidence and retention of disability that older women encounter is sometimes pinned on their higher life expectancy [11, 16]. According to another study, disability in older adults is because of their lifestyle in earlier stages of life [17]. For example, smoking, drinking, and being obese at an early age has contributed to disability at older ages. However, there exists a gender difference in the prevalence of smoking and drinking, as men are more prone to it than women. As documented, had women started smoking and drinking at the levels men do, it would have had a further detrimental impact on them [14].

Above 46% of the older adults live with a disability, and at the current rate of population ageing, by 2050, the older adults will become the world's biggest community with disability [18] and greater disability burden is observed among population in higher age groups in India [19, 20]. On the other hand, women have higher life expectancy than men; however, they are worse off at functional ability than men – which is known as the male-female health-survival paradox [13, 21]. Therefore, understanding the factors associated with differential disability burden among older men and women, is crucial for framing policies and interventions. Thus, the purpose of the present study is to investigate the prevalence of sex disparities in reported difficulty in ADL and IADL and explore the factors contributing to such sex disparities in functional health among older adults in India using extensive country-representative survey data.

2. Methods

2.1 Data

This study used the baseline survey of the Longitudinal Aging Study in India (LASI) conducted during 2017-18 [22]. The LASI, which is the Indian version of the Health and Retirement Studies (HRS), is a nationally representative survey conducted by the International Institute for Population Sciences (IIPS) in collaboration with the Harvard T.H. Chan School of Public Health and the University of Southern California (USC) [22]. LASI provides vital information on demography, biomarkers, chronic health conditions, symptom-based health conditions, functional health, mental health (cognition and depression), household economic status, healthcare utilisation and health insurance, family and social networks, work and employment, retirement and life expectations of 72,250 adults aged 45 and above across all the states and union territories of India [22]. LASI adopted a multistage stratified cluster sampling design to follow the sample biennially for 25 years. Further details regarding the sample design, survey instruments, fieldwork, data collection and processing, and response rates are publicly available in the LASI report [22]. The overall sample size for the LASI was over 72,250 people aged 45 years and over. However, the present study analysed the data of people aged 60 years and above. Hence the analytical sample size for the present study was 31,464 (15,098 male and 16,366 female) older adults.

2.2 Ethics statement

This study used a publicly available secondary dataset with no information that could lead to the identification of the respondents. The ethical clearance for LASI 2017-18 was approved by the Joint Ethical Review Board of the International Institute for Population Sciences (IIPS) in collaboration with the Harvard T.H. Chan School of Public Health and the University of Southern California (USC). All participants who agreed to participate in the survey signed an informed consent form, and the data collection procedure followed the

relevant guidelines and regulations. The authors asked permission to use the data via an online form, and the data manager has permitted to use the data for the current study. Therefore, prior ethical approval for using these datasets was not necessary.

2.3 Variable description

2.3.1 Outcome variables

The outcome variables were dichotomized – difficulty in ADL (Activities of Daily Living) was coded as no and yes, and difficulty in IADL (Instrumental Activities of Daily Living) was coded as no and yes [22]. The respondents who had no difficulty in performing ADL were categorised as "No" (code 0) and otherwise were categorised as "Yes" (code 1). Similarly, older adults who did not face difficulty in performing IADL were grouped into the "No" category and otherwise were grouped as "Yes" [23, 24].

1. ADL is a term used to refer to normal daily self-care activities (such as movement in bed, changing position from sitting to standing, feeding, bathing, dressing, grooming, and personal hygiene). The ability or inability to perform ADLs is used to measure a person's functional status, especially in the case of people with disabilities and older adults [25, 26].
2. IADLs are activities not necessarily related to the basic functioning of a person, but they let an individual live independently in a community. Respondents were asked if they were having any difficulties performing these activities expected to last more than three months. The activities were – preparing a hot meal; shopping for groceries; making a telephone call; taking medications; doing work around the house or garden; managing money (such as paying bills and keeping track of expenses); and getting around or finding an address in unfamiliar places [25, 26].

