

**TRANSITION IN CHRONIC MORBIDITY AND ACTIVITY OF DAILY
LIVING AMONG ELDERLY IN INDIA: EVIDENCE FROM A
LONGITUDINAL STUDY**

A Dissertation submitted for the partial fulfillment for the award

of the degree of

Master of Philosophy in Population Studies for

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BY

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Under the guidance of

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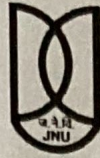
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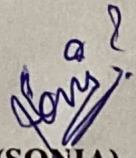
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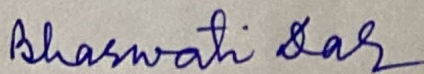
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CERTIFICATE

I, Sonia, do hereby declare that this dissertation entitled "TRANSITION IN CHRONIC MORBIDITY AND ACTIVITY OF DAILY LIVING AMONG ELDERLY IN INDIA: EVIDENCE FROM A LONGITUDINAL STUDY" submitted by me for the DEGREE OF MASTER OF PHILOSOPHY is a bona fide work and it has not submitted to any other university for the award of any other degree.

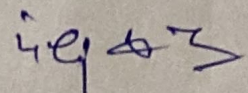

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It is hereby recommended that the dissertation may be placed before the examiners for evaluation.



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Chapter 1

Introduction

Chapter 1

Introduction

1.1 Introduction

Population aging is an inevitable consequence of three demographic changes, which include declining fertility, reduction in mortality levels, and increased survival at older ages, which directly affects the distribution of the population at older ages. Population aging is a global phenomenon through which each country of the developed and developing world is now experiencing growth in the size and proportion of older persons in their population rapidly. With the increasing population, the structure of the population of every country is changing from a young population to an older population. According to World Population Prospects 2019 (UN,2019), the world's population is 7.7 billion, and it could possibly grow to around 8.5 billion in 2030, 9.7 billion in 2050, and 10.9 billion in 2100. There were approximately 703 million older people aged 65 years or over in the world in 2019 and in 2050 this number is going to reach to 1.5 billion. Globally, the share of the older people aged 65 years or over increased from 6 percent in 1990 to around 9 percent in 2019 and this proportion is further projected to rise to 16 percent by mid of this century, so that globally 1 in 6 people will be aged 65 years or over. Also, by 2050, 1 in every 6 people in the world will be the age of 65 years and above, up from 1 in 11 in 2019 (United Nations, 2019).

According to recent WHO estimates, the world has already surpassed one billion marks of 60+ population. In India, according to a recent census, it has been estimated that around 103.8 million people have already reached the age of 60. In the same census, there are around 27 million people with some disability in India. This increase in aging and shift in the burden of chronic disease will indeed add more burden in terms of disability in India.

Functional disability is mainly prevalent in older adults, and it is associated with considerable loss of independence, reduction in quality of life, and even death, and it is found that this proportion of severity will increase with age.

According to Population Census of 2011, there are nearly 104 million elderly persons (aged 60 years or above) in India, in which 53 million are females, and 51 million are males. In the last few decades, the proportion of the elderly has increased from 5.6% in 1961 to 8.6% in 2011. For males,

it was around 8.2%, while for females, it was 9.0%. The rural and urban differentials say that approximately 71% of the elderly population resides in rural areas, while 29 % is in urban areas. The sex ratio among elderly people was quite high up to 1028 in 1951, and has subsequently dropped and again reached up to 1033 in 2011.

With the rising proportion of the old age population, morbidity and disability among the elderly are expected to increase as older people are more vulnerable to getting diseases at old age. The bulk of disability can be seen in both young as well as old cohorts, but it is mostly contributed by the older cohorts and majorly affects the older population of any nation, especially the weaker sections of the society. The latest available estimates for India on disability suggests that the disability-adjusted life expectancy for India is only 53 years, against the overall life expectancy of 67 years (WHO, 2004). A study by Pandey et al., (2011) noted that disability prevalence is positively associated with a poor standard of living; therefore, poverty increases one's likelihood of being disabled. The percentage of elderly disabled persons is slightly higher in rural areas as compared to urban areas; 6 percent of the elderly population was reported as disabled in rural areas whereas, in urban areas, 4% of the elderly population was disabled—Census of India, 2011.

Functional disability is mostly prevalent in older adults as they are more vulnerable to get multiple morbidities, which is directly associated with a considerable loss of independence, reductions in quality of life, and sometimes even death. The proportion and severity of disability increase with age, which means that with the increasing age of a person, the prevalence of disability will also increase. Which directly increases the cost of health care on families and on the government. The functional decline may also impose a burden of substantial uncompensated informal care on government and society. As India has one of the largest shares of the population, and accelerated growth and proportion of the population will continue to increase, which will lead to unavoidably serious challenges to its medical resources and health services. Hence the government should be ready to face these challenges, and proper study should be done to predict the upcoming problems and challenges. So, we can say that there is an urgent need for understanding the trends and patterns of disability prevalence among the elderly, and a proper understanding and study of the health status and well-being of the aging population is necessary. We also have to study various factors and determinants affecting the health condition of the elderly, which can be of great importance.

1.2 Review of Literature

With the aging population across the globe, which means the proportion of older persons in almost every country is increasing and experiencing a faster growth rate. According to UN Network on Ageing Newsletter, every second, two people in this world turn 60. First time in the history of our existence, there will be more number of older people than younger people (World Population Prospects, UN 2019). Even India is no exception in the case of a growing 60+ population; according to the aging report 2017, it has been estimated that the 60+ population is expected to grow by 326 percent from 2000 to 2050. Due to this demographic shift in population, there will be a rise in the increase of dependency ratio along with the burden. As noted by the WHO aging report, the aging population for society may be resourceful as human capital if only their health is good; otherwise, there may be some serious negative consequences. But these health and well-being factors are determined by various factors such as economic, social, psychological as well as physiological factors.

The existing surveys on disability differ due to different approaches in measurement, so there are no conscience estimates on the number of disabilities or prevalence of disability. For example, the UN or the World Bank estimates suggest that globally 10-12% of the population has faced at least one form of disability. However, WHO Health Survey and WHO GBD survey indicate a figure of around 16-19% of people with disabilities, which is a higher estimate as compared to UN or World Bank estimates (Mont, 2007). According to WHO survey estimates, disability prevalence is at 25%, which is much higher than the global average; even with Indian surveys, there are discrepancies in disability estimates (Mont, 2007). According to the census 2001, there are 11.8 million people with any kind of disability, whereas the corresponding NSS estimated the figure to be around 26.5 million people, which shows huge discrepancies in disability estimates. These may be due to a detailed question that is enquired in surveys than the census (Jeffery & Signal, 2008).

Functional disability is mostly prevalent in older adults, which is associated with a considerable loss of independence, reductions in quality of life, and sometimes even more serious consequences like even death. According to recent research by Saikia et al., (2016), ASDP (Age-standardized disability prevalence) varies substantially across districts in India and is higher among women, rural dwellers, and members of scheduled tribes (STs) and scheduled castes (SCs) as they are more

vulnerable to morbidity and disability risk. The disability rate rises with increasing proportions of the population who are urban dwellers, aged 65 or older, members of STs, and living in dilapidated housing.

A recent study by Goli et al. (2012) has identified that the disadvantaged groups as poor sections of the society often live in poorer physical conditions because of their poor economic condition, which usually results in absences of bathrooms, and "helping features" such as railings which creates difficulties in performing their daily activities for the older people and results in various types of disability.

Women are expected to live longer than men and experience a greater fraction of the remaining years with disabilities in both urban and rural areas. People who have better initial functional states can live longer and spend a smaller fraction of their remaining life years suffering from a disability (Chengbei Hou et al., 2019). There are substantial evidences that how disability is associated with increase in ageing. In a study by Pou (2013) based on IHDS data, it was found that with the aging, there is an increase in disability among the elderly, and more than 50 percent of the elderly were suffering from one or other form of ADL.

Based on a study by Linda G. et al. 2013, it is found that increased in education could account for the decline in ADL limitation among elderly. Apart from that he has also found that how musculoskeletal conditions are also a cause of ADL limitation.

Apart from functional disability, having a chronic disease is one of the most common health problems among the elderly. The disease disrupts normal activity along with a reduction in quality of life (Costa DL, 2002; Freedman VA & Martin LG, 2000; Tey NP et al., 2016)). A major component of the burden of illness for the elderly derives from prevalent chronic disease. Around 80% of seniors have at least one chronic health condition, and 68% have two or more National Council on Ageing 2019 (NCOA). According to (NCOA) 2019, hypertension, high cholesterol, arthritis, diabetes, etc., are among the top ten most common chronic diseases in older adults.

Most of the available studies on chronic morbidity in India are disease specific and have focused on the prevalence only. A study by Swami HM et al. (2002) based in Chandigarh found that in India elderly female were more prone to chronic morbidity. But another study, based in Karnataka concluded that, prevalence of chronic morbidity is equally distributed among both the sexes. Apart

from that, in a subsequent study by Shankar R. et al. (2007) found that caste, literacy or education, socioeconomic status and some other demographic factors have also a significant effect on chronic morbidity which he has observed in his study area i.e. Varanasi, a district in Uttar Pradesh.

There are a lot of studies available which have found that there is a strong relationship or association between the disease and disabilities among older persons (Parmar and Saika, 2018; Velayutham B et al., 2016; Fried LP et al., 1999). Gruenberg and Kramer (1983) also stated that death postponement gives rise to chronic diseases and disability. With the increase in aging and shift in the burden of chronic disease indeed adds more burden in terms of disability in developing countries like India. According to a study by Martin LG et al. (2014), it was found that there is a strong relationship between the severity of disability and type of co-morbidity, as most of these morbidities limit a person's mobility.

According to Jack M. Guralnik et al. (1993), diseases like heart attack, stroke, high blood pressure, diabetes, dyspnea, and exertional leg pain are highly associated with significant risk for mobility loss. Apart from these diseases, there are also other diseases that limit a person's mobility and affect his lifestyle and social movement. The reason behind this can be the stepwise increase in the risk of mobility loss with the increasing number of chronic conditions among elderly males as well as females. Lin S.F et al. (2016), in their research, concluded that among other diseases like cardiovascular diseases, respiratory diseases, etc., arthritis shows the greatest contribution to disability of all types of ADLs which was followed by obesity and Cancer was the least important contributor to disabilities among all of them.

Apart from this, a combination of more than two disabilities also increases the chances of limiting a person's mobility and increases the chances of getting disabled at older ages. Also a study by Walker A. E. (2007), found that eighty percent of 75 plus year elderly are suffering from multi-morbidity and disability and the prevalence of this is especially higher among elderly who are obese, female, have low socioeconomic status, living alone and are less educated.

Another nested case-control study has found that functional limitation is associated with multi-morbidity which is further strongly associated with low socioeconomic background, increasing age and with those who had disease prior to the study (Akker V.D. et al. 2000). A few number of studies in India have found also the relationship between disability, chronic morbidity and

functional limitation. However, a study based on Spanish elderly women identified that multi-morbidity was associated with impaired functioning also (Loza E. et al. 2009). In contrast to this another study by Hudon C. et al. (2008), found that multi-morbidity was not at all associated with physical activity limitation. Similarly, another researcher based her study on Italians living in a community, in which she found that multi-morbidity can affect four years of mortality, only if it is associated with disability (Landi et al., 2010).

In a linkage between chronic disease and disability, it was found that functional disability and physical disability were higher among elderly who have chronic morbidity, and this disability was found to be higher among the oldest old (Kumar et al., 2017; Hou C et al.,2019).

In a study by Hou C. (2019) in China found that women have a higher chance of transitioning from no disability to a mild disability as compared to their counterparts, and the probability of this transition has been increasing with the rise in age. With time, it is found that an improvement can be seen as, in disability, there seems to be a transition from disability to no disability over the period. Increasing shreds of evidence suggest that disability prevalence measured as ADL or IADL has been falling. During 1980-90 it was found that there was a reduction of 0.4-2.7% per year in disability in developed countries. In one of the studies by Hoffman et al. (2010) found that mobility dynamic among the elderly has an overall improvement, as these improvements over the period have been observed mostly among the medical beneficiaries.

1.3 Need for the Study

In countries like India, the population is growing at an alarming rate. With increasing population and improvement in medical facilities, life expectancy has increased while mortality rates have declined in most countries due to which population at an older age is also increasing at a rapid rate. But population aging is still considered a problem only faced by the developed world, and not much is being done about it among developing countries like India.

In countries like India, where people are experiencing compression of mortality and expansion of morbidity, so there is a need to study how morbidity and disability prevail within the country and underlying characteristics that affect it. The existing research on disability among elderly is differential among male-female or understanding the covariates explaining the disability (NSSO 2003, 2011; Pou & Goli 2013, Saika et al. 2016) but none of the study has ever tried to explain the

transition of disability over the period among elderly in India. Many of these previous studies in the Indian context relied on cross-sectional surveys. These cross-sectional surveys are highly useful for continuously monitoring of progress, and don't allow for examining the dynamics of household outcomes, the lack of longitudinal data has prevented us from analyzing what characteristics increase the odds of disability.

With the help of available longitudinal data in India, we can explore the transition of ADL and various other co-morbidities over the period. Which can help us in finding out the major reasons which affects the mobility of a person and various chronic health conditions. We can also point out that how disability and chronic diseases are interrelated to each other and how one influences the other. In developing country like India, people have diseases like arthritis, hypertension, diabetes and various other physiological disorders which deteriorate the functioning of a person's body.

Functional decline may also impose a burden of substantial uncompensated informal care on government and society. India has one of the largest share of population, and accelerated growth and proportion of population will continue to increase which will lead to unavoidably serious challenges to its medical resources and health services. Hence the government should be ready to face these challenges and upcoming problems for which first we have to study the transition and association between various disabilities and diseases among elderly. So, there is an urgent need of understanding health status and well-being of the ageing population is necessary.

Therefore, this study aims to fill the gap of disability studies in India by exploring the disability among the elderly, particularly with a dimension of disability and health transition in the elderly in India. And the association of this transition with different socio-economic status will render a piece of useful information for policy implications.

Detailed investigation of disability, disability transition, health transition and their covariates is particularly important in the Indian context. As India's older population is growing rapidly, it will continue to grow in the next decade.

1.4 Research Question

1. What is the prevalence of disability among the elderly in India?
2. How does the transition of ADL and health status change among the elderly?
3. What is the effect of change in ADL due to morbidity and other associated factors over time?

1.5 Objectives

1. To find out the changes in ADL and health status among the elderly over the period from IHDS-I (2005-06) and IHDS-II (2011-12).
2. To examine the transition of ADL and morbidity among the cohort of elderly in India between 2005-06 and 2011-12.
3. To examine the effect of change in ADL due to morbidity and other associated factors over the period of time?

1.6 Organization of Thesis

The entire dissertation is divided into six chapters. Chapter 1 will take us through a brief introduction, a review of literature followed by the need of the study, and after that research question and objectives. Chapter 2 includes the sources of data that have been used in the research and the methodologies used in order to analyze the objectives of the research. Chapter 3 attempts to study the changing pattern of ADL and chronic morbidity in all states of India. Chapter 4 deals with the transition of ADL and health status among the elderly in India, along with various background characteristics from IHDS 1 to IHDS 2. Chapter 5 tries to examine the association between change in ADL and health status with other associated factors from IHDS 1 to IHDS 2. Chapter 6 will include the summary and conclusion of the study, along with major findings and limitations of the study.

Chapter 1: Introduction.

Chapter 2: Data Sources and Methods

Chapter 3: Prevalence of Disability and status of health among elderly

Chapter 4: Changing pattern of ADL and chronic morbidity and their socio-economic correlates

Chapter 5: Effect of change in ADL due to chronic morbidity

Chapter 6: Conclusion

Chapter 2

Data Sources and Methods

Chapter 2

Data Sources and Methods

2.1 Introduction

This chapter includes sources of data and methods which has been used in the given study. This study has used only one single source of data to accomplish analytical outcomes. As Data sources and methodology play a major role in carrying out any research, it is very important to give a description of both in detail. First, this chapter will give us a brief description of the source of data that we have used in carrying out this research. Secondly, it includes a methodology that has been adapted to analyze the objectives of the study.

2.2 Sources of Data

2.2.1 India Human Development Survey - In this study, we have used the India Human Development Survey (IHDS) 2005-06 and 2011-12 data for the study of multiple dimensions of disability and the Activity of Daily Living(ADL) among the elderly who are of age 60 plus. IHDS is a research project which is done by the University of Maryland, USA, and the National Council of Applied Economic Research. IHDS includes a nationally representative sample of 41,554 households in the first round and 42,152 households in the second round, across all the states and the union territories of India, with the exception of Andaman and Nicobar and Lakshadweep in the first round. In IHDS round 1, the sample size is around 215754, in which the total number of elderly is 17904. While in round 2, the sample size is 204569, and the number of the elderly population that is interviewed is around 21926 people. Whereas for panel data, the total population is 150988, and there are 10523 elderly people who have been interviewed for both rounds. Among them, 5033 were males, and 5490 were females. Also, the survey includes a representative sample of urban and rural areas of India and covers 99.9 percent of India's population. Most of the households were re-interviewed from the first round of IHDS that took place in 2005-06, and some of them who were replaced and missed out of the sample due to death or due to migration in round two were excluded from the study. The questionnaires of IHDS include two sets, one for households and the other for women. In the given study, we have used the information on the

socioeconomic characteristics of the elderly and the activities of daily living (ADL) of the population aged 60 and above.

2.3 Methodology

2.3.1 Estimation of prevalence of disability and chronic morbidity:

In objective 1, both rounds of IHDS has been used to see the change in disability and chronic morbidity from round one to round two.

The disability prevalence has been calculated for all the ADLs (walking, toileting, dressing, hearing, speaking, far sight and short sight) in the survey. In order to gain a robust understanding of changes in disability and their association with socio-economic backgrounds, a disable score has been constructed using all the ADLs in the survey. The disable score for a person is defined as 0 if the person has no disability and 1 if the person has one disability 2 if the person has two disabilities, and so on. Further, this disability score has been categorized as 0 as no disability and 1 as only one disability, 2 as two disabilities and 3 as more than 2 disabilities.

Similarly, to see the changing pattern of the health status of the elderly, the status of chronic morbidity has been calculated from IHDS-I to IHDS-II. For that we have included all 15 types of major chronic morbidities which are available in the data set i.e. cataract, tuberculosis, high BP, heart disease, diabetes, leprosy, cancer, asthma, polio, paralysis, epilepsy, mental illness, STD or AIDS, met with an accident in the last 12 months, other long term; with some associated socio-economic variables. For further understanding, chronic morbidity is divided into four scores, 0 if the person has no major chronic morbidity, 1 if the person has one major morbidity, 2 if the person has two to four major morbidity, and 3 if the person has more than four major morbidities.

In order to gain greater insights into the percentage of disabilities and health status with different socio economic backgrounds, regression analysis has been carried out. In this analysis, the disable score has been categorized as no disability; 1 disability, 2 disabilities, and more than 2 disabilities. On the other hand, the same scores have also been given to health status, 0 for no morbidity, 1 for only one major morbidity, 2 for two major morbidities, and 3 for more than two major morbidities.

When we have a dependent variable with more than two categories, we have several estimation procedures, one of the popular choice of methods is multinomial logistic regression, but we use

this procedure when the response variable is categorical, and this procedure doesn't account for the natural ordering of the variable. Ordered logistic regression provides a means to explore the ordering information. As the constructed disabled score is ordered in terms of no disability of a person to more than 2 disabilities, an ordered logistic regression has been carried out, and the same procedure is followed for health status, after which adjusted percentages have been reported.

Consider the response or dependent variable Y (disability score with four categories) and X the explanatory or independent variables. The categories of Y conditioning on X occurring with probability $p_1, p_2, p_3,$ and p_4 can be written as

$$p_j = \Pr(Y=j/X) \quad j=1,2,3,4$$

Description of Background Characteristics-

Dependent Variable-

Disability- Disabilities is an umbrella term covering impairments, activity limitations, and participation restrictions. An impairment is a problem in body function or structure; an activity limitation is a difficulty encountered by an individual in executing a task or action; while a participation restriction is a problem experienced by an individual in involvement in life situations (WHO).

In this study, we have defined functional disability as “difficulty or unable to do” certain kinds of Activities of Daily Living (ADL) by household members aged 60 and above. ADL considered in this study are walking, toileting, dressing, hearing, short sight, far sight, and speaking are used to assess functional disability. The question asked was, “Does anyone in the household have a problem in walking, toileting, dressing.....?” with the categories to choose from as 0 if “No Difficulty”, 1 as “Somewhat Difficulty”, 2 as “Unable to do”.

Disability score, as constructed above, has been used as the dependent variable in the regression analysis.

Independent Variable-

For Chronic health conditions or health status of the elderly, the respondents have asked about their experience with several chronic diseases like high blood pressure, heart disease, diabetes,

cancer, etc. The question that has been asked in the survey was, “Has a doctor ever diagnosed any member in the household as having – high BP/heart disease/diabetes/cancer/cataract, etc.?”

In this study, various independent variables have been used as background characteristics which are: Age, sex, place of residence, marital status, education, caste, religion, any major morbidity, living arrangement, and wealth. Marital status is further categorized into three parts as, Married, Widowed, and Others; Others category includes divorced, separated as well as singles. At the same time, education qualification is further subdivided into four categories. In this, Illiterates are considered as those who have 0 years of education; Primary we considered as elderly who has the education of 1 to 5 years; Secondary are considered as elderly having education from 6 to 10 years and higher secondary as those who have the education of 11 and above years. Now, Caste/Religion is further divided into Hindu, Muslim, Christian, Jain, Sikh, and others, including OBC, Dalit, and Adivasi. On the other hand, living arrangement is based on whether the person is living alone or with his/her family. Whereas any Chronic morbidity is categorized into, Yes and No. At last, wealth has been categorized into Poorest, Poorer, Middle class, Richer, and Richest.

2.3.2 Methodology for estimating the transition of ADL and chronic morbidity:

In second objective disability transition and health transition has been calculated, that is how elderly population in India over the period of 2000-05 to 2011-12 has mobilized among different ADLs and chronic morbidities. Using both the rounds of data a longitudinal data has been constructed. Then transition has been observed only for those elderly who were interviewed in both the rounds. Elderly that were replaced and missed out of sample due to death or due to migration has been excluded from the study.

To gain more insights on the transition, a transition variable has been constructed. Where we have categorized elderly into four categories that is, no change or transition in ADL in 2005 and 2011; No ADL in 2005 to ADL in 2011; ADL in 2005 to no ADL in 2011; Change or transition between ADLs. The main exposure variable in our study is, the presence of any given type of chronic morbidity and the variables controlled are various demographic and socio-economic indicators. Likewise, chronic morbidity is also classified into four categories to reflect the transition pattern.

A multinomial regression has been done in terms of adjusted predicted probabilities. The following multinomial regression has been used to estimate the coefficients. We have considered this model as the dependent category that is, transition of ADL has more than one categories and the explanatory variables X. The mathematical form of the fitted regression is given by

$$Z_1 = \log (p_1/p_4) = \alpha_1 + \sum_{j=1}^n \beta_{1j} * X_j$$

$$Z_2 = \log (p_2/p_4) = \alpha_2 + \sum_{j=1}^n \beta_{2j} * X_j$$

$$Z_3 = \log (p_3/p_4) = \alpha_3 + \sum_{j=1}^n \beta_{3j} * X_j$$

And $p_1 + p_2 + p_3 + p_4 = 1$

Where $\alpha_i = 1, 2$: constants

β_{ij} $i = 1, 2; j = 1, 2, \dots, n$: Multinomial regression coefficients

p_1 are the estimated probability of no change in ADL in 2005 and 2011.

p_2 are estimated probability of no ADL in 2005 and ADL in 2011.

p_3 are estimated probability of ADL in 2005 to no ADL in 2011.

p_4 is estimated probability of change or transition between ADLs.

For the sake of simplicity in the interpretation of results, multinomial logistic regression coefficients are converted into adjusted percentages. The procedure consists of the following steps;

By using regression coefficient and mean values of independent variables, the probability was computed as:

$$P_i = \frac{\exp (Z_i)}{\{1 + \sum \exp (Z_i)\}}, i = 1, 2, 3, 4 \text{ and } P_4 = 1 - P_1 + P_2 + P_3 \text{ where } Z \text{ was the estimated value of response for all categories of each variable.}$$

To obtain the percentage values, the probability P was multiplied by 100.

As we note that the coefficients of multinomial regression are bit hard to interpret and not as straight forward as simple linear regression or logistic regression. So the convenient way to represent is to convert them into adjusted percentages.

Description of Background Characteristics-

Dependent variable- Here dependent variables are same as transition variables which have been constructed into four categories for regression analysis above.

Independent Variables- In this study various independent variables have been used as background characteristics which are: Age, sex, place of residence, marital status, education, caste, religion, any major morbidity, living arrangement and wealth. Marital status is further categorized into three parts as, Married, Widowed and Others; Others category includes divorced, separated as well as singles. Whereas education qualification is further subdivided into four categories. In this Illiterates are considered as those who have 0 years of education; Primary we considered as elderly who has education of 1 to 5 years; Secondary are considered as elderly having education from 6 to 10 years and higher secondary as those who have education of 11 and above years. Now, Caste/Religion is further divided into Hindu, Muslim, Christian, Jain, Sikh and others include OBC, Dalit and Adivasi. On the other hand, living arrangement is based on whether the person is living alone or with his/her family. Whereas any Chronic morbidity is categorized into, Yes and No. At last wealth has been categorized into Poorest, Poorer, Middle class, Richer and Richest. All these characteristics have been fixed at the base survey period.

2.3.3 Methodology for estimating the effect of change in ADL due to chronic morbidity and with other associated factors:

In the last objective we tried to estimate the change in ADL index score due to change in mortality index. IHDS data set is a panel data we tried to know the effect of major morbidity change on daily functional limitations. IHDS is a short panel data, meaning many observation and two time periods. To have a casual estimation of how major morbidity changes have effect on functional limitation we have employed fixed effect regression technique. We used the following specification

$$\Delta ADL_{ij} = \alpha_j + \beta * \Delta Major\ morbidity_{ij} + \sum x_{ijk} + e_{ij}$$

Where,

ΔADL_{ij} - represents change in Activity of daily living score for individual i and community j against community fixed effect represents by α_j .

$\Delta Major\ morbidity_{ij}$ - represents change in major morbidity from IHDS1 to IHDS2.

X_{ijk} – represents a series of demographic controls and e_{ij} represents error term.

To measure a change in ADL and major morbidity over the years. We have constructed ADL and Major morbidity score. To compute ADL or major morbidity score we defined a variable to be 0 if there is no functional limitations or major morbidity to the respondent, if a person suffered from an illness then we have 1. For each individual we have a functional limitation score or major morbidity score after adding all the limitation of the respondent. For example, if a person reported difficulty in walking and seeing then we have 2 score. Then the ADL index is defined as follows

$$ADL\ index = (ADLscore - Min\ Score) / (Max\ Score - Min\ score).$$

This index takes value 1 if an individual can perform all the functional limitations defined in the study, and zero if an individual cannot perform any of the limitations. A similar score for Major morbidity has been defined in this study.

2.4 Software Used-

For the analysis of given study, we have used different software. First objective of the study has been carried out in Microsoft Excel and for the rest of objectives we have used STATA 14.1 version.

Chapter 3

Prevalence of Disability and Health Status of Elderly

Chapter 3

Prevalence of Disability and Health Status of Elderly

3.1 Introduction

The rapidly accelerating population of the elderly in the world is leading to various unpredictable challenges to the health system. As the mortality rate at older ages is decreasing with the advancement in medicine and improvement in the health care system, the extent of morbidity among the elderly is increasing at a faster rate. With the increasing longevity, the health of the elderly is something that on which society is not paying attention to. Due to this, the rate and prevalence of chronic diseases and functional disability among the elderly is increasing at a much faster rate, which is directly worsening the health status and well-being of older adults.

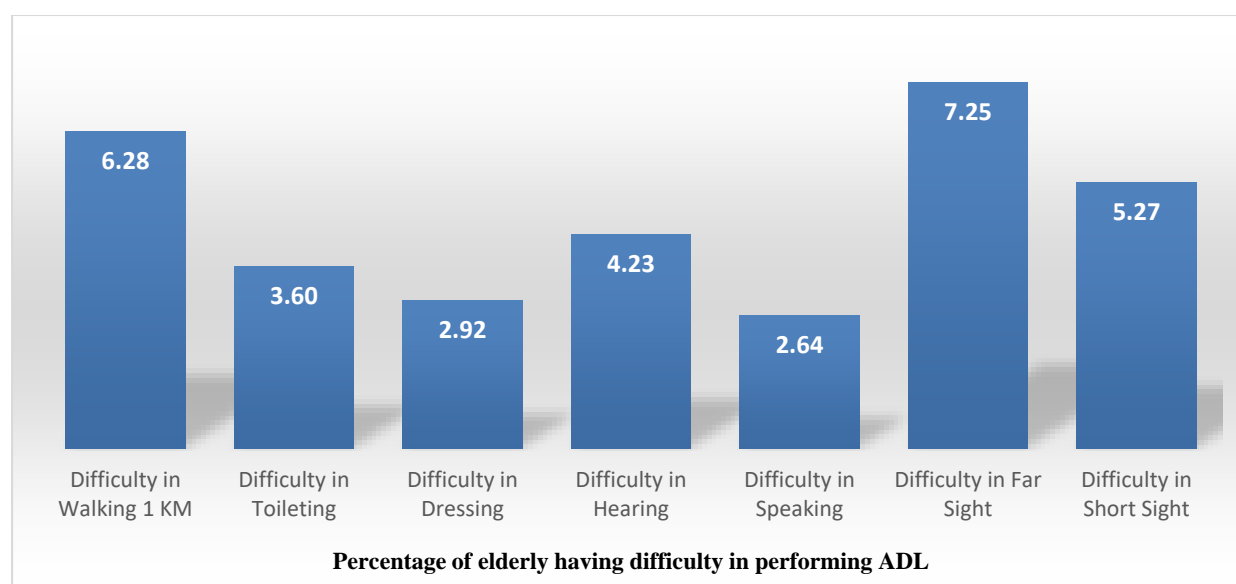
Disability, in simple words, can be defined as a physical or a mental health condition that limits a person's ability to perform any normal life activities or activities of his daily living. According to The World Health Organization (WHO, 1976), disability is "any restriction or lack (resulting from an impairment) of ability to perform any activity in the manner or within the range considered normal for a human being." The recent definition of WHO defines disability as "Disabilities is an umbrella term, covering impairments, activity limitations, and participation restrictions. According to the Census of India, disability is connected to concrete medical conditions and the inability to perform bodily functions, such as walking or moving, hearing, seeing, speaking, dressing, etc. The burden of chronic diseases increases the prevalence of disability among the elderly. According to various longitudinal studies, the prevalence of disability in developed and wealthy countries is quite lower than in developed and low-income countries. According to Census 2011, there are 27 million disabled people in India. The prevalence of total disability among the elderly in India is around 5%, Census 2011.