2.3.2 Explanatory variables

1. Age was categorised as young old (60-69 years), old-old (70-79 years) and oldest-old (80+ years).
2. Sex was categorised as male and female.
3. Educational status was categorised as no education/primary not completed, primary, secondary and higher.
4. Working status was categorised as currently working, retired/never worked and currently not working.
5. Marital status was coded currently married, widowed and others. Others included never married/divorced/separated.
6. Living arrangement was coded as living alone, living with a spouse, living with children and spouse and living with others.
7. Tobacco and alcohol consumption was recoded as no and yes.
8. Overweight/obesity was coded as no and yes. The respondents with a body mass index of 25 and above were categorised as obese/overweight [27].
9. Physical activity status was recoded as frequent (every day), rare (more than once a week, once a week, one to three times in a month), and never [28]. The question through which physical activity was assessed was "How often do you take part in sports or vigorous activities, such as running or jogging, swimming, going to a health centre or gym, cycling, or digging with a spade or shovel, heavy lifting, chopping, farm work, fast bicycling, cycling with loads?" [22].
10. Self-rated health was coded as good which includes "excellent", "very good", and "good" categories of the original variable, whereas poor includes "fair" and "poor" categories [29].
11. Morbidity status was categorised as "no morbidity", "1" (one morbid condition), and "2+" (comorbidity).

12. The monthly per capita consumption expenditure (MPCE) quintile was assessed using household consumption data [22]. Sets of 11 and 29 questions on the expenditures on food and non-food items, respectively, were used to canvas the sample households. Food expenditure was collected based on a reference period of seven days, and non-food expenditure was collected on reference periods of 30 days and 365 days. Food and non-food expenditures have been standardised to the 30-day reference period. The MPCE is computed and used as the summary measure of consumption. The variable was divided into five quintiles, i.e., from poorest to richest [22].
13. Religion was coded as Hindu, Muslim, Christian, and Others.
14. Caste was recoded as Scheduled Tribe (ST), Scheduled Caste (SC), Other Backward Class (OBC), and Others. The STs and SCs comprise of the historically socially segregated population as per the now constitutionally-abolished Indian caste system, and are India's most disadvantaged social groups. The OBCs are identified as "educationally, economically and socially backwards", and considered low in the traditional caste hierarchy but are better than the SC and ST populations. The "Other" caste category comprises of people with higher social status who are not included in any of the three groups.
15. The place of residence was categorised as rural and urban.
16. The region was coded as North, Central, East, Northeast, West, and South.

2.4 Statistical analysis

Descriptive analysis and bivariate analysis were carried out to present the preliminary results. The proportion test evaluated the gender differentials and observed the difference's statistical significance [30]. Multivariate decomposition analysis was used to identify covariates' contributions, explaining the group differences in average predictions [31]. The

decomposition analysis examined the contribution of the independent variables to the gender difference in difficulty in ADL and IADL among older adults in India.

The multivariate decomposition analysis has two contribution effects: compositional differences (endowments) 'E' and the effects of characteristics (which are the difference in the coefficients or behavioural change) 'C' for the selected predictor variables [32]. The observed differences in difficulty in ADL and IADL thus can be additively decomposed into characteristics (or endowments) components and a coefficient (or effects of characteristics) component [33]. The command *mvdcmp* was used to perform multivariate decomposition analysis in STATA 14 [34].

2.5 Patient and Public Involvement

No patients were involved.

3. Results

3.1 Background characteristics

Table 1 shows the bio-demographic and socioeconomic characteristics of 15,098 male and 16,366 female older adults in India. We observed that six in every ten older adults of either gender were in the young-old age group. Additionally, 53%, 44% and 16% of male older adults had no formal education, were currently not working and were widowed, respectively. Further, among female older adults, 82% had no formal education, 19% were currently working, and 54% were widowed. While 16% of males were overweight or obese, the same was higher (23%) in female older adults. Six in ten females and three-fourths of older males never experienced physical activity. Nearly half of older adults of either gender had poor self-rated health, and a quarter had two and more morbidities. Moreover, the majority (more than 80%) of older adults followed Hinduism, and more than 26% belonged to the SC/ST caste.

While four in every ten older adults belonged to the lowest 40% wealth quintile, seven in ten older adults lived in a rural community, respectively.

3.2 Bivariate analysis

Table 2 gives the bivariate distribution of male and female older adults with physical limitations concerning the bio-demographic and socioeconomic characteristics. There was a significant gender differential in difficulty in ADL (% Diff: 4.6%, p-value<0.001) and difficulty in IADL (% Diff: 17.3%, p-value<0.001). Among individuals with difficulty in ADL, a higher proportion of females had no formal schooling (28%), were widowed (30%), never had physical activity (29%), had poor health (34%) and had two or more morbidities (35%) in comparison to their male counterparts (25%, 24%, 27%, 28% and 30% respectively). In the oldest-old age group, a higher proportion of females (47%) suffered from difficulty in ADL than males (41%). On the other hand, a higher proportion of older women with difficulty in IADL had no formal schooling (60% in female vs 48% in the male), was widowed (63% vs 48%), never had physical activity (59% vs 45%), had poor health (66% vs 40%) and had two or more morbidities (66% vs 47%).