3.2 Prevalence of ADL limitation among elderly in India: IHDS-I and IHDS-II

According to a UN forecast, by 2050, there will be 323 million people over age 60 in India. To ensure a better quality of life for now rapidly increasing elderly population has become a challenge

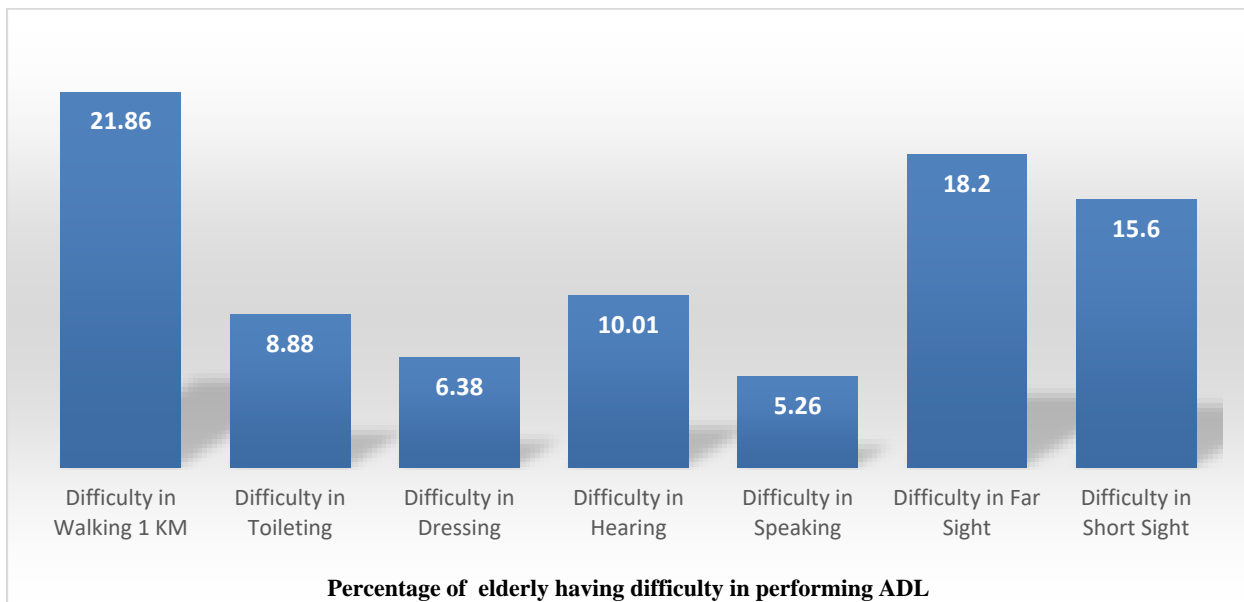
in countries like India, where people are more susceptible to disease and disability. The most important component of successful aging is the maintenance of good functional capacity. To measure the health status and quality of life among older people, the physical functioning of the body is one of the most important indicators (Storeng SH et al., 2018). Anywhere in the world, Activity of Daily Living (ADL) is often considered as the major and one of the most important index for measuring the functional capacity of elderly people (Chalise HN et al., 2008). ADL is usually defined as common everyday tasks that a person needs to do to maintain an independent life for his survival (Van der Vorst et al., 2016). We have done the statistical analysis to calculate the prevalence of disability by background characteristics among the elderly in 2005-06 and 2011-12. In the present study, seven types of ADLs are given with the percentages of their prevalence among the elderly in India. The seven types of ADLs which are given in table 8 and 9 are; difficulty in walking 1 KM, difficulty in toileting, difficulty in dressing, difficulty in hearing, difficulty in speaking, difficulty in far sight, and difficulty in short sight. The results of this study suggest that far sight has the highest percentage of prevalence of disability (Figure 3.1). Around 7.25 percent of elderly have a problem in far sight in 2005-06. Followed by around 6.28 percent of the elderly having a problem with walking a 1km distance, and 5.27 percent of the elderly have a problem in short sight. The lowest percentage of difficulty can be seen while speaking (2.64 percent), followed by dressing (2.92 percent), toileting (3.6 percent), and hearing (4.23 percent).

Figure 3.1: Prevalence of ADL limitation among elderly in India in 2005-06 (IHDS-I)



Whereas in 2011-12, the problem of walking, farsightedness, and short-sightedness are prominent disabilities among seven disabilities that we have discussed in our study. At the same time, the disability in speaking and dressing shares a very small part. Firstly, there are 21.86 percent of people who face difficulty in walking a 1-kilometer distance, and there are 14.06 percent of people who have somewhat difficulty, and 7.80 percent people are unable to walk (Table 9). People who have difficulty in using toilet are around 8.88 percent. There is 2.50 percent of people are unable to dress on their own.

Figure 3.2: Prevalence of ADL limitation among elderly in India in 2011-12 (IHDS-II)



Having any kind of chronic morbidity plays an important role in the occurrence of difficulty in performing various types of ADLs. A study by Jeffery and Singal, 2008 suggests that non-communicable diseases like stroke, cancer, asthma, blood pressure, etc., are strongly associated with impairments among the elderly. Similarly, the results of this study are consistent with previous studies, as in this study also, the prevalence of disability in all seven ADLs is higher among people who have some kind of chronic morbidity. Around 16.09 percent of people have difficulty in walking a 1km distance due to chronic morbidity. While 16.52 percent of people have

difficulty in far sight and 12.84 percent have difficulty in short sight due to any kind of morbid condition (Table 8).

Some studies show that there is a marginal difference in the prevalence of disability among people who live in urban and rural areas. The prevalence of disability in all seven ADLs is higher in rural areas compared to urban areas. In 2005-06 rural are elderly faced the highest difficulty in far sight (7.4 percent), walking (6.39 percent), and in short sight (5.31 percent), followed by hearing (4.45 percent), toileting (3.69 percent), dressing (2.98 percent) and speaking (2.74 percent). While in an urban area, the prevalence of disability in all seven ADLs is also higher in far sight (6.79 percent), followed by walking (5.92 percent), short sight (5.14), hearing (3.54 percent), toileting (3.33 percent), dressing (2.72 percent) and speaking (2.32 percent). Whereas in 2011-12, around 2.15 percent in a rural area, 1.73 percent of elderly in urban areas have difficulty in hearing and 89.29 percent of elderly in a rural area, and 91.66 percent of elderly in urban areas had no difficulty in hearing. Almost 3.1 percent of rural elderly and 4.28 percent of urban elderly have farsightedness and 2.6 percent in a rural area and 4.15 percent in urban area have short-sightedness.

A study based on Indian states by Valayutham et al., 2016, shows that the disability rates among males were higher than in females. But our results show that the prevalence of disability among elderly females is higher than in males in India in both rounds of IHDS. Around 7.98 percent of females and 6.54 percent of males have difficulty in far sight, and 7.71 percent of females and 5.42 percent of males have difficulty in walking 1km distance (Table 8). According to table 10 of IHDS-1, 90.5 percent of males have no difficulty in any of the ADLs, while 2.82 percent of males have difficulty in one of the ADLs, and 2.66 percent have difficulty in two ADLs, and around 4.03 percent have difficulty in more than two ADLs. But the prevalence of difficulty in females is a bit higher than in males, as 88.36 percent of females have no difficulty in performing any of the ADLs. In comparison, 3.53 percent have difficulty in one ADL, and 2.98 percent have difficulty in two ADLs, and almost 5.12 percent have difficulty in more than two ADLs. Around 9.48 percent of females and 6.02 percent of males have difficulty in walking a 1km distance. Table 11 shows that there are 74.54 percent of males and 66.79 percent of females who don't face any kind of difficulty in performing any type of ADL. While in the male category, we can see that 7.24 percent face difficulty in one ADL, 6.42 percent in two ADLs, and 11.79 percent face difficulty in performing more than two ADLs. For females, it is 8.84 percent in one ADL, 6.66 percent in two ADLs, and

16.99 percent in more than two ADLs of round two. The lowest gender gap can be seen in speaking, as only 1.58 percent of females and 1.58 percent of males have difficulty in speaking in round two.

There are enough shreds of evidence on how age is associated with disability. The prevalence of disability increases with the increase in the chronological age of a person (Bozkurt et al., 2016). The results of this study also found that the prevalence of disability among the elderly is increasing with age. As we can see in table 8 that how the prevalence of functional limitation is increasing from the age group 60-65 years to 75 plus. The results of IHDS-II data show that while walking 1km of distance, the highest percentage of disability can be seen in the age group of 75 years and above (37.77%) followed by 66 to 74 years (22.56%) and 60 to 65 years (14.04), which shows that how it is increasing with the age of the person. For round one of IHDS, among all the ADLs, the prevalence of disability for walking 1KM distance for age group 75 years and above is 11.4 percent, which is almost half (6.95 percent) for the earlier age group of 66 to 74 years and 4.11 percent for the age group of 60 to 65 years.

Results of IHDS-1 show that the prevalence of disability in all seven ADLs is higher among the uneducated than the educated elderly. In round two of IHD, the prevalence of disability among the elderly is mostly higher among people who are illiterates than people who have completed higher education. Only 1.31 percent of elderly who have completed their higher education face difficulty in toileting, while this percentage is 3.37 percent for illiterates. Disability in all seven ADLs is more prevalent among Muslims, Jain, Christian, and Sikhs than Hindus. While walking, 6.11 percent of Muslims and 14.77 percent of Christian, Jain, and Sikhs feel difficulty in round one. These percentages are quite lower in far sight and short sight. The elderly who are in the lowest wealth quintile have a higher percentage of disability prevalence in all seven ADLs. The prevalence of disability in all seven ADLs is higher among the poorest elderly than the richest elderly.

From a theoretical perspective, living arrangements, like other socio-economic factors, can have a substantial amount of impact on the elderly's health, as concluded by a study by Pollen, 2011. Also, a study by Ross et al., 1990, also suggested that living with a family member has a major impact on the elderly's health as the family provides mental, physical, economic, and social support to the other members, which can affect the occurrence of poor self-rated health, disability in the

activity of daily living, mortality and cognitive impairment among elderly. Similarly, in this study also, the elderly who are living alone are more prone to feel difficulty in most of the ADLs. As almost 7.02 percent and 6.3 percent of people who are living alone face difficulty in walking and in far sight in round one of IHDS (Table 8). According to IHDS-2 (Table 9), around 8.69 percent of elderly who are living alone and 7.09 percent who are living with their family are unable to walk a 1km distance. At the same time, 14.97 percent who are living alone and 13.34 percent who are living with their family face some difficulty while walking a 1km distance in India. Only 1.7 percent of elderly who are living alone and 1.18 percent who are living with family are unable to speak. Moreover, a study by Lee et al., 2005 suggests that living with children or a spouse is associated with health-promoting lifestyles. According to our results, a marginal difference can also be seen in the elderly who are married and widowed. The percentage of disability is quite higher in people who are widowed than in people who are married. Around 11.77 percent of widowed and 5.34 percent of married elderly face difficulty in walking 1km distance, and 1.71 percent of married and 3.79 percent of widowed elderly face difficulty in dressing up on their own in round two of IHDS.

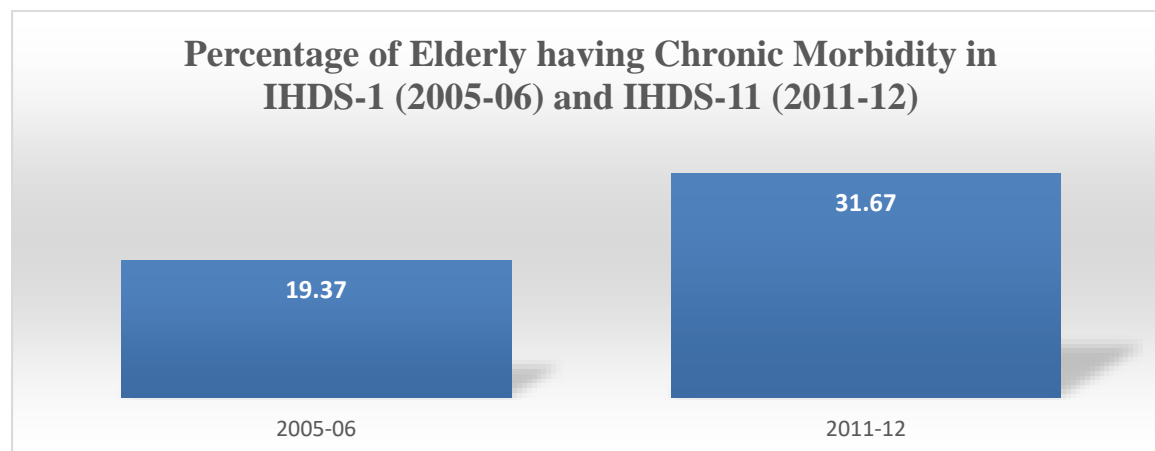
Table 16 shows the adjusted percentages of ordered logistic regression for disability among the elderly in India. As our discussion lies on the disability of the elderly in their activity of daily living, so hereafter, we discuss the disability among the elderly. In IHDS-1, disability has been found to be significant with sex, residence, age, education, marital status, religion, and wealth quintile except for living arrangement. After controlling all the factors, 89.81 percent of males and 87.53 percent of females have no ADL. In contrast, 5.56 percent of females have more than two ADLs as compared to males (4.47 percent). The elderly belonging to urban are less disabled (4.55 percent) as compared to rural areas (5.20 percent). With age, a rise in disability can be seen in table 16, as people belonging to the later age groups have a higher percentage of disability. Table 17 shows adjusted disability prevalence among the elderly in 2011-12. The table shows significant results in sex, residence, age, education, marital status, religion, and wealth quintile. In 2011-12, after controlling all the factors, 72.83 percent of males and 67.86 percent of females had no ADL. At the same time, 12.91 percent of males and 15.90 percent of females have difficulty in more than two ADLs. According to the age group of a person, 6.51 percent of elderly who are in the age group 60-65 years, 8.64 percent of age group 66-74 percent, and 10.61 percent of age group 75 years and above have difficulty in one of the eight ADLs.

3.3 Prevalence of Chronic Morbidity among elderly in India: IHDS-I and IHDS-II

As life expectancy is increasing, having any type of chronic disease has become very common among the elderly. Although much research has been done on the health status of the elderly in India and in other various countries of the world, still relatively little is known about the role or effect of morbidity on the health of the elderly. This part of the chapter basically talks about the prevalence of chronic morbidity among the elderly in India, which is going to give us a picture of the health status of 60 plus population in India. Lack of education, extreme poverty, and social exclusion in countries like India increase the prevalence of chronic morbidity among older people. Due to this, developed as well as developing countries are facing important structural and financial challenges related to the huge numbers of older people with chronic conditions who require adequate social and health care, which directly creates a burden on the working population as well as on government. So, to minimize the burden of multiple morbidities on society, there is a need for careful study and monitoring of the prevalence of chronic morbidity in developed as well as developing countries. In India, almost 50 percent of the elderly population has a chronic disease, Bhatt R. et al., 2011. The findings of our study show that, among the total 60-plus population of India, 19 percent of the elderly have some kind of morbid condition, while 80 percent of them are free from any kind of major morbidity in round one. While in round two of IHDS, the prevalence of chronic morbidity has increased to 31 percent for elderly who are 60 plus. This implies that with aging population, the prevalence of multiple morbidities is expected to increase in the coming years; Wolff J. L. et al., 2002.

A study by Kamlesh Joshi et al., 2003, suggests that perceived health declines with age and increases the probability of having any type of major morbidity that has an impact on areas of daily activity. Similarly, Gijsen R. et al., 2001, concluded that many health problems and chronic conditions are usually increase with age and lead to an increase in the absolute number of health issues in the population. In this study also, we can see that how the percentage of elderly who have any kind of morbidity is increasing with age as in the age group 60-65 years, the percentage of people with morbidity is 19.41 percent which has increased to 23.38 percent in the age group 66 to 74 years and further increased to 24.6 percent in the age group 75 and above in the first round of IHDS (Table 12).

Figure 3.3: Percentage of Elderly having Chronic Morbidity in IHDS-I and IHDS-II



Similarly, in round two, in the age group of 60-65 years, 31.73 percent of the elderly have morbidity, which has increased to 35.80 percent for age group 66-74 years and further increased to 38.04 percent of age group 75 years and above (Table 13).

On the basis of gender, in a study by Kamlesh Joshi et al., 2003, concluded that elderly women in both rural and urban areas are more prone to getting a chronic disease than males. But our results suggest that the percentage of females having the morbid condition is lower than males. Almost 21.84 percent of males and 21.13 percent of females have some kind of morbidity in round one (Table 12). Around 35.23 percent of females have morbid conditions, while 33.43 percent of males have major morbidity in IHDS-11 (Table 13). In 2005-06 around 39.06 percent of elderly in urban areas and 32.38 percent of elderly in rural areas have morbidity. While in 2011-12, the percentage of elderly with morbidity was quite higher in urban areas (28.26 percent) than in rural areas (19.39 percent).

Based on a study by Walker A. E. 2007, 80 percent of 70-plus-year elderly have multi-morbidity, and the prevalence of morbidity is higher among elderly who belongs to a low socio-economic group, those living alone, and those who are less educated. Table 14 suggests that around 14.81 percent of illiterate, 20.03 percent of elderly who have completed primary education, 19.62 percent who have completed secondary education, and 20.33 percent who have completed higher secondary education, have only one major morbidity. These percentages are very marginal for married and widowed elderly and similarly for elderly who are living alone and who are living with family. Among Christian, Jain, and Sikhs, the percentage of elderly who have more than four

major morbidities is 0.31 percent, and for Hindus, it's 0.13, and for Muslims, it's zero. Whereas 11.89 percent of the poorest, 12.07 percent of poorer, 15.94 percent of the middle class, 23.89 percent of richer, and 27.35 percent of the richest elderly have two to four types of major morbidity in round one of IHDS. On the other hand, table 15 reveals that almost 8.03 percent of elderly who are illiterate and 12.56 percent of elderly who have completed their primary education, 14.24 percent who have completed their secondary education, and 14.29 percent of elderly who have completed their education have two to four major morbidities. According to the marital status, 0.25 percent of married elderly and 0.19 percent of widowed elderly have more than four major morbidities. Around 24.55 percent of poorest elderly, 22.71 percent of poorer elderly, 22.68 percent of middle class elderly, 23.24 percent of richer elderly, and 24.13 percent of richest elderly have at least one major morbidity.

Elderly who are living alone or with their family doesn't show much difference as 23.05 percent of elderly who are living alone and 23.86 percent of elderly who are living with their family have at least one major morbidity. There is around 0.17 percent of elderly who are living alone, and 0.25 percent of elderly who are living with their family have more than four major morbidities.

Table 18 shows ordered logistic regression of prevalence of morbidity among the elderly, which is found to be significant with sex, residence, age, education, religion, and wealth quintile of elderly in India in 2005-06. Around 15.63 percent of elderly males have one major morbidity, while this percentage is 17.80 percent for females. Similarly, 5.81 percent of elderly who stay in urban areas and 4.37 percent of elderly who stay in rural areas have two to four major morbidity. With age, the percentage of elderly who have morbidity is increasing. Around 15 percent of elderly in the age group 60-65 years, 18.27 percent of elderly in the age group 66-74 years, and 18.92 percent of elderly in the age group 75 years and above have one major morbidity. The percentage of morbidity among illiterate persons is lower than among those who have completed their higher secondary school. Marital status doesn't show much about the health status of the elderly. Table 19 shows the adjusted morbidity prevalence among the elderly in India in 2011-12. The prevalence of morbidity is higher among females than in males. Almost 11.90 percent of females and 9.62 percent of males have two to four major morbidities. In the urban area, 24.64 percent and in rural areas, 22.11 percent of the elderly have one major morbidity. With age, the percentage of elderly who have any kind of morbidity also increases. Around 9.18 percent of illiterate, 12.46 percent of

elderly who have completed primary school education, 12.65 percent of elderly who have completed higher secondary education, and 13.64 percent of elderly who have completed secondary school education have at least two to four major morbidities.

3.4 Summary

In the given study, we have examined the prevalence of total disability among the elderly in India from IHDS-I and IHDS-II. We have computed the percentage of disability among 60 plus population in India. The prevalence of total disability in India has increased in the last six years from IHDS-I to IHDS-II. There persists a variation in disability prevalence among the elderly. In both rounds, Urban dwellers are observed to have lower disability prevalence, whereas their counterparts are prone to more disability. A study by Parmar et al. (2018) states that irrespective of the type of disability, the prevalence of disability is higher among females than males. From the given data, it was also evident that irrespective of the type of disability, males have a higher disability prevalence than females in all seven ADLs. A trend that those with lower socio-economic status possess a greater likelihood of maintaining ADL independence is observed in a study by Dewen Wang et al., 2008. Our results also suggest that the elderly who belongs to the poorest class are less prone to getting disabled than the elderly who belongs to the wealthiest class.

We have also examined the health status of the elderly by simply looking at their health condition or whether they have any chronic morbidity or not. Results show that elderly who are living in urban areas have higher chances of having any type of major morbidity than elderly who are living in rural areas. Illiterate elderly are less prone to having major morbidity than elderly who have completed their higher education. The health status of males and females doesn't show much difference in this study. Also, married elderly have lesser chances of having any type of morbidity than elderly who are widowed. The percentages of elderly with more than four major morbidities are very low, but these percentages are enormous if we see elderly with two to four major morbidities.

Therefore, this whole chapter gives us a picture of the overall health status of the elderly. Here we can clearly see how many elderlies have difficulty in all eight types of ADLs and how many elderlies have any kind of major morbidity out of the given 17 types of morbidity.

Chapter 4

**Transition of ADL and Chronic
Morbidity with their socio-economic
correlates**

Chapter 4

Transition of ADL and Chronic Morbidity with their socio-economic correlates

4.1 Introduction

The twenty-first century is witnessing serious health concerns emerging due to rapid demographic and epidemiological transitions all over the world; one of the major concerns among them is population aging (Pou & Goli, 2013). This process of demographic aging will play a key role in developing new policies to deal with the impending crisis. With the ongoing demographic transition in India, population aging will continue to rise due to improvement in mortality rates and compression of morbidity rates (Yadav et al., 2011). With the rising old age population, disease and disability are expected to increase at older ages (Murray & Lopez, 1997). Disease and disability at later stages of life have a massive impact on the state resources along with the financial burden on households as well as on the government. As the population structure of the country is changing at a faster rate, the share of the elderly population is going to increase over the period (UN population projection), which will increase the dependency ratio in the country (Goli & Pandey, 2010; Population Reference Bureau 2012).

Although rates of disability are lower in India, the rapid population change will escalate the disease and disability rates that are comparable to now developed countries, and with the little health resources to deal with, this health concern will make the situation worse. The population of developing countries is already facing numerous socio-economic issues; when studying these impacts on health and disability will be large, especially among the elderly. Among the studies conducted in various countries and in India have found that there seems to be a consistent inverse relationship between the socio-economic characteristics and disability (Kabir et al., 2003; Liang, Liu, & Gu, 2001; Pou & Goli, 2013; Saika et al., 2016). The majority of epidemiological studies have focused attention on disability as the function of age, disease, and sex of the elderly (Kaplan, 1992; Strawbridge et al., 1993).

Many studies have been conducted on aging and its determinant in India (Goli et al., 2012; Saika et al., 2016; Pandey, 2011). However, a comprehensive investigation of socio-economic factors affecting functional disability in India is lacking. Few recent studies (Pou & Goli) have

concentrated on this area, but none of the studies have concentrated on chaining patterns of disabilities and diseases and how socio-economic factors are contributing to explaining these changes over the period. The purpose of our study is to examine the impact of socio-economic factors on the Activity of Daily living and health over a period of 7 years among the elderly in India. Along with this, the study tries to examine the factors associated with multiple disabilities and chronic morbidity among the elderly and the change in prevalence of multiple disabilities and health over the period.

Transition probabilities are defined as moving from one disability state to another disability state; many studies have calculated the transition probabilities for hypertension, disabilities, and activity of daily living. In India, the studies on elderly disability have mainly concentrated on the prevalence of disability through cross-sectional studies, and this study tries to explore the lacuna of the above studies by examining the transition between ADL and chronic morbidity among the elderly using longitudinal data.

4.2 Changing pattern of ADL and its Socio-economics characteristics

In this chapter, we have done the statistical analysis to see the transition of disability in the activity of daily living among the elderly from IHDS-I to IHDS-II. There are a huge number of researchers who have worked on disability and its associated factors (Ostir G.V. et al., 1999). But none of them have focused on how the transition of disability in the activity of daily living is happening among the elderly in India. By using both rounds of IHDS data, we have created a matrix table of transition for ADL among the elderly. Given table 1 shows that, in both round of IHDS, there is 65.2 percent of the elderly population who has not faced any kind of difficulties in the activity of daily living in India. This percentage is quite good; as further if we go, we can see that around 8.9 percent of the elderly have no ADL in round one, but in round two, they have shifted to facing difficulty in at least one ADL out of the given seven types of ADL. In the same way, 8 percent of the elderly have no ADL in round one, but in round two, they have shifted to facing difficulty in at least two ADLs. Likewise, there is around 17.90 percent of elderly who have shifted from having no difficulty in ADL in round one to having difficulty in performing more than two ADLs. A study based in India states that this much increase in disability rate in India is due to the lack of education, extreme poverty, and low socio-economic status of older people in our country (Elwan A., 1999).

Table 1: Transition Matrix of change in ADL Status among elderly from IHDS-I to IHDS-II

IHDS-1	IHDS-2			
	No ADL	One ADL	Two ADL	More than Two ADL
No ADL	65.20	8.90	8.00	17.90
One ADL	50.15	11.01	9.17	29.66
Two ADL	45.42	9.15	9.83	35.59
More than Two ADL	44.35	5.91	12.10	37.63

Similarly, there is 50.15 percent of people who have difficulty in one ADL in round one and no difficulty in round two. Almost 11.01 percent of people are there who had difficulty in one ADL in round one and round two. While there are 9.17 percent of people had difficulty in one ADL in round one and shifted to difficulty in two ADLs in round two; also 29.66 percent of elderly have shifted to more than three ADLs in round two from one ADL in round one. Almost 45.42 percent of the elderly in round one had difficulty in two ADLs and no difficulty in round two. At the same time, 9.15 percent of people have difficulty in two ADLs in round one and one difficulty in round two. Around 9.83 percent had difficulty in two ADLs in both the rounds and 35.59 percent of people had difficulty in performing two ADLs in round one, who have shifted to difficulty in more than two ADLs in round two. Around 44.35 percent of people have difficulty in more than three ADLs in round one and have no difficulty in round two. At the same time, 5.91 percent have difficulty in more than three ADLs in round one and one ADL in round two. There is 12.1 percent of elderly who have difficulty in more than two ADLs in round one and then shifted to difficulty in two ADLs in round two. Around 37.63 percent of the elderly have difficulty in more than two ADLs in both rounds of IHDS.

For further understanding, we have created a transition matrix of change in ADL status with various background characteristics among the elderly in India. Given table 2 shows that in both rounds of IHDS, 60.99 percent of the elderly haven't experienced any change in the status of ADL. In comparison, 3.1 percent of the elderly have experienced some change in ADL status. Almost 31.51 percent of elderly have no ADL in round one but got ADL in round two. At the same time, 4.4 percent of the elderly had ADL in round one and no ADL in round two. A study by Kandamuthan M. 2004 found that having any kind of disability in performing ADLs is often associated with severe socio-economic disadvantages and social exclusion. From our results, we can figure out that the status of disability in ADL has changed from round one to round two.

Table 2: Transition Matrix of change in ADL Status with background characteristics among elderly from IHDS-I to IHDS-II

Background Characteristics	Change in ADL Status	No ADL in round 1 to ADL in round 2	No ADL in round 2 to ADL in round 1	No Change in ADL Status	n
Sex					
Male	2.66	28.35	3.97	65.01	5033
Female	3.50	34.41	4.79	57.30	5490
Residence					
Rural	3.25	31.91	4.26	60.58	7753
Urban	2.67	30.40	4.80	62.13	2770
Age					
60-65 Years	2.50	28.27	3.86	65.38	6406
66-74 Years	3.58	33.01	5.13	58.29	2769
75 + Years	4.97	43.84	5.49	45.70	1348
Education					
Illiterate	2.83	33.50	4.37	59.30	6472
Primary	3.72	31.26	4.78	60.23	1881
Secondary	3.83	24.95	4.15	67.06	1591
Higher Secondary	2.13	27.53	3.91	66.43	563
Marital Status					
Married	2.44	27.89	4.13	65.54	5568
Widowed	3.85	35.63	4.77	55.75	4755
Others	3.50	34.50	3.00	59.00	200
Religion					
Hindu	3.22	28.66	4.53	63.59	2826
Muslim	2.65	29.02	4.89	63.44	982
Christian, Jain, Sikh	7.82	34.04	6.34	51.80	473
Others	2.74	33.01	4.12	60.13	6232
Living Arrangement					
Living Alone	3.40	32.33	4.34	59.93	6731
Living with Family	2.62	30.64	4.51	62.23	3662
Total	3.10	31.51	4.40	60.99	10523

There are 3.50 percent of females and 2.66 percent of males who have experienced a change in their ADL status. Out of them, 28.35 percent of males and 34.41 percent of males didn't have difficulty in performing ADLs in round one, but due to some reason, they have got difficulty in performing ADLs in the second round of IHDS. Another thing that we can see here is that there are people who have difficulty in round one, but with some intervention or treatment, their condition has got improved.

A lot of studies didn't find a conscience agreement on sex and transition of disability, as Diehr & Patrick (2001) in their study have found that women have more years of healthy life than men,

while a study by Hardy et al., (2008) has found that the men are more likely to have a good transition from disability to non-disability and more likely to have good health than their counterparts. Table 2 shows that there are 3.97 percent of males and 4.79 percent of females whose condition has got improved in the second round. Likewise, few studies have also proved that how the area of residence also affects the ADL status of the elderly. In India, there are 60.58 percent of people in the rural area and 62.13 percent in urban areas who have experienced no change in round one and round two. At the same time, 31.91 percent of people in rural and 30.40 percent have no ADL in round one and ADL in round two. Similarly, 4.26 percent of people in rural and 4.80 percent in urban have difficulty in ADL in round one, but these people have no difficulty in round two. There are total of 3.25 percent of people in rural and 2.67 percent in urban who have experienced a change in status of ADL. There are 65.38 percent of people in the age group 60-65, 58.29 percent in the 66-74 age group, and 45.70 percent in the age group 75 plus who have experienced no change in both the rounds. While 28.27 percent of people in the age group 60-65, 33.01 percent in the age group 66-74, and 43.84 percent in the age group 75 plus who have no ADL in round one and some ADL in round two. People who have experienced some difficulty in ADL in round one and no difficulty in round two are 3.86 percent in the age group 60-65, 5.13 percent in the age group 66-74, and 5.49 percent in the age group 75 plus.

Based on research by Filmer D. 2006, people with disability are associated with less educational attainment. Our results show that according to education qualification of a person, there are the highest number of people in secondary school (67.06 percent) who have not experienced any change in round one and round two, while this percentage is low in other categories like for illiterates it is 59.30percent, for primary school it is 60.23 percent, for higher secondary it is 66.43 percent. There are 33.50 percent of people who are illiterate, 31.26 percent of people who have passed the primary school, 24.95 percent of elderly who have qualified secondary school, and 27.53 percent of elderly of higher secondary school have no ADL in round one and have some difficulty in round two. Similarly, there are people who have ADL in round one and no ADL in round two; the percentage of this proportion of people is around 4.37 percent among illiterates, 4.78 percent in the primary, 4.15 percent in secondary, and 3.91 percent in the higher secondary category. Whereas there are 2.83 percent of illiterates, 3.72 percent in the primary, 3.83 percent in secondary, and 2.13 percent in higher secondary have experienced some change in the status of ADL among the elderly population.

A longitudinal study by Zi Zhou et al., 2016, explored the associations between living arrangements and disability among the elderly. In this study, he has observed that results were not significant with living arrangements or elderly who are living with a spouse or living alone. In this study, results show that around 59.93 percent of elderly who are living alone and 62.23 percent who are living with family haven't experienced any change in the status of ADL. Whereas 3.40 percent of elderly who are living alone and 2.62 percent of elderly who are living with their family have experienced some changes in the status of ADL. Some studies have also shown an association with marital status also. Therefore, in this study, we can see that more number of married people (65.54 percent) have experienced no change in round one and round two while this percentage is less in widowed (55.75 percent) and other categories (59 percent) whereas 27.89 percent for a married person, 35.63 percent of widowed and 34.50 percent of other category have experienced no ADL in round one and some ADL in round two. Similarly, 4.13 percent of married people, 4.77 percent of widowed, and 3 percent of others have experienced some difficulty in ADL in round one and no difficulty in ADL in round two. There are people who have experienced a change in status of ADL from round one to round two; for the married person, it is around 2.44 percent, for widowed, it is 3.85 percent, and for others, it is 3.5 percent. Around 63.59 percent of Hindus, 63.44 percent of Muslims, 60.13 percent of OBC, Dalit, Adivasi, and 51.80 percent of Christian, Jain, and Sikh have experienced no change in the status of ADL from round one to round two. Whereas 3.22 percent of Hindus, 2.65 percent of Muslims, 2.74 percent of OBC, Dalit, Adivasi, and 7.82 percent of Christian, Jain, and Sikh have experienced some changes in the status of ADL from round one to round two. Around 28.66 percent of elderly Hindus, 29.02 percent of Muslims, 34.04 percent of Christian, Jain, Sikh, and 33.01 percent of OBC, Dalit, and Adivasi have no ADL in round one and got ADL in round two.