3.3 Decomposition of gender difference in difficulty in ADL

Table 3 shows the contribution of bio-demographic and socioeconomic characteristics to gender inequality in difficulty in ADL. The results showed significant gender inequality in difficulty in ADL (Coef: 0.046; p-value<0.001), and 78% of the gender difference can be explained by the differences in distributions of characteristics between the male and female older adults. The majority of the gender gap in difficulty in ADL were accounted for by the difference in the level of formal education (15% reduction), work status (18% reduction) and marital status (13% reduction), respectively. Moreover, differences in the level of physical activity, health status, and morbidity prevalence between the male and female older adults

contributed to a 9%, 8% and 5% increase in the gender gap, respectively. Additionally, 2% of the ADL-related gender gap was accounted for by the gap among the six regions of India.

3.4 Decomposition of gender difference in IADL

Table 4 shows the contribution of bio-demographic and socioeconomic characteristics to the IADL-related gender gap. We observed a significant gender gap in difficulty in IADL (Coef: 0.051; p-value<0.001), and 30% of the gender inequality can be explained by the differences in characteristics between the male and female older adults. We found that differences in the level of formal education (28% contribution), marital status (10% contribution), health status (4% contribution) and morbidity prevalence (2% contribution) among females and males contributed significantly to the gender gap in difficulty in IADL. Moreover, the male-female gap in alcohol consumption accounted for a 9% decrease of gender gap in difficulty in IADL.

4. Discussion

The present study of sex differences in functional difficulties demonstrated that the proportion of older people with difficulty in ADL and IADL increased with age for both sexes. In the total study population, 5% more women than men had difficulty in ADL, whereas, 17% more women than men had difficulty in IADL. The sex difference in difficulty in ADL and IADL observed in the present study was in line with the previous studies [35–37]. A recent study by Crimmins et al. (2019) found that the likelihood of having difficulties in ADL and IADL was about twofold higher for women than for men around the world [36]. The current findings also agree with the female disability disadvantage reported in earlier studies showing that women have lower grip strength, slower gait speed, take longer time to rise from a sitting position, and have worse physical functioning than men [37–39].

The decomposition of contributing factors to sex differences showed that lack of education among older women substantially contributed to differences in difficulty in ADL and IADL. Several studies showed an independent association between education and disability in older

women, suggesting that low education may be regarded as a risk factor for accelerating decline [40, 41]. Also, female gender and lower levels of education were found to be the risk factors of functional difficulties in multiple studies [42, 43]. As documented, ADL and IADL require a range of physically demanding capabilities, and in addition, IADL requires cognitive capacity, which is known to be related to educational level, and older women are primarily disadvantaged [44, 45]. Longitudinal studies are needed to determine how education influences the progression of disability in specific subgroups of older people and older women in particular in their daily activities.

An individual-level analysis of SRH by gender based on the World Health Survey showed that some differences between older men and women could be attributed to education and employment levels [46]. Consistently, the working status extensively explained our study's sex differences in difficulty in ADL and IADL. However, differences in lifestyle habits such as tobacco and alcohol consumption did not explain the gender gap in functional limitations in the current study.

Further, women had higher chances of suffering from disability due to physiological differences such as lower muscle strength or bone density or lifestyle factors like sedentary life and obesity [42, 47], suggesting a female disadvantage in overall physical and associated functional health. Although a few studies have shown no gender differences in physical and functional health, the current analysis observes greater contribution of self-rated health and morbidity status to sex differences in difficulty in ADL and IADL among older individuals. This can be partially attributed to the survival bias, resulting in a selection effect with the strongest men surviving the older age groups [48, 49]. Thus, women's generally weaker physique than men might influence sex differences in difficulty in ADL and IADL. Concordantly, an American study found that older women had a worse inflammatory index, contributing to worse overall functioning [50]. Thus, effective interventions are urgently

needed to prevent or delay the onset of disability in older adults, especially women suffering from any morbidity or poor physical health.