Table 3 shows the adjusted percentage for the ADL change among the elderly in India from IHDS-I (2005-06) to IHDS-II (2011-12). Given results show significant results for sex, residence, age, education, religion, and living arrangement. Overall, disability prevalence is found to be higher among females than their counterparts. Around 33.94 percent of females and 29.05 percent of males have shifted from no ADL in round one to ADL in round two. At the same time, 64.51 percent of males and 57.45 percent of females haven't experienced any change in ADL status.

Table 3: Multinomial regression: Adjusted percentage for change in ADL Status among elderly in India from IHDS-I to IHDS-II

Background Characteristics	Change in ADL Status	No ADL in round 1 to ADL in round 2	No ADL in round 2 to ADL in round 1	No Change in ADL Status
Sex				
Male®	2.55 [2.08-3.01]	29.05 [27.66-30.44]	3.87 [3.28-4.45]	64.51 [63.06-65.97]
Female	3.73*** [3.15-4.31]	33.94*** [32.55-35.32]	4.86*** [4.22-5.50]	57.45 [56.01-58.90]
Residence				
Rural®	3.38 [2.96-3.80]	31.47 [30.42-32.53]	4.32 [3.84-4.79]	60.81 [59.70-61.92]
Urban	2.51** [1.92-3.10]	31.97 [30.09-33.85]	4.54 [3.72-5.35]	60.96 [59.02-62.91]
Age				
60-65®	2.54 [2.14-2.94]	28.17 [27.04-29.31]	3.89 [3.40-4.39]	65.37 [64.17-66.57]
66-74	3.65*** [2.94-4.37]	33.52*** [31.71-35.32]	5.04*** [4.21-5.86]	57.77 [55.89-59.65]
>=75	4.84*** [3.65-6.02]	44.29*** [41.52-47.05]	5.25*** [4.03-6.48]	45.61 [42.84-48.37]
Education				
Illiterate®	2.64 [2.24-3.05]	32.48 [31.25-33.71]	4.07 [3.55-4.59]	60.79 [59.51-62.06]
Primary	4.27*** [3.32-5.23]	31.67 [29.53-33.82]	5.17** [4.13-6.20]	58.87 [56.62-61.12]
Secondary	4.41*** [3.24-5.59]	27.98** [25.59-30.37]	4.79 [3.64-5.95]	62.79 [60.25-65.34]
Higher Secondary	1.80 [0.52-3.09]	31.16 [27.01-35.32]	4.26 [2.45-6.08]	62.75 [58.47-67.03]
Marital Status				
Married®	3.04 [2.57-3.51]	31.59 [30.37-32.80]	4.12 [3.60-4.64]	61.24 [59.98-62.49]
Widowed	3.29 [2.62-3.97]	31.58 [29.70-33.46]	5.00 [4.08-5.93]	60.11 [58.10-62.11]
Others	2.98 [0.11-5.84]	34.64 [26.84-42.45]	2.86 [0.09-5.62]	59.50 [51.49-67.52]
Religion				
Hindu®	3.30 [2.62-3.97]	29.22 [27.46-30.97]	4.64 [3.84-5.45]	62.82 [60.97-64.68]
Others	2.78 [2.36-3.20]	32.99*** [31.80-34.18]	3.89 [3.39-4.38]	60.33 [59.09-61.56]
Muslims	3.03 [1.90-4.16]	28.96 [26.08-31.84]	5.35** [3.89-6.81]	62.64 [59.58-65.70]
Christian, Jain, Sikh	6.64*** [4.43-8.86]	32.82** [28.54-37.09]	7.01 [4.73-9.30]	53.51 [49.01-58.00]
Living Arrangement				
Living Alone®	3.48 [3.01-3.96]	32.25 [31.05-33.44]	4.25 [3.73-4.76]	60.00 [58.76-61.25]
Living with Family	2.53** [1.98-3.07]	30.46* [28.83-32.09]	4.63*** [3.85-5.41]	62.37 [60.65-64.08]

®-reference category; *** p<0.001, **p<0.05, *p<0.10

In one of the studies by Laditka et al., it was found that the elderly in rural areas in China are expected to spend more time in impairment than the elderly living in urban areas. Similarly, in this study, the prevalence of disability among the elderly is lower among elderly who are in urban areas than their counterparts. On the other hand, 2.64 percent of illiterate elderly, 4.27 percent of elderly who have completed primary school, 4.41 percent of elderly who have completed secondary school, and 1.80 percent of elderly who have completed higher secondary school, have experienced changes in their ADL status. Around 5 percent of widowed elderly and 4.12 percent

of married elderly had no ADL in round one but got some difficulty in performing a few ADLs from the given eight ADLs. Whereas 32.82 percent of Christian, Jain, Sikhs and 29.22 percent of Hindus, and 28.96 percent of Muslims had no ADL in round one, but in round two, they found some difficulty in performing ADL. Almost 60 percent of elderly who are living alone and 62.37 percent of elderly who are living with their family haven't experienced any change in their ADL status from round one to round two.

4.3 Changing pattern of major morbidity and its Socio-economics characteristics

To understand the transition of chronic morbidity among the elderly population in India, we have created a transition matrix of change in the morbidity status of the elderly. Table 4 shows the transition matrix of chronic morbidity in both rounds of IHDS. Our analysis shows that 68.38 percent of people have no morbidity in both rounds. At the same time, 22.6 percent of the elderly population had no morbidity in round one and got at least one morbidity in round two.

Table 1: Transition Matrix of change in Morbidity Status among elderly from IHDS-I to IHDS-II

IHDS-1	IHDS-2			
	No Morbidity	One Morbidity	Two to Four Morbidity	More than Four Morbidity
No Morbidity	68.38	22.60	8.82	0.20
One Morbidity	0	47.05	50.75	2.21
Two to Four Morbidity	0	0	83.18	16.82
More than 4 Morbidity	0	0	66.67	33.33

Similarly, 8.82 percent of elderly had no morbidity in round one and got two to four morbidities in round two, and 0.2 percent of elderly had no morbidity in round one and got more than four chronic morbidities in round two. Almost 47.05 percent of the elderly had at least one morbidity in both rounds of IHDS. There was around 50.75 percent of the elderly who had one morbidity in round one and shifted to two to four morbidities in round two. Similarly, 2.21 percent of the elderly had one morbidity in round one, who have got more than four chronic morbidities in round two. Moreover, 83.18 percent of the elderly had two to four morbidities in round one and in round two. There was 16.82 percent of elderly who had two to four morbidity in round one and then shifted to more than four morbidities in round two. Around 66.67 percent of the elderly had more than

four morbidities in round one, who had shifted to two to four morbidities in round two. There was 33.33 percent of the elderly who had more than four morbidities in both rounds of IHDS.

Table 5 represents the transition matrix of change in status of morbidity from IHDS round one to round two. Given table shows that 10.23 percent of the elderly haven't faced any changes in the status of morbidity from round one to round two. At the same time, 7.75 percent of the elderly have experienced a change in their morbidity status in both rounds.

Table5: Transition Matrix of change in Morbidity with background characteristics Status among elderly from IHDS-I to IHDS-II

Background Characteristics	No Morbidity in both the Rounds	No Morbidity in round one to Morbidity in round two	No Change in Morbidity Status	Change in Morbidity Status	n
Sex					
Male	56.69	26.13	9.89	7.29	5033
Female	55.94	25.34	10.55	8.18	5490
Residence					
Rural	59.23	25.20	9.03	6.54	7753
Urban	48.09	27.15	13.61	11.16	2770
Age					
60-65 Years	58.12	24.93	9.51	7.45	6406
66-74 Years	53.56	26.72	11.20	8.52	2769
75 + Years	53.26	27.37	11.72	7.64	1348
Education					
Illiterate	60.66	24.27	8.92	6.15	6472
Primary	50.51	27.33	12.39	9.78	1881
Secondary	49.91	28.47	11.38	10.25	1591
Higher Secondary	44.40	28.42	14.92	12.26	563
Marital Status					
Married	55.93	26.02	10.36	7.69	5568
Widowed	56.68	25.26	10.30	7.76	4755
Others	57.50	28.00	5.00	9.50	200
Religion					
Hindu	52.76	26.57	11.92	8.74	2826
Muslim	51.83	28.41	9.88	9.88	982
Christian, Jain, Sikh	45.45	27.06	12.68	14.80	473
Others	59.45	24.81	9.32	6.42	6232
Living Arrangement					
Living Alone	56.72	25.18	10.33	7.77	6731
Living with Family	54.97	26.95	10.16	7.92	3662
Total	56.30	25.72	10.23	7.75	10523

Around 25.72 percent of the elderly had no morbidity in round one but got morbidity in round two. In comparison, 56.30 percent of the elderly had no morbidity in both rounds. In India, 56.69 percent of male elderly and 55.94 percent of female elderly had no morbidity in both rounds. In contrast, 26.13 percent of males and 25.34 percent of females had no morbidity in round one but got morbidity in round two. Around 9.89 percent of males and 10.55 percent of females haven't experienced any change in morbidity status from round one to round two. While 7.29 percent of males and 8.18 percent of females have experienced changes in their morbidity status.

In the rural area, 59.23 percent of the elderly didn't have any morbidity in both rounds, whereas in the urban area, this percentage is around 48.09 percent. Almost 25.2 percent of rural elderly and 27.15 percent of urban elderly had no morbidity in round one but got morbidity in round two. While 6.54 percent elderly of in rural areas and 11.16 percent elderly of in urban areas have experienced some changes in their morbidity status from round one to round two. An analysis of morbidity patterns clearly indicate that by age, the burden of ailment or morbidity increases (NSSO, 2006). Therefore, in this study, we can see that there is around 24.93 percent of elderly in the age group 60 to 65 years, 26.72 percent elderly of age group 66 to 74 years, and 27.37 percent of elderly in the age group 75 years and above had no morbidity in round one, but in round two they have got morbidity.

A study by Gertrudis I.J.M et al., 1999, found that level of education has a weak but significant unique contribution to chronic morbidity. Results of our study show that around 60.66 percent of elderly who are illiterates, 50.51 percent of elderly who have completed primary education, 49.91 percent of elderly who have completed secondary education, 44.4 percent of elderly who have completed higher secondary education have no morbidity in both the rounds. But if we move further, we can see that 24.27 percent of elderly who are illiterates, 27.33 percent of elderly who have completed primary education, 28.47 percent of elderly who have completed secondary education, 28.42 percent of elderly who have completed higher secondary education, they have shifted from no morbidity in round one to morbidity in round two. Almost 7.76 percent of widowed elderly and 7.69 percent of married elderly have faced some changes in morbidity status, and 10.30 percent of widowed and 10.36 percent of married elderly haven't experienced any change in their morbidity status. Almost 28.41 percent of Muslim elderly, 27.06 percent of Christian, Jain, Sikh elderly, 26.57 percent of Hindu elderly, and 24.81 percent of OBC, Dalit, and Adivasi had no morbidity in round one, but in round two, they have got morbidity. Almost 56.72 percent of elderly

who are living alone and 54.97 percent of elderly who are living with their family had no morbidity in both rounds. Whereas 25.18 percent of elderly who are living alone and 26.95 percent of elderly who are living with their family had no morbidity in round one but have got morbidity in round two.

Table 6: Multinomial regression: Adjusted percentage for change in Morbidity Status among elderly in India from IHDS-I to IHDS-II

Background Characteristics	No Morbidity in both the Rounds	No Morbidity in round one to Morbidity in round two	No Change in Morbidity Status	Change in Morbidity Status
Sex				
Male®	58.63 [57.14-60.12]	25.41 [24.09-26.63]	9.30 [8.43-26.60]	6.64 [5.93-7.34]
Female	53.36 [51.90-54.82]	26.21** [24.89-27.52]	11.20*** [10.24-12.17]	9.21*** [8.30-10.12]
Residence				
Rural®	57.91 [56.77-59.04]	25.62 [24.60-26.63]	9.41 [8.73-10.10]	7.04 [6.44-7.65]
Urban	50.63 [48.63-52.63]	26.99*** [25.21-28.77]	12.55*** [11.25-13.85]	9.81*** [8.67-10.94]
Age				
60-65®	57.95 [56.71-59.18]	24.95 [23.86-26.05]	9.60 [8.85-10.34]	7.48 [6.82-8.14]
66-74	53.55 [51.66-55.43]	26.78*** [25.09-28.48]	11.07*** [9.88-12.26]	8.58** [7.52-9.64]
>=75	51.45 [48.70-54.20]	28.58*** [26.05-31.11]	11.82*** [10.02-13.62]	8.13* [6.59-9.64]
Education				
Illiterate®	60.28 [58.98-61.57]	24.70 [23.55-25.85]	8.85 [8.10-9.61]	6.15 [5.51-6.79]
Primary	50.33 [48.03-52.63]	26.99*** [24.95-29.04]	12.17*** [10.64-13.69]	10.49*** [9.07-11.92]
Secondary	49.66 [47.04-52.28]	28.32*** [25.94-30.70]	11.83*** [10.13-13.54]	10.16*** [8.58-11.75]
Higher Secondary	44.96 [40.58-49.33]	28.93*** [24.92-32.93]	15.28*** [12.10-18.47]	10.81*** [8.14-13.48]
Marital Status				
Married®	55.66 [54.39-56.93]	26.36 [25.23-27.50]	9.98 [9.21-10.76]	7.97 [7.27-8.68]
Widowed	56.44 [54.39-58.50]	25.11 [23.28-26.93]	10.99 [9.68-12.31]	7.43 [6.36-8.51]
Others	60.07 [52.11-68.03]	20.48 [13.83-27.13]	8.16 [3.73-12.59]	11.27 [6.24-16.30]
Religion				
Hindu®	54.95 [53.04-56.86]	25.85 [24.16-27.45]	11.07 [9.89-12.25]	8.11 [7.10-9.12]
Others	57.70 [56.45-58.96]	25.21** [24.39-26.62]	9.91** [9.13-10.69]	6.86** [6.19-7.52]
Muslims	51.03 [47.86-54.19]	28.90 [26.00-31.81]	9.90 [8.00-11.80]	10.15** [8.23-12.08]
Christian, Jain, Sikh	49.88 [45.36-54.41]	26.20 [22.24-30.16]	10.96 [8.25-13.67]	12.94*** [10.08-15.80]
Living Arrangement				
Living Alone®	56.34 [55.08-57.59]	25.48 [24.36-26.60]	10.24 [9.47-11.01]	7.93 [7.24-8.62]
Living with Family	55.28 [53.52-57.04]	26.64*** [25.06-28.22]	10.34*** [9.24-11.44]	7.72*** [6.79-8.66]

®-reference category; *** p<0.001, **p<0.05, *p<0.10

Table 6 shows the adjusted percentage for morbidity change among the elderly in India from round one to round two of the IHDS survey. The prevalence of morbidity is significantly greater among females than males in India. Almost 9.21 percent of females and 6.64 percent of males have experienced changes in the health status of the elderly from round one to round two. At the same time, 9.30 percent of males and 11.20 percent of females haven't experienced any change in both rounds. In the urban area, 50.63 percent of the elderly have no morbidity in both rounds. But this percentage is 57.91 percent for the elderly who are staying in the rural area. Given table shows that the prevalence of morbidity is increasing with age, as 24.95 percent of elderly who are in the age group 60-65 years, 26.78 percent of elderly in the age group 66-74 years, and 28.58 percent of elderly in the age group 75 plus had no morbidity in round one but they have got some kind of morbidity in round two.