Moreover, socioeconomic disadvantages such as poor household living conditions and lower caste status, with India hosting a high proportion of the population of deprived STs, generally contribute to a higher disability prevalence [20]. The findings of our study also show that the proportion of the population who are from households of the poorest wealth quintile or members of SCs has no relationship to disability levels. This is also compatible with the findings of previous studies in India and other developed countries [51, 52]. The present study also found a significant sex disparity explained by rural residence compared to urban areas. Rural women's poor ADL and IADL statuses might reflect inadequate healthcare and health infrastructure [53]. Since higher economic status tends to be associated with better health status, access to health care, healthy food and housing [54], the current results indicate that preventive interventions should focus on the heterogeneous groups of older adults, particularly those belonging to socioeconomically vulnerable groups. Two hypotheses of differential exposure and differential vulnerability have been stated in multiple studies to explain the role of social factors in gender–health associations [55, 56], suggesting that due to the different access to material resources and other social conditions of life, men and women are exposed to different levels of risk, resulting in different health outcomes and women's biological vulnerability make them at increased health risks. Since sex differences in health are enormous, such hypotheses need to be further examined in poor resource settings, including India.

Since there has been nearly no systematic study of the sex differences in the prevalence of disability in India that examined the contribution of various health, demographic, and socioeconomic characteristics of the older population with disabilities, we believe that this study adds important information to the existing literature. The analyses provide insights into

the disability burden and the sex differentials and its contributing factors in India based on the recent survey data with exhaustive information of the ageing population. However, there are several limitations of the present study to be acknowledged. The data used are cross-sectional and use multivariate decomposition for analysis. Therefore, we cannot establish any causality between functional limitations and different socioeconomic and health-related variables. Also, the dependent variables in our study are two functional health measures, which are combinations of multiple functional task items; and current findings may not be generalisable to individual measures of functional health. Similarly, our data on functional health are based on self-reports. Thus, some of the sex differences we find may be due to how men and women respond to related questions, and mild forms of disability could be underestimated. Hence, future studies may address these issues using more objective and follow-up data with more analytical tools.

5. Conclusion

Due to the rapidly increasing ageing population, early detection and prevention of disability or preservation of daily functioning for older adults and women in particular, should be the highest priority for physicians and health decision-makers. Evidence-based tools need to be developed to help them adequately identify those at high risk of disability. Moreover, the gendered pathways to functional disability need further investigation to inform policymakers on successful ageing measures for older men and women.

Declarations

Competing interest statement

The authors declare that there is no competing interest

Contributor statement

Conceived and designed the research paper: SS and TM; analyzed the data: SS; Contributed agents/materials/analysis tools: TM and RP; Wrote the manuscript: TM, SS, RP, and ART; Refined the manuscript: SS, RP, ART and TM. All authors read, reviewed and approved the manuscript to be published.

Data sharing statement

The study uses secondary data which is available on reasonable request through https://www.iipsindia.ac.in/content/lasi-wave-i

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Tables

Table-1. Socio-demographic profile of older adults in India, 2015-16

Background characteristics	Male		Female	
	Sample	Percentage	Sample	Percentage
Age				
Young-old	8,730	57.8	9,678	59.1
Old-old	4,702	31.1	4,803	29.4
Oldest-old	1,666	11.0	1,886	11.5
Education				
Not educated/primary not completed	8,019	53.1	13,314	81.4
Primary	2,235	14.8	1,297	7.9
Secondary	3,096	20.5	1,297	7.9
Higher	1,748	11.6	458	2.8
Working status				
Currently working	6,613	43.8	3,108	19.0
Retired/never worked	7,907	52.4	5,593	34.2
Currently not working	578	3.8	7,665	46.8
Marital status				
Currently married	12,242	81.1	7,211	44.1
Widowed	2,489	16.5	8,837	54.0
Others	366	2.4	318	2.0
Living arrangement				
Living alone	380	2.5	1,397	8.5
Living with spouse	3,929	26.0	2,485	15.2
Living with children and spouse	10,205	67.6	11,268	68.9
Living with others	583	3.9	1,216	7.4
Tobacco consumption				
No	6,197	41.1	12,706	77.6
Yes	8,901	59.0	3,660	22.4
Alcohol consumption				
No	10,939	72.5	15,943	97.4
Yes	4,159	27.6	423	2.6
Obesity/overweight				
No	12,755	84.5	12,568	76.8
Yes	2,343	15.5	3,798	23.2
Physical activity				
Frequent	3,706	24.6	1,966	12.0
Rarely	2,360	15.6	1,672	10.2
Never	9,031	59.8	12,729	77.8
Self-rated health				
Good	8,253	54.7	8,335	50.9
Poor	6,845	45.3	8,031	49.1
Morbidity				
No morbidity	7,507	49.7	7,274	44.5
1	4,240	28.1	4,928	30.1
2+	3,351	22.2	4,164	25.4
Wealth index				
Poorest	3,145	20.8	3,681	22.5
Poorer	3,219	21.3	3,611	22.1
Middle	3,262	21.6	3,331	20.4
Richer	2,902	19.2	3,136	19.2
Richest	2,570	17.0	2,607	15.9
Religion				

Hindu	12,386	82.0	13,484	82.4
Muslim	1,769	11.7	1,781	10.9
Christian	388	2.6	511	3.1
Others	555	3.7	590	3.6
Caste				
Scheduled Caste	2,836	18.8	3,113	19.0
Scheduled Tribe	1,166	7.7	1,389	8.5
Other Backward Class	6,925	45.9	7,308	44.7
Others	4,172	27.6	4,556	27.8
Place of residence				
Rural	10,879	72.1	11,322	69.2
Urban	4,219	28.0	5,044	30.8
Region				
North	1,863	12.3	2,096	12.8
Central	3,395	22.5	3,202	19.6
East	3,713	24.6	3,729	22.8
Northeast	437	2.9	497	3.0
West	2,457	16.3	2,941	18.0
South	3,233	21.4	3,900	23.8
Total	15,098	100.0	16,366	100.0

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Table-2. Percentage of older males and females reported difficulty in ADL and IADL in India, 2017-18

Background characteristics	Difficulty in ADL				Difficulty in IADL			
	Male	Female	Differences	p-value	Male	Female	Differences	p-value
Age								
Young-old	16.1	19.8	3.7	<0.001	31.3	49.7	18.4	<0.001
Old-old	25.8	32.1	6.3	<0.001	46.8	64.3	17.5	<0.001
Oldest-old	41.3	47.1	5.8	<0.001	63.1	75.3	12.1	<0.001
Education								
Not educated/primary not completed	24.8	28.2	3.4	<0.001	47.8	60.1	12.3	<0.001
Primary	18.7	22.4	3.7	0.023	35.9	41.6	5.7	<0.001
Secondary	19.6	16.4	-3.2	<0.001	31.0	49.8	18.8	<0.001
Higher	16.8	19.4	2.5	<0.001	22.5	28.6	6.1	<0.001
Working status								
Currently working	12.6	16.8	4.2	<0.001	28.4	50.0	21.6	<0.001
Retired/never worked	29.3	32.9	3.6	<0.001	48.8	63.0	14.2	<0.001
Currently not working	27.7	25.9	-1.8	0.121	42.8	55.3	12.5	<0.001
Marital status								
Currently married	21.4	21.9	0.6	<0.001	37.6	49.5	11.9	<0.001
Widowed	24.5	30.3	5.8	<0.001	48.1	63.1	15.0	<0.001
Others	23.0	26.2	3.3	0.144	50.8	55.4	4.7	0.084
Living arrangement								
Living alone	23.8	28.5	4.7	0.147	48.1	62.8	14.7	<0.001
Living with spouse	25.7	21.5	-4.2	0.494	42.6	49.5	6.9	<0.001
Living with children and spouse	20.3	26.8	6.5	<0.001	37.7	56.9	19.2	<0.001
Living with others	24.4	32.8	8.4	<0.001	49.0	66.2	17.2	<0.001
Tobacco consumption								
No	21.9	25.6	3.6	<0.001	37.1	56.0	18.9	<0.001
Yes	21.9	29.9	8.0	<0.001	41.4	60.2	18.8	<0.001
Alcohol consumption								
No	23.0	26.7	3.7	<0.001	39.8	57.0	17.2	<0.001
Yes	19.1	21.4	2.3	0.008	39.2	55.1	15.8	<0.001
Obesity/overweight								
No	22.1	27.8	5.6	<0.001	40.9	58.1	17.2	<0.001
Yes	20.8	22.5	1.8	<0.001	33.0	53.1	20.2	<0.001
Physical activity								
Frequent	14.2	19.2	4.9	<0.001	30.6	51.0	20.3	<0.001
Rarely	15.1	19.0	3.9	<0.001	32.0	51.5	19.5	<0.001
Never	26.9	28.7	1.8	<0.001	45.3	58.6	13.2	<0.001
Self-rated health								