The prevalence of morbidity has changed for married and widowed elderly. Around 7.97 percent of married elderly and 7.43 percent of widowed elderly have experienced changes in their health status from round one to round two. According to the religion of person, 11.07 percent of Hindu, 9.90 percent of Muslim, 10.96 percent of Christian, Jain and Sikh haven't experienced any change in their morbidity status from round one to round two. Around 56.34 percent of elderly who are living alone and 55.28 percent of elderly who are living with their family had no morbidity in both the rounds.

4.4 Summary

This chapter deals with the transition of ADLs and chronic morbidity from round one of IHDS to round two. As the level of disability increases with an increase in age of a person, so from the given study, we can see that in these five years, almost one-third of the elderly population who don't have any difficulty in round one has shifted to difficulty in the next round. We can also see that there are elderly who have moved from difficulty to no difficulty in some exceptional cases, or we can say that this has happened due to improvement in the health care system or improvement in morbidity rates. From the given study, we can conclude that the level of disability decreases with the increase in the socio-economic status of a person. The transition shows that males, who have a good economic condition, belong to urban areas, have at least more than ten years of schooling, have lesser chances of getting disabled than females who belong to weaker sections of the society, are illiterate, and reside in rural areas. Similarly, the transition of chronic morbidity

shows that around thirty percent of the elderly population has shifted from no major morbidity in round one to morbidity in round two.

Chapter 5

Effect of change in ADL due to chronic morbidity

Chapter 5

Effect of change in ADL due to chronic morbidity

5.1 Effect of change in ADL due to chronic morbidity and with associated factors

Functional disability is mostly prevalent in older adults, and many studies have found that there will be a rise in the severity of the disability with rising age. In the coming decades, India will witness a higher pace of growth among the older population after China, which will lead to a severe challenge to its medical resources (Hou et al., 2019). The rise in the aging population and the increase in disease disability have become an increasingly prominent issue that needs greater attention in the upcoming years (Hou et al., 2019). These health objectives should not solely concentrate on morbidity or mortality prevalence but also on the healthy years of the elderly population (Croix et al., 2005).

Along with this rise in aging and disease, there will be a rise in health inequality. Performing daily routines is an essential aspect of everyday life (Mor V et al., 1994). In many of the studies, ADL disability has been found to be either in a dormant state or an inevitable worsening process; however, significant research has identified that this disability is not stable (Hoffman et al., 2010). This concept has become increasingly crucial for understanding transition, and factors associated with the transition will help us deliver better health care to the elderly.

There are several studies that have focused on how morbidity is associated with ADL and how it affects ADL in various manner. A study by Linda P Fried et al. 1999, gave substantial evidence that physical disability results from chronic morbidity, which is directly associated with the presence and severity of the disability. In this study, we are going to see the change in ADL index score due to change in morbidity index or with other associated factors among the elderly in India from IHDS-I to IHDS-II. Here we have a full specification of the effect of major morbidity on the health status of the individual. For major morbidity, we have a positive effect, suggesting that with an increase in major morbidity, we have more functional limitations among the elderly, which is also found to be consistent with other previous studies as already stated above. The results suggest

that with having major morbidity is associated with an increased burden of ADL among the elderly in India.

There are also some studies that have proved that how interaction with specific diseases is one of the major factors in causing disability among the elderly. But Martin and Freedman's (2000) findings from 1984 and 1994 suggest that the self-reported prevalence of chronic morbidity has less debilitating effects on disability. Also, in some of the western countries, it was found that decreasing disability has been reported implying a postponement of disabilities even after there is a rise in chronic diseases (Christensen et al., 2009). But comparing long-term trends or by studying longitudinal data will help to further compare or distinguish between these theories given by various researchers.

Table 7: Fixed Effect Method: Effect of change in ADL due to Morbidity and other factors among elderly in India from IHDS-I to IHDS-II

Background Characteristics	Effect of Change in ADL
Morbidity Index	92.68*** [85.28-100.08]
Age	
66-74 years	6.04*** [5.20-6.88]
75 or more years	15.80*** [14.48-17.12]
Education	
Primary	0.83 [-0.91-2.57]
Secondary	-0.35 [-2.79-2.08]
Higher Secondary	-0.26 [-4.47-3.95]
Marital Status	
Widowed	6.10*** [4.55-7.64]
Others	4.09* [-0.04-8.22]
Religion	
Others	0.47 [-1.31-2.27]
Muslim	3.42 [-7.15-14]
Christian Jain Sikh	3.34 [-1.45-8.13]
Wealth Quintile	
Poorer	-1.64** [-3.23—0.05]
Middle	-2.58*** [-4.41—0.74]
Richer	-2.61** [-4.78—0.43]
Richest	-2.48* [-5.04-0.07]
No. of Person in Family	0.37** [0.06-0.69]
No. of Children	-1.19*** [-1.69—0.69]

®-reference category; *** p<0.001, **p<0.05, *p<0.10

Apart from that, many studies have found that functional limitation or limitation in ADL is strongly associated with the chronological age of a person (Joshi K. et al., 2003), which is found to be true in this study too. In this study, age is found to be positively associated with ADL limitation, which means that with the increase in age, there is an increase in functional limitations among the elderly.

There are several studies that identified age, education, and marital status, religion, economic status as an impact on the disability of the elderly (Saikia et al., 2016; Pou & Goli, 2013). Similarly, in the results, we found age, marital status, and the number of people in a family are positively associated while wealth and number of children are negatively associated. Education and religion of the elderly are not found to be statistically significant in our results.

Many studies have cited the longevity advantage of being married over their counterparts (Noreen Goldman et al., 1995). Married persons live longer, healthier, and happier than single persons (House JS et al., 1988). In the same way, a lot of studies have also found that widowed elderly are at higher risk of being functionally disabled as compared to married elderly (Hui Liu et al., 2013). This study shows that marital status is positively associated with a change in ADL.

For the wealth quintile also, we have found that there is a negative relationship between wealth and the ADL index and that increase in the wealth quintile has an increase effect on functional limitations among the elderly.

5.3 Summary

In this chapter, we assess the relative importance of determining the relationship between ADL and chronic morbidity. Here in this study, we have examined the linkage between the functioning of older adults and chronic morbidity with their associated factors while controlling all demographic shifts. We can see that chronic morbidity is positively associated with ADL. The results clearly suggest that with an increase in chronic morbidity, disability among the elderly or the functioning of their body will get affected, or the disability prevalence will also increase. An aggregate decline will occur in functioning if the person has some kind of major morbidity. We can also say that a reduction in severity can also be observed in functioning if the person has no chronic morbidity. Other associated factor shows that apart from Age, Marital Status, and Religion, all other elements are negatively correlated with ADL. It suggests that there is a negative relationship between Education, Wealth Quintile, and the Number of Children.

A clear understanding of the contribution of these associated factors will provide insights into the continuing debate and will also facilitate anticipation of future patterns of old age functioning with chronic morbidity and planning for related medical and social services for future generations.

Chapter 6

Summary and Conclusion

Chapter 6

Summary and Conclusion

6.1 Conclusion-

As a result of increasing the size and proportion of the elderly in India, the importance of studying the prevalence of disability and its association with chronic morbidity with other socio-economic determinants has become even more critical and has been the aim of this study. This study has attempted to throw attention on the ADL profile of elderly in India and its association with chronic morbidity and with other associated factors. This study has found that the prevalence of disability in ADL, among the elderly has increased from IHDS-I to IHDS-II, and a similar result was observed in the Census 2001 to 2011 (Census of India, 2001,2011). The prevalence of disability in males is higher than in females in both rounds of IHDS, which is consistent with some of the previous studies done by various researchers (Medhi GK et al., 2006). This study has also found that the burden of disability is observed to be more in rural areas as compared to urban areas, similar findings has been observed in a study by Keshari P et al., 2017. The disability is inversely proportional to age; as age increases, the difficulty level in performing ADL for the elderly also increase.

The level of disability also varies from the level of education as the prevalence would be higher among illiterates than literates (Filmer D., 2008). Findings of this study also suggests that the prevalence of disability could be seen as higher among widows than among the elderly who are married, which shows consistent results if compared to other studies (Lee S et al., 2005). We have also found that people who have more than two morbidities or have any morbidity have higher chances of getting disabled than people who have no morbidity. The prevalence of disability among SC/ST and OBC is quite similar; no significant difference can be seen in the first round of IHDS, while the difference has increased from 1percent to 3percent in the second round. Muslims are more vulnerable to getting disabled than Hindus and other religions. The prevalence of household wealth can be attributed to the fact that the wealthier stratum of society has a higher level of disability (Wolff JL et al., 2002).

Aging is one of the primary reasons for the difficulties in mobility, which is also explicit in our results. The study shows that from the given seven types of ADLs (Walking, toilet, speaking, hearing, dressing, far sight, short sight), the highest percentage of elderly face more difficulty while walking one km distance, in far sight as well in short sight. This includes majorly the proportion of old-old ages or those who are more than 75 years above as due to having other various types of morbidity conditions, they are less mobile than young older adults who are less than 65 years old while lowest percentage of difficulty can be seen in speaking and dressing.

Secondly we have seen the transition of ADL and chronic morbidity among elderly. The results of this study show that, from round one of IHDS to round two, the status of ADL among the elderly has changed. Almost 30 percent of people who had no difficulty in ADL in round one have shifted to difficulty in ADL in round two and vice-versa. A higher number of females have observed some changes in the status of ADL from round one to round two. Similarly, the status of disability has changed for people who live in rural areas more than in urban areas. The transition of disability from round one to round two have not affected the young-old (60-65) adults, while it has affected the middle-old (66-74) ages and old-old ages(75plus). There is a higher percentage of illiterates who have no difficulty in ADL in round one and have shifted to difficulty in round two. At the same time, this percentage is smaller for literates. A higher number of widowed persons have observed changes in the status of disability from round one to round two than married persons.

This study explored the role of various chronic morbidity in explaining the overall functioning of older adults. Our result shows that in both the rounds of IHDS, chronic condition or having any type of major morbidity had a more significant impact on difficulty while doing activities of daily living among elderly aged 60 years and above. Age, marital status, religion, and education are some of the significant predictors of difficulty in all the above mention ADLs. The percentage of older adults having any type of major morbidity has increased from the first round of IHDS to the second round of IHDS, which also results in increasing difficulty while performing ADLs. This shows that having any type of major morbidity has a massive impact on ADLs. That is why we have also examined how much effect does chronic morbidity has over all types of ADLs. Our result shows that chronic morbidity has a positive impact on ADL, which suggests that an increase in major morbidity will also increase the limitation of ADL. Therefore, we can say that morbidity is clearly associated with an increased burden of disability among older adults in India. It also

suggests that in both rounds, chronic morbidity has a more debilitating effect on functioning. Therefore, our study identifies how earlier treatment or management is required for the improvement in old age functioning. Such finding has very important implications for the planning of future medical services and the well-being of the elderly.

From this study, it is evident that there is a rise in chronic morbidity and disability prevalence over the period; the most affected are males and persons in rural areas. The vulnerable socio-economic groups who have any kind of major morbidity have higher chances of facing difficulty in ADL. So along with the given epidemiological transition, the rise of disability will add more burden to the existing health systems. In order to reap the window of opportunity for a country, we have to give special attention to the elderly population, as the elderly population plays a significant role in decision making and economic and non-economic activities. So providing a proper health care system, socio-economic support, institutional care, and long-term care can enhance healthy aging and reduce the rate of morbidity as well as mortality.

6.2 Limitations of the Study-

Severity aspects of disability are missing in the data of IHDS. Given data lacks the information on whether the person is disabled from birth or the disability is due to his chronological age. Even though IHDS data provides information on the activity of daily living of the elderly, a detailed longitudinal study on a larger scale will be more helpful in identifying the transition of disabilities in India.

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APPENDIX

Table 8: Percentage of elderly suffering from functional limitation with various background characteristics among elderly, IHDS-1 (2005-06)

Background Characteristics	Difficulty in Walking 1 KM			Difficulty in Toileting			Difficulty in Dressing		
	No Difficulty	With Difficulty	Unable to Do	No Difficulty	With Difficulty	Unable to Do	No Difficulty	With Difficulty	Unable to Do
Chronic Morbidity									
No	96.40	2.47	1.13	97.87	1.16	0.97	98.30	0.77	0.93
Yes	83.91	10.91	5.17	91.02	5.57	3.41	92.62	4.39	2.99
Sex									
Male	94.58	3.46	1.95	96.66	1.76	1.58	97.31	1.38	1.31
Female	92.83	5.13	2.04	96.13	2.46	1.41	96.83	1.73	1.44
Residence									
Rural	93.61	4.37	2.03	96.31	2.17	1.52	97.02	1.58	1.40
Urban	94.08	4.02	1.90	96.67	1.91	1.41	97.26	1.47	1.27
Age									
60-65 Years	95.89	3.04	1.06	97.63	1.47	0.90	98.18	1.01	0.81
66-74 Years	93.05	5.03	1.93	96.21	2.32	1.47	96.89	1.73	1.37
75 + Years	88.60	6.69	4.70	93.22	3.60	3.19	94.25	2.81	2.94
Education									
Illiterate	93.89	4.08	2.04	96.24	2.20	1.55	96.98	1.58	1.44
Primary	92.62	5.34	2.04	96.64	1.93	1.42	97.49	1.38	1.13
Secondary	93.36	4.88	1.76	96.13	2.46	1.41	96.60	2.02	1.38
Higher Secondary	96.49	1.47	2.04	98.36	0.40	1.24	98.37	0.39	1.24
Marital Status									
Married	94.68	3.71	1.61	96.89	1.81	1.30	97.37	1.43	1.20
Widowed	92.08	5.27	2.65	95.58	2.59	1.82	96.56	1.79	1.65
Others	93.79	4.17	2.04	95.88	2.64	1.48	97.53	0.78	1.69
Religion									
Hindu	94.16	4.44	1.40	96.90	2.10	1.00	97.59	1.49	0.92
Muslim	93.89	4.48	1.63	96.61	1.84	1.55	97.17	1.35	1.48
Christian, Jain, Sikh	85.23	10.64	4.14	94.99	3.25	1.76	96.03	2.25	1.72
Others	94.02	3.82	2.16	96.25	2.09	1.67	96.92	1.57	1.51
Wealth Quintile									
Poorest	92.52	5.07	2.41	95.39	2.90	1.70	96.18	2.27	1.55
Poorer	94.67	3.40	1.93	96.42	2.09	1.49	97.26	1.09	1.65
Middle	94.11	3.92	1.97	96.39	1.97	1.64	97.00	1.63	1.36
Richer	94.11	4.38	1.51	96.94	1.72	1.34	97.64	1.24	1.12
Richest	93.22	4.68	2.10	97.05	1.71	1.24	97.48	1.43	1.09
Living Arrangement									
Living Alone	93.70	4.28	2.02	96.54	2.02	1.43	97.31	1.37	1.33

Living with Family	93.73	4.29	1.97	96.22	2.21	1.57	96.81	1.76	1.43
Total	93.72	4.29	2.00	96.40	2.11	1.50	97.08	1.55	1.37

Cont...