Good	16.5	18.9	2.4	<0.001	31.1	47.9	16.7	<0.001
Poor	28.4	34.5	6.0	<0.001	49.9	66.4	16.5	<0.001
Morbidity								
No morbidity	17.7	21.4	3.7	<0.001	35.5	51.5	16.0	<0.001
1	23.2	26.8	3.5	<0.001	41.3	57.1	15.9	<0.001
2+	29.7	35.3	5.6	<0.001	46.9	66.3	19.4	<0.001
Wealth index								
Poorest	22.8	28.4	5.6	<0.001	42.6	57.1	14.4	<0.001
Poorer	20.8	27.0	6.2	<0.001	41.3	57.4	16.1	<0.001
Middle	24.6	26.4	1.8	<0.001	38.7	55.1	16.4	<0.001
Richer	20.0	24.8	4.7	<0.001	37.9	58.6	20.8	<0.001
Richest	21.0	25.7	4.7	<0.001	37.2	56.5	19.3	<0.001
Religion								
Hindu	21.0	26.3	5.2	<0.001	38.8	57.3	18.5	<0.001
Muslim	28.0	30.0	2.0	<0.001	43.3	58.2	14.9	<0.001
Christian	26.1	23.4	-2.8	<0.001	37.0	47.9	10.9	<0.001
Others	20.2	25.7	5.5	<0.001	49.1	53.7	4.6	<0.001
Caste								
Scheduled Caste	22.1	29.0	6.9	<0.001	42.6	58.2	15.7	<0.001
Scheduled Tribe	19.7	20.8	1.1	<0.001	37.8	51.4	13.6	<0.001
Other Backward Class	22.9	25.0	2.1	<0.001	41.6	60.0	18.4	<0.001
Others	20.8	29.0	8.2	<0.001	34.9	52.9	18.0	<0.001
Place of residence								
Rural	21.9	27.1	5.2	<0.001	42.7	60.1	17.4	<0.001
Urban	21.9	25.2	3.3	<0.001	31.8	49.8	18.0	<0.001
Region								
North	12.9	15.2	2.3	<0.001	32.5	49.6	17.1	<0.001
Central	18.1	23.3	5.2	<0.001	35.4	53.1	17.7	<0.001
East	25.6	32.3	6.7	<0.001	42.8	59.6	16.7	<0.001
Northeast	13.5	20.1	6.6	<0.001	32.1	48.3	16.3	<0.001
West	28.5	36.6	8.1	<0.001	35.6	54.3	18.7	<0.001
South	23.0	23.1	0.0	<0.001	48.7	64.6	15.9	<0.001
Total	21.9	26.5	4.6	<0.001	39.7	56.9	17.3	<0.001

Difference: Female-Male; p-value based on proportion test; ADL: Activities of daily living; IADL: Instrumental activities of daily living; p-values were not adjusted for multiple testing and may be interpreted as exploratory only.

Table-3. Multivariate logistic regression decomposition estimates for gender differentials in difficulty in ADL among older adults in India, 2017-18

Background characteristics	Due to differences in characteristics					Due to differences in coefficients				
	Coef.	Standard error	p-value	Percent contribution		Coef.	Standard error	p-value	Percent contribution	
Age										
Young-old										
Old-old	-0.002	<0.001	<0.001	-2.5		0.006	0.003	0.034	9.9	
Oldest-old	0.001	<0.001	<0.001	1.1	-1.4	0.004	0.001	0.008	6.4	16.3
Education										
Not educated/primary not completed	0.012	0.005	0.014	20.2		-0.014	0.009	0.126	-23.2	
Primary	-0.001	0.001	0.536	-1.2		-0.005	0.003	0.074	-9.0	
Secondary	-0.002	0.003	0.384	-3.9		-0.002	0.004	0.681	-2.8	
Higher					15.2					-35.1
Working status										
Currently working										
Retired/never worked	-0.014	0.002	<0.001	-24.2		-0.013	0.005	0.016	-21.1	
Currently not working	0.025	0.004	<0.001	41.9	17.7	-0.002	0.001	0.003	-3.9	-25.0
Marital status										
Currently married										
Widowed	0.008	0.003	0.004	12.7		0.002	0.002	0.299	2.6	
Others	0.000	<0.001	0.021	-0.1	12.6	0.001	0.001	0.183	1.5	4.1
Living arrangement										
Living alone										
Living with spouse	0.000	0.001	0.800	-0.6		-0.001	0.005	0.852	-1.7	
Living with children and spouse	0.000	<0.001	0.217	0.1		0.014	0.014	0.298	24.0	
Living with others	0.001	0.001	0.129	1.4	0.9	0.000	0.001	0.858	-0.3	22.1
Tobacco consumption										
No										
Yes	0.003	0.002	0.251	4.4	4.4	-0.001	0.005	0.748	-2.5	-2.5
Alcohol consumption										
No										
Yes	0.004	0.004	0.372	6.1	6.1	-0.003	0.004	0.559	-4.2	-4.2
Obesity/overweight										
No										
Yes	-0.001	0.001	0.066	-1.6	-1.6	0.000	0.002	0.774	0.8	0.8
Physical activity										
Frequent										
Rarely	-0.001	0.001	0.122	-1.7		-0.001	0.002	0.668	-1.6	
Never	0.006	0.002	<0.001	10.4	8.7	-0.005	0.007	0.476	-8.5	-10.1

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Self-rated health										
Good										
Poor	0.005	<0.001	<0.001	8.0	8.0	-0.002	0.003	0.482	-3.6	-3.6
Morbidity										
No morbidity										
1	0.001	<0.001	<0.001	1.2		-0.001	0.002	0.760	-1.3	
2+	0.003	<0.001	<0.001	4.2	5.4	-0.001	0.002	0.816	-0.8	-2.1
Wealth index										
Poorest	0.000	<0.001	0.769	0.0		-0.001	0.002	0.896	-1.3	
Poorer	0.000	<0.001	0.223	-0.1		-0.001	0.002	0.187	-1.8	
Middle	0.000	<0.001	0.406	0.0		-0.004	0.002	0.463	-6.4	
Richer	0.000	<0.001	0.725	0.0		0.001	0.002	0.749	1.5	
Richest					-0.1					-7.9
Religion										
Hindu										
Muslim	0.000	<0.001	0.252	0.0		0.002	0.001	0.209	2.9	
Christian	0.000	<0.001	0.119	-0.2		-0.002	0.002	0.144	-3.7	
Others	0.000	<0.001	0.198	0.0	-0.2	0.000	0.001	0.604	0.8	0.0
Caste										
Scheduled Caste										
Scheduled Tribe	0.000	<0.001	0.233	-0.1		-0.001	0.002	0.674	-1.6	
Other Backward Class	0.000	<0.001	0.053	0.3		-0.006	0.004	0.180	-9.4	
Others	0.000	<0.001	0.986	0.0	0.1	-0.001	0.003	0.792	-1.5	-12.5
Place of residence										
Rural										
Urban	0.000	<0.001	0.441	-0.1	-0.1	0.003	0.003	0.226	5.7	5.7
Region										
North										
Central	-0.001	<0.001	<0.001	-1.3		0.001	0.002	0.460	2.5	
East	-0.001	<0.001	<0.001	-1.9		-0.001	0.002	0.666	-1.7	
Northeast	0.000	<0.001	0.478	0.0		0.004	0.002	0.086	6.0	
West	0.002	<0.001	<0.001	4.0		0.003	0.002	0.108	4.9	
South	0.001	<0.001	<0.001	0.9	1.8	0.004	0.003	0.156	7.2	18.9
Constant						0.031	0.032	0.339	51.2	
Total	0.046	0.006	<0.001	77.5		0.013	0.007	0.066	22.5	

Note - p-values were not adjusted for multiple testing and may be interpreted as exploratory only.