Background Characteristics	Difficulty in Hearing			Difficulty in Speaking			Difficulty in Far Sight		
	No Difficulty	With Difficulty	Unable to Do	No Difficulty	With Difficulty	Unable to Do	No Difficulty	With Difficulty	Unable to Do
Chronic Morbidity									
No	97.02	2.31	0.66	98.40	1.01	0.59	95.28	3.54	1.18
Yes	91.19	5.86	2.96	93.56	3.95	2.50	83.48	12.26	4.26
Sex									
Male	96.32	2.76	0.92	97.56	1.59	0.84	93.46	4.87	1.67
Female	95.20	3.40	1.40	97.15	1.68	1.16	92.02	5.97	2.01
Residence									
Rural	95.55	3.26	1.19	97.26	1.70	1.03	92.60	5.33	2.07
Urban	96.46	2.49	1.05	97.68	1.42	0.90	93.21	5.69	1.10
Age									
60-65 Years	97.34	1.77	0.89	98.30	0.81	0.90	94.71	3.98	1.31
66-74 Years	95.21	3.51	1.28	97.01	2.11	0.89	91.80	6.36	1.84
75 + Years	92.18	6.09	1.73	95.26	3.28	1.46	88.61	8.05	3.34
Education									
Illiterate	95.53	3.21	1.26	97.28	1.61	1.11	93.35	4.59	2.06
Primary	96.03	3.13	0.84	97.52	1.73	0.76	90.89	7.43	1.67
Secondary	95.83	2.94	1.23	97.15	1.88	0.96	91.68	6.87	1.46
Higher Secondary	97.95	1.46	0.59	98.60	0.92	0.49	94.47	4.79	0.75
Marital Status									
Married	96.27	2.62	1.11	97.55	1.44	1.00	93.47	4.71	1.83
Widowed	94.85	3.92	1.23	97.03	2.00	0.96	91.47	6.63	1.90
Others	97.60	1.29	1.11	97.45	0.64	1.91	94.13	4.93	0.94
Religion									
Hindu	95.81	3.21	0.98	97.92	1.50	0.58	92.73	5.92	1.35
Muslim	95.30	3.77	0.93	97.40	1.92	0.68	93.69	5.02	1.29
Christian, Jain, Sikh	94.57	4.84	0.59	96.26	2.63	1.11	82.51	16.12	1.37
Others	95.90	2.81	1.30	97.20	1.59	1.21	93.21	4.64	2.15
Wealth Quintile									
Poorest	94.68	3.60	1.72	96.73	1.68	1.59	92.49	4.67	2.83
Poorer	96.12	2.69	1.18	97.61	1.30	1.09	93.72	4.49	1.80
Middle	95.66	3.16	1.18	96.90	2.15	0.95	93.00	5.03	1.97
Richer	95.97	3.21	0.81	97.97	1.35	0.68	93.01	5.80	1.19
Richest	96.62	2.63	0.76	97.76	1.68	0.56	91.34	7.47	1.20
Living Arrangement									
Living Alone	96.18	2.85	0.96	97.77	1.42	0.81	92.98	5.60	1.42
Living with Family	95.29	3.33	1.38	96.88	1.89	1.22	92.47	5.20	2.32
Total	95.77	3.07	1.16	97.36	1.64	1.00	92.75	5.41	1.84

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Background Characteristics	Difficulty in Short Sight			N
	No Difficulty	With Difficulty	Unable to Do	
Chronic Morbidity				
No	96.80	2.29	0.91	14056
Yes	87.16	9.67	3.17	3847
Sex				
Male	95.43	3.32	1.25	9064
Female	94.01	4.45	1.54	8839
Residence				
Rural	94.69	3.84	1.47	13659
Urban	94.86	4.00	1.14	4244
Age				
60-65 Years	96.20	2.83	0.97	9573
66-74 Years	94.04	4.46	1.50	4906
75 + Years	91.59	5.98	2.43	3424
Education				
Illiterate	95.11	3.48	1.41	11426
Primary	93.48	4.98	1.54	3048
Secondary	94.05	4.64	1.31	2578
Higher Secondary	96.05	3.00	0.94	850
Marital Status				
Married	95.23	3.48	1.29	11122
Widowed	93.86	4.54	1.60	6538
Others	95.24	4.18	0.58	243
Religion				
Hindu	95.02	3.96	1.02	4356
Muslim	95.09	3.84	1.07	1738
Christian, Jain, Sikh	87.73	10.44	1.84	662
Others	94.97	3.46	1.57	11146
Wealth Quintile				
Poorest	94.77	3.97	1.26	3938
Poorer	95.49	2.90	1.61	3732
Middle	94.49	3.82	1.69	3755
Richer	94.92	4.00	1.08	3286
Richest	93.86	4.85	1.28	3190
Living Arrangement				
Living Alone	95.10	3.75	1.16	9569
Living with Family	94.30	4.03	1.67	8325
Total	94.73	3.88	1.39	17904

Table 9: Percentage of elderly suffering from functional limitation with various background characteristics among elderly, IHDS-2 (2011-12)

Background Characteristics	Difficulty in Walking 1 KM			Difficulty in Toileting			Difficulty in Dressing		
	No Difficulty	With Difficulty	Unable to Do	No Difficulty	With Difficulty	Unable to Do	No Difficulty	With Difficulty	Unable to Do
Chronic Morbidity									
No	85.32	10.01	4.67	94.49	3.60	1.91	96.18	2.38	1.44
Yes	64.41	21.80	13.79	84.69	10.48	4.83	88.74	6.75	4.51
Sex									
Male	82.32	11.67	6.02	92.88	4.79	2.34	95.17	2.85	1.98
Female	74.19	16.32	9.48	89.47	7.07	3.45	92.16	4.86	2.98
Residence									
Rural	77.70	14.42	7.88	90.91	6.12	2.98	93.67	3.82	2.51
Urban	79.17	13.21	7.62	91.64	5.60	2.75	93.52	4.01	2.47
Age									
60-65 Years	85.96	10.07	3.97	95.39	3.15	1.46	96.92	1.89	1.19
66-74 Years	77.44	14.84	7.72	91.75	5.86	2.39	94.06	3.70	2.24
75 + Years	62.23	21.59	16.18	81.05	12.17	6.78	85.91	8.43	5.66
Education									
Illiterate	75.89	15.25	8.86	90.13	6.51	3.37	92.57	4.50	2.93
Primary	78.65	14.19	7.17	90.74	6.74	2.52	94.37	3.55	2.08
Secondary	82.24	11.64	6.11	93.23	4.39	2.39	95.28	2.74	1.98
Higher Secondary	86.55	9.14	4.31	95.62	3.07	1.31	96.72	2.15	1.13
Marital Status									
Married	83.11	11.55	5.34	93.66	4.35	1.99	95.75	2.55	1.71
Widowed	70.22	18.01	11.77	87.04	8.59	4.37	90.12	6.09	3.79
Others	76.41	15.77	7.82	91.13	5.50	3.37	94.89	2.81	2.30
Religion									
Hindu	80.64	12.04	7.32	92.75	4.81	2.44	95.08	2.93	1.99
Muslim	78.75	13.25	7.99	89.85	6.45	3.7	92.5	4.3	3.2
Christian, Jain, Sikh	65.88	23.19	10.93	87.9	8.94	3.16	91.82	5.07	3.11
Others	77.63	14.56	7.81	90.86	6.18	2.96	93.33	4.11	2.56
Wealth Quintile									
Poorest	76.57	15.02	8.42	89.50	7.27	3.23	92.77	4.69	2.54
Poorer	77.69	13.82	8.49	91.02	6.17	2.80	93.76	4.05	2.18
Middle	78.68	13.66	7.67	92.08	4.77	3.15	94.11	3.22	2.67
Richer	78.83	14.21	6.96	91.32	5.74	2.94	93.46	3.83	2.71
Richest	79.40	13.34	7.26	92.22	5.41	2.37	94.26	3.34	2.41
Living Arrangement									
Living Alone	76.34	14.97	8.69	90.10	6.32	3.58	92.69	4.25	3.06
Living with Family	79.57	13.34	7.09	91.96	5.65	2.39	94.37	3.58	2.05
Total	78.14	14.06	7.80	91.12	5.96	2.91	93.62	3.88	2.50

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Background Characteristics	Difficulty in Hearing			Difficulty in Speaking			Difficulty in Far Sight		
	No Difficulty	With Difficulty	Unable to Do	No Difficulty	With Difficulty	Unable to Do	No Difficulty	With Difficulty	Unable to Do
Chronic Morbidity									
No	92.40	6.13	1.47	96.27	2.77	0.97	86.91	10.44	2.65
Yes	85.38	11.54	3.08	91.82	5.91	2.27	72.03	22.23	5.74
Sex									
Male	91.09	7.15	1.76	95.75	3.01	1.24	84.47	12.43	3.10
Female	88.95	8.77	2.28	93.79	4.63	1.58	79.28	16.44	4.28
Residence									
Rural	89.29	8.56	2.15	94.64	3.97	1.39	81.81	14.48	3.70
Urban	91.66	6.62	1.73	94.96	3.56	1.48	81.76	14.51	3.73
Age									
60-65 Years	95.30	3.83	0.87	97.32	1.90	0.79	87.84	9.66	2.50
66-74 Years	90.28	7.78	1.94	95.21	3.33	1.46	80.94	15.77	3.29
75 + Years	78.14	17.22	4.64	88.52	8.78	2.71	69.97	23.13	6.91
Education									
Illiterate	88.32	9.25	2.44	93.79	4.66	1.56	80.00	15.58	4.42
Primary	91.01	7.62	1.37	95.69	3.08	1.22	82.33	14.54	3.13
Secondary	93.44	5.06	1.50	96.17	2.58	1.25	85.16	12.49	2.35
Higher Secondary	93.60	5.10	1.30	97.02	1.94	1.04	87.92	9.67	2.41
Marital Status									
Married	92.72	5.84	1.44	96.37	2.58	1.05	85.15	12.01	2.84
Widowed	85.63	11.40	2.98	92.17	5.82	2.01	76.28	18.58	5.15
Others	89.42	8.54	2.04	93.79	4.77	1.44	83.40	13.39	3.21
Religion									
Hindu	91.12	7.16	1.72	95.78	3.23	0.99	83.28	14.04	2.68
Muslim	91.02	6.88	2.1	93.74	4.72	1.54	82.83	13.51	3.65
Christian, Jain, Sikh	90.6	6.78	2.62	94.64	3.06	2.3	75.87	20.7	3.43
Others	89.39	8.5	2.11	94.51	3.97	1.52	81.35	14.54	4.11
Wealth Quintile									
Poorest	88.12	9.50	2.38	93.74	4.46	1.81	80.03	15.60	4.38
Poorer	88.61	9.28	2.12	94.27	4.55	1.18	81.67	13.89	4.44
Middle	90.54	7.19	2.28	95.10	3.52	1.38	83.03	13.51	3.47
Richer	91.19	7.03	1.77	95.30	3.37	1.32	81.94	14.83	3.23
Richest	92.10	6.39	1.50	95.60	3.11	1.29	82.89	14.29	2.81
Living Arrangement									
Living Alone	89.49	8.42	2.09	94.20	4.11	1.70	80.69	15.20	4.11
Living with Family	90.42	7.62	1.96	95.19	3.63	1.18	82.68	13.93	3.39
Total	89.99	7.99	2.03	94.74	3.85	1.42	81.80	14.49	3.71

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Background Characteristics	Difficulty in Short Sight			N
	No Difficulty	With Difficulty	Unable to Do	
Chronic Morbidity				
No	88.32	9.13	2.56	14392
Yes	76.93	18.07	5.00	7532
Sex				
Male	86.89	10.51	2.60	10636
Female	82.06	13.79	4.15	11288
Residence				
Rural	84.75	11.74	3.51	15442
Urban	83.58	13.30	3.12	6482
Age				
60-65 Years	90.03	8.09	1.88	10378
66-74 Years	83.09	13.54	3.37	6726
75 + Years	74.11	19.19	6.70	4816
Education				
Illiterate	82.98	12.93	4.08	12920
Primary	85.21	11.95	2.84	3829
Secondary	87.16	10.91	1.94	3682
Higher Secondary	88.11	9.54	2.35	1449
Marital Status				
Married	87.62	10.07	2.31	13213
Widowed	78.96	15.91	5.13	8167
Others	88.32	8.25	3.44	543
Religion				
Hindu	85.81	11.81	2.38	5263
Muslim	84.32	11.64	4.04	2106
Christian, Jain, Sikh	80.9	16.69	2.41	606
Others	84.05	12.23	3.71	13928
Wealth Quintile				
Poorest	83.84	11.95	4.21	5318
Poorer	84.68	11.56	3.75	4409
Middle	84.44	12.57	2.99	3841
Richer	84.29	12.74	2.97	4119
Richest	84.91	12.30	2.79	4236
Living Arrangement				
Living Alone	83.17	12.99	3.85	9611
Living with Family	85.38	11.59	3.03	12300
Total	84.40	12.20	3.40	21925

Table 10: Percentage of Prevalence of Activity of Daily Living by various background characteristics among elderly, IHDS-1 (2005-06)

Background Characteristics	No ADL	One ADL	Two ADL	More than two ADL	N
Chronic Morbidity					
No	93.01	2.22	1.93	2.84	14056
Yes	75.80	6.80	6.22	11.19	3847
Sex					
Male	90.50	2.82	2.66	4.03	9064
Female	88.36	3.53	2.98	5.12	8839
Residence					
Rural	89.37	3.03	2.85	4.75	13659
Urban	89.69	3.61	2.71	3.98	4244
Age					
60-65 Years	92.22	2.68	2.28	2.82	9388
66-74 Years	87.88	3.87	3.10	5.15	5015
75 + Years	83.91	3.54	3.92	8.63	3501
Education					
Illiterate	89.98	2.83	2.70	4.49	11426
Primary	87.55	3.80	3.53	5.12	3048
Secondary	88.54	3.74	2.87	4.84	2578
Higher Secondary	91.77	3.78	1.69	2.76	850
Marital Status					
Married	90.60	3.00	2.40	4.00	11122
Widowed	87.40	3.53	3.54	5.53	6538
Others	91.36	1.07	2.57	5.00	243
Religion					
Hindu	89.20	3.56	3.07	4.17	4718
Muslim	90.21	2.83	2.13	4.84	10610
Christian, Jain, Sikh	76.32	7.29	7.50	8.90	1732
Others	90.20	2.83	2.55	4.43	844
Wealth Quintile					
Poorest	88.64	3.03	2.89	5.44	3938
Poorer	91.30	2.23	2.49	3.97	3732
Middle	89.73	2.80	2.81	4.66	3755
Richer	89.50	3.92	2.44	4.14	3286
Richest	87.85	4.11	3.52	4.52	3190
Living Arrangement					
Living Alone	89.43	3.29	2.99	4.28	9569
Living with Family	89.44	3.03	2.62	4.90	8325
Total	89.44	3.17	2.82	4.57	17904

Table 11: Percentage of Prevalence of Activity of Daily Living by various background characteristics among elderly, IHDS-2 (2011-12)

Background Characteristics	No ADL	One ADL	Two ADL	More than two ADL	N
Chronic Morbidity					
No	78.51	6.19	5.28	10.01	14982
Yes	53.37	12.10	10.45	24.09	6942
Sex					
Male	74.54	7.24	6.42	11.79	10636
Female	66.79	8.84	7.38	16.99	11288
Residence					
Rural	70.15	8.39	6.66	14.80	15442
Urban	71.51	7.29	7.51	13.68	6482
Age					
60-65 Years	79.20	7.31	5.76	7.72	10378
66-74 Years	69.33	8.31	7.40	14.97	6726
75 + Years	53.59	9.35	8.73	28.34	4816
Education					
Illiterate	68.10	8.48	7.11	16.31	12920
Primary	71.77	7.42	6.17	14.65	3829
Secondary	74.91	7.48	7.03	10.57	3682
Higher Secondary	78.22	7.58	6.81	7.39	1449
Marital Status					
Married	75.50	7.57	6.23	10.69	13213
Widowed	62.82	8.42	7.96	20.80	8167
Others	66.50	14.58	7.96	10.96	543
Religion					
Hindu	72.34	8.21	7.08	12.36	5263
Muslim	73.19	6.02	5.64	15.15	2106
Christian, Jain, Sikh	58.46	12.79	10.24	18.50	606
Others	69.99	8.12	6.91	14.97	13928
Wealth Quintile					
Poorest	67.61	9.49	7.19	15.70	5318
Poorer	70.19	8.41	6.37	15.03	4409
Middle	72.10	7.14	6.60	14.15	3841
Richer	71.81	6.93	7.21	14.05	4119
Richest	71.98	7.85	7.14	13.03	4236
Living Arrangement					
Living Alone	69.08	7.91	7.17	15.85	9611
Living with Family	71.72	8.20	6.73	13.36	12300
Total	70.55	8.06	6.92	14.47	21925