Table-4. Multivariate logistic regression decomposition estimates for gender differentials in difficulty in IADL among older adults in India, 2017-18

Background characteristics	Due to differences in characteristics					Due to differences in coefficients				
	Coef.	Standard error	p-value	Percent contribution		Coef.	Standard error	p-value	Percent contribution	
Age										
Young-old										
Old-old	-0.002	<0.001	<0.001	-1.2	-0.7	0.002	0.004	0.549	1.2	0.6
Oldest-old	0.001	<0.001	<0.001	0.5		-0.001	0.002	0.546	-0.7	
Education										
Not educated/primary not completed	0.065	0.006	<0.001	37.6		0.004	0.013	0.774	2.2	
Primary	-0.006	0.002	<0.001	-3.6		-0.001	0.004	0.875	-0.4	
Secondary	-0.010	0.004	0.007	-5.6	28.4	0.001	0.006	0.911	0.4	
Higher										2.2
Working status										
Currently working										
Retired/never worked	-0.012	0.002	0.000	-6.8		-0.029	0.008	<0.001	-16.5	
Currently not working	0.006	0.005	0.283	3.2	-3.5	-0.001	0.001	0.248	-0.7	-17.2
Marital status										
Currently married										
Widowed	0.018	0.003	<0.001	10.4		0.000	0.002	0.839	0.3	
Others	0.000	<0.001	0.062	0.0	10.4	-0.001	0.001	0.295	-0.6	-0.3
Living arrangement										
Living alone										
Living with spouse	-0.002	0.002	0.283	-1.1		-0.007	0.008	0.385	-4.0	
Living with children and spouse	0.000	<0.001	0.029	0.1		-0.013	0.020	0.531	-7.4	
Living with others	0.002	0.001	0.003	1.3	0.3	0.000	0.001	0.985	0.0	-11.5
Tobacco consumption										
No										
Yes	-0.005	0.003	0.145	-2.6	-2.6	-0.010	0.007	0.135	-5.9	-5.9
Alcohol consumption										
No										
Yes	-0.015	0.005	0.005	-8.6	-8.6	0.012	0.006	0.049	7.2	7.2
Obesity/overweight										
No										
Yes	-0.002	0.001	<0.001	-1.4	-1.4	0.002	0.002	0.428	1.1	1.1
Physical activity										
Frequent										
Rarely	-0.001	0.001	0.432	-0.3		-0.003	0.003	0.374	-1.5	
Never	0.003	0.002	0.106	1.9	1.5	-0.017	0.009	0.076	-9.7	-11.2

Self-rated health										
Good										
Poor	0.007	<0.001	<0.001	4.2	4.2	-0.001	0.005	0.889	-0.4	-0.4
Morbidity										
No morbidity										
1	0.001	<0.001	<0.001	0.6	2.3	0.002	0.004	0.613	1.0	
2+	0.003	<0.001	<0.001	1.7		-0.001	0.003	0.655	-0.9	0.2
Wealth index										
Poorest	0.000	<0.001	0.602	0.0		-0.003	0.004	0.445	-1.6	
Poorer	0.000	<0.001	0.592	0.0		-0.002	0.003	0.584	-1.1	
Middle	0.000	<0.001	0.629	0.0		0.002	0.003	0.528	1.3	
Richer	0.000	<0.001	0.804	0.0		0.005	0.003	0.164	2.7	
Richest					-0.1					1.3
Religion										
Hindu										
Muslim	0.000	<0.001	0.033	0.0	-0.2	0.005	0.002	0.025	2.6	
Christian	0.000	<0.001	0.001	-0.2		0.002	0.002	0.331	1.2	
Others	0.000	<0.001	0.353	0.0		-0.003	0.001	0.005	-2.0	1.8
Caste										
Scheduled Caste										
Scheduled Tribe	0.000	<0.001	0.102	0.1	0.1	0.000	0.003	0.890	-0.3	
Other Backward Class	0.000	<0.001	0.925	0.0		-0.002	0.006	0.731	-1.2	
Others	0.000	<0.001	0.469	0.0		0.000	0.005	0.927	0.3	-1.2
Place of residence										
Rural										
Urban	-0.001	<0.001	<0.001	-0.6	-0.6	0.007	0.004	0.094	4.0	4.0
Region										
North										
Central	0.000	<0.001	0.516	0.1	0.7	-0.001	0.003	0.702	-0.6	
East	0.000	<0.001	0.008	-0.3		-0.006	0.003	0.084	-3.4	
Northeast	0.000	<0.001	0.007	0.1		-0.006	0.003	0.026	-3.5	
West	0.001	<0.001	0.009	0.3		0.000	0.002	0.946	0.1	
South	0.001	<0.001	<0.001	0.6		-0.003	0.004	0.434	-1.9	-9.2
Constant						0.175	0.047	<0.001	101.2	
Total	0.051	0.008	<0.001	29.6		0.122	0.010	<0.001	70.4	

Note - p-values were not adjusted for multiple testing and may be interpreted as exploratory only.