Table 12: Status of Chronic Morbidity by various background characteristics among elderly, IHDS-1 (2005-06)

Background Characteristics	Morbidity Status		N
	No	Yes	
Sex			
Male	78.16	21.84	9064
Female	78.87	21.13	8839
Residence			
Rural	80.61	19.39	13659
Urban	71.74	28.26	4244
Age			
60-65 Years	80.59	19.41	9573
66-74 Years	76.62	23.38	4906
75 + Years	75.40	24.60	3424
Education			
Illiterate	81.72	18.28	11426
Primary	73.79	26.21	3048
Secondary	72.89	27.11	2578
Higher Secondary	69.34	30.66	850
Marital Status			
Married	78.63	21.37	11122
Widowed	78.07	21.93	6538
Others	84.84	15.16	243
Religion			
Hindu	74.87	25.13	4356
Muslim	78.34	21.66	11146
Christian, Jain, Sikh	63.54	36.46	1738
Others	82.06	17.94	662
Wealth Quintile			
Poorest	85.24	14.76	3938
Poorer	83.78	16.22	3732
Middle	81.79	18.21	3755
Richer	72.85	27.15	3286
Richest	70.24	29.76	3190
Living Arrangement			
Living Alone	80.95	19.05	9569
Living with Family	80.25	19.75	8325
Total	80.63	19.37	17904

Table 13: Status of Chronic Morbidity by various background characteristics among elderly, IHDS-II (2011-12)

Background Characteristics	Morbidity Status		N
	No	Yes	
Sex			
Male	66.57	33.43	10636
Female	64.77	35.23	11288
Residence			
Rural	67.62	32.38	15442
Urban	60.94	39.06	6482
Age			
60-65 Years	68.27	31.73	10378
66-74 Years	64.20	35.80	6726
75 + Years	61.96	38.04	4816
Education			
Illiterate	68.36	31.64	12920
Primary	63.02	36.98	3829
Secondary	60.83	39.17	3682
Higher Secondary	60.98	39.02	1449
Marital Status			
Married	66.01	33.99	13213
Widowed	64.73	35.27	8167
Others	70.62	29.38	543
Religion			
Hindu	65.83	34.17	5263
Muslim	63.41	36.59	2106
Christian, Jain, Sikh	53.31	46.69	606
Others	70.70	29.30	13928
Wealth Quintile			
Poorest	69.80	30.20	5318
Poorer	70.35	29.65	4409
Middle	69.85	30.15	3841
Richer	66.49	33.51	4119
Richest	64.82	35.18	4236
Living Arrangement			
Living Alone	68.37	31.63	9611
Living with Family	68.32	31.68	12300
Total	68.33	31.67	21925

Table 14: Status of Chronic Morbidity by various background characteristics among elderly, IHDS-1 (2005-06)

Background Characteristics	No Major Morbidity	One Major Morbidity	Two to Four Major Morbidity	More than Four Major Morbidity	N
Sex					
Male	78.16	17.14	4.66	0.04	9064
Female	78.87	16.15	4.95	0.03	8839
Residence					
Rural	80.61	15.36	4.01	0.02	13659
Urban	71.74	20.82	7.33	0.10	4244
Age					
60-65 Years	80.59	15.18	4.21	0.01	9573
66-74 Years	76.62	17.63	5.70	0.05	4906
75 + Years	75.40	19.36	5.15	0.09	3424
Education					
Illiterate	81.72	14.81	3.47	0.00	11426
Primary	73.79	20.03	6.10	0.07	3048
Secondary	72.89	19.62	7.40	0.10	2578
Higher Secondary	69.34	20.33	10.12	0.21	850
Marital Status					
Married	78.63	16.39	4.95	0.03	11122
Widowed	78.07	17.29	4.60	0.05	6538
Others	84.84	11.50	3.66	0.00	243
Religion					
Hindu	74.87	2.77	22.23	0.13	4356
Muslim	78.34	3.53	18.13	0.00	1738
Christian, Jain, Sikh	63.54	2.26	33.89	0.31	662
Others	82.06	2.96	14.96	0.02	11146
Wealth Quintile					
Poorest	85.22	2.84	11.89	0.05	3938
Poorer	83.78	4.14	12.07	0.00	3732
Middle	81.79	2.27	15.94	0.00	3755
Richer	72.85	3.18	23.89	0.08	3286
Richest	70.24	2.22	27.35	0.19	3190
Living Arrangement					
Living Alone	78.57	16.92	4.47	0.05	9569
Living with Family	78.44	16.35	5.19	0.02	8325
Total	78.51	16.65	4.80	0.04	17904

Table 15: Status of Chronic Morbidity by various background characteristics among elderly, IHDS-II (2011-12)

Background Characteristics	No Major Morbidity	One Major Morbidity	Two to Four Major Morbidity	More than Four Major Morbidity	N
Sex					
Male	66.57	23.35	9.89	0.18	10636
Female	64.77	24.33	10.64	0.27	11288
Residence					
Rural	67.62	23.81	8.39	0.18	15442
Urban	60.94	23.94	14.78	0.34	6482
Age					
60-65 Years	68.27	22.62	8.95	0.16	10378
66-74 Years	64.20	24.31	11.35	0.14	6726
75 + Years	61.96	25.90	11.65	0.49	4816
Education					
Illiterate	68.36	23.56	8.03	0.05	12920
Primary	63.02	23.67	12.56	0.75	3829
Secondary	60.83	24.66	14.24	0.27	3682
Higher Secondary	60.98	24.46	14.29	0.27	1449
Marital Status					
Married	66.01	23.44	10.31	0.25	13213
Widowed	64.73	24.77	10.31	0.19	8167
Others	70.62	20.25	8.95	0.18	543
Religion					
Hindu	63.27	24.25	12.32	0.15	5263
Muslim	60.67	25.54	13.20	0.60	2106
Christian, Jain, Sikh	49.65	24.26	24.21	1.89	606
Others	68.73	22.88	8.28	0.11	13928
Wealth Quintile					
Poorest	69.19	24.55	6.25	0.01	5318
Poorer	69.27	22.71	7.96	0.06	4409
Middle	67.82	22.68	9.22	0.28	3841
Richer	63.50	23.24	13.03	0.23	4119
Richest	59.80	24.13	15.53	0.54	4236
Living Arrangement					
Living Alone	66.14	23.05	10.63	0.17	9611
Living with Family	66.05	23.86	9.84	0.25	12300
Total	66.08	23.52	10.18	0.21	21925

Table 16: Ordered Logistic regression: Adjusted disability prevalence among elderly in India -IHDS-I (2005-06)

Background Characteristics	No ADL	One ADL	Two ADL	More Than Two ADL
Sex				
Male®	89.81 [89.12-90.50]	2.90 [2.62-3.17]	2.81 [2.53-3.08]	4.47 [4.08-4.85]
Female	87.53*** [86.76-88.30]	3.47*** [3.16-3.79]	3.42*** [3.10-3.74]	5.56*** [5.11-6.01]
Residence				
Rural®	88.28 [87.69-88.86]	3.28 [3.01-3.56]	3.22 [2.94-3.50]	5.20 [4.83-5.57]
Urban	89.65** [88.76-90.54]	2.94** [2.63-3.25]	2.85** [2.54-3.17]	4.55** [4.07-5.02]
Age				
60-65®	91.60 [91.02-92.18]	2.44 [2.21-2.68]	2.33 [2.10-2.55]	3.61 [3.29-3.92]
66-74	87.48*** [86.56-88.40]	3.52*** [3.18-3.86]	3.44*** [3.100-3.79]	5.53*** [5.03-6.04]
>=75	82.84*** [81.52-84.17]	4.63*** [4.18-5.09]	4.67*** [4.19-5.16]	7.83*** [7.08-8.58]
Education				
Illiterate®	89.72 [89.14-90.31]	2.92 [2.66-3.18]	2.83 [2.57-3.09]	4.51 [4.16-4.85]
Primary	86.15*** [84.90-87.39]	3.81*** [3.40-4.21]	3.79*** [3.36-4.21]	6.24*** [5.56-6.92]
Secondary	86.65*** [85.17-88.12]	3.68*** [3.24-4.13]	3.65*** [3.18-4.12]	5.99*** [5.21-6.77]
Higher Secondary	89.26 [86.93-91.58]	3.04 [2.41-3.67]	2.96 [2.30-3.62]	4.73 [3.60-5.86]
Marital Status				
Married®	89.45 [88.72-90.18]	2.99 [2.71-3.28]	2.91 [2.62-3.19]	4.63 [4.22-5.04]
Widowed	87.52** [86.41-88.63]	3.48** [3.10-3.85]	3.42** [3.04-3.81]	5.56** [4.96-6.15]
Others	87.85 [83.61-92.08]	3.40 [2.32-4.48]	3.34 [2.18-4.49]	5.40 [3.34-7.46]
Religion				
Hindu®	88.80 [87.88-89.72]	3.16 [2.84-3.49]	3.08 [2.75-3.41]	4.93 [4.44-5.43]
Others	89.43 [88.83-90.03]	3.00 [2.74-3.27]	2.91 [2.65-3.18]	4.64 [4.28-4.99]
Muslims	87.99 [86.41-89.56]	3.37 [2.91-3.83]	3.30 [2.82-3.79]	5.32 [4.53-6.12]
Christian, Jain, Sikh	80.23*** [77.52-82.94]	5.15*** [4.46-5.84]	5.33*** [4.54-6.12]	9.27*** [7.77-10.77]
Wealth Quintile				
Poorest®	87.21 [85.94-88.49]	3.54 [3.14-3.95]	3.50 [3.08-3.92]	5.72 [5.04-6.40]
Poorer	88.99** [87.88-90.09]	3.10** [2.74-3.46]	3.03** [2.66-3.40]	4.86** [4.29-5.44]
Middle	88.23 [87.16-89.30]	3.29 [2.94-3.65]	3.23 [2.86-3.60]	5.23 [4.66-5.80]
Richer	89.03** [88.03-90.03]	3.09** [2.75-3.43]	3.02** [2.67-3.36]	4.84** [4.32-5.37]
Richest	89.52* [88.49-90.55]	2.97* [2.62-3.31]	2.88* [2.54-3.23]	4.61* [4.08-5.14]
Living Arrangement				
Living Alone®	88.84 [88.08-89.60]	3.14 [2.84-3.44]	3.07 [2.77-3.37]	4.93 [4.50-5.36]
Living with Family	88.50 [87.65-89.35]	3.23 [2.91-3.54]	3.16 [2.84-3.48]	5.09 [4.62-5.57]

®-reference category; *** p<0.001, **p<0.05, *p<0.10

Table 17: Ordered Logistic regression: Adjusted disability prevalence among elderly in India -IHDS-II (2011-12)

Background Characteristics	No ADL	One ADL	Two ADL	More Than Two ADL
Sex				
Male®	72.83 [71.90-73.75]	7.61 [7.24-7.97]	6.64 [6.28-7.00]	12.91 [12.30-13.51]
Female	67.86*** [66.96-68.77]	8.50*** [8.11-8.90]	7.71*** [7.32-8.10]	15.90*** [15.27-16.54]
Residence				
Rural®	70.30 [69.57-71.03]	8.04 [7.68-8.41]	7.18 [6.82-7.53]	14.47 [13.94-14.99]
Urban	69.95 [68.81-71.09]	8.10 [7.71-8.50]	7.25 [6.85-7.65]	14.68 [13.92-15.43]
Age				
60-65®	78.82 [78.01-79.63]	6.51 [6.17-6.84]	5.32 [5.02-5.62]	9.33 [8.86-9.81]
66-74	68.98*** [67.90-70.06]	8.64*** [8.22-9.06]	7.61*** [7.20-8.02]	14.74*** [14.03-15.45]
>=75	54.48*** [53.05-55.91]	10.61*** [10.13-11.09]	10.50*** [9.96-11.04]	24.39*** [23.27-25.50]
Education				
Illiterate®	70.44 [69.62-71.25]	8.02 [7.65-8.40]	7.1 [6.78-7.51]	14.37 [13.82-14.93]
Primary	68.49** [67.07-69.90]	8.36** [7.93-8.79]	7.56** [7.11-8.00]	15.57** [14.63-16.51]
Secondary	70.35 [68.78-71.91]	8.04 [7.60-8.48]	7.17 [6.71-7.62]	14.43 [13.42-15.43]
Higher Secondary	72.24 [69.72-74.76]	7.69 [7.11-8.26]	6.76 [6.13-7.38]	13.30 [11.77-14.82]
Marital Status				
Married®	72.52 [71.69-73.43]	7.71 [7.35-8.08]	6.73 [6.37-7.08]	13.02 [12.41-13.63]
Widowed	66.91*** [65.66-68.16]	8.72*** [8.28-9.16]	7.93*** [7.49-8.38]	16.42*** [15.60-17.24]
Others	68.11** [64.36-71.85]	8.52** [7.79-9.25]	7.68** [6.82-8.54]	15.67** [13.33-18.01]
Religion				
Hindu®	72.57 [71.41-73.72]	7.63 [7.24-8.03]	6.69 [6.30-7.08]	13.09 [12.36-13.82]
Others	69.61*** [68.84-70.38]	8.18*** [7.81-8.56]	7.33*** [6.97-7.69]	14.86*** [14.30-15.41]
Muslims	70.98 [69.11-72.84]	7.94 [7.46-8.42]	7.04 [6.53-7.55]	14.03 [12.88-15.19]
Christian, Jain, Sikh	61.40*** [58.29-64.50]	9.41*** [8.85-9.97]	8.96*** [8.26-9.67]	20.21*** [18.03-22.39]
Wealth Quintile				
Poorest®	66.47 [65.02-67.92]	8.70 [8.26-9.14]	7.98 [7.52-8.44]	16.83 [15.85-17.82]
Poorer	68.30* [66.92-69.68]	8.40* [7.97-8.83]	7.60* [7.16-8.05]	15.68* [14.76-16.59]
Middle	71.76*** [70.43-73.09]	7.79*** [7.37-8.20]	6.86*** [6.44-7.28]	13.57*** [12.73-14.41]
Richer	70.89*** [69.60-72.19]	7.95*** [7.53-8.36]	7.05*** [6.63-7.47]	14.09*** [13.26-14.91]
Richest	72.93*** [71.63-74.22]	7.56*** [7.15-7.97]	6.61*** [6.20-7.02]	12.88*** [12.08-13.69]
Living Arrangement				
Living Alone®	70.37 [69.35-71.38]	8.03 [7.64-8.42]	7.16 [6.77-7.55]	14.42 [13.75-15.09]
Living with Family	70.05 [69.17-70.93]	8.09 [7.71-8.46]	7.23 [6.86-7.60]	14.62 [14.00-15.24]

®-reference category; *** p<0.001, **p<0.05, *p<0.10

Table 18: Ordered Logistic regression: Adjusted morbidity prevalence among elderly in India -IHDS-I

Background Characteristics	No Morbidity	One Morbidity	Two to Four Morbidity	More than Four Morbidity
Sex				
Male®	79.84 [78.95-80.73]	15.63 [14.91-16.35]	4.47 [4.13-4.82]	0.04 [0.01-0.06]
Female	76.81*** [75.80-77.82]	17.80*** [17.00-18.60]	5.33*** [4.91-5.74]	0.04*** [0.01-0.08]
Residence				
Rural®	80.07 [79.33-80.81]	15.51 [14.90-16.13]	4.37 [4.05-4.68]	0.03 [0.01-0.06]
Urban	74.91*** [73.68-76.15]	19.20*** [18.24-20.17]	5.81*** [5.34-6.29]	0.05*** [0.01-0.09]
Age				
60-65®	80.74 [79.92-81.55]	15.00 [14.33-15.66]	4.22 [3.90-4.54]	0.03 [0.01-0.06]
66-74	76.19*** [75.02-77.36]	18.27*** [17.36-19.17]	5.48*** [5.03-5.93]	0.05*** [0.01-0.08]
>=75	75.26*** [73.77-76.76]	18.92*** [17.80-20.03]	5.75*** [5.21-6.29]	0.05*** [0.01-0.09]
Education				
Illiterate®	81.54 [80.75-82.34]	14.44 [13.80-15.09]	3.96 [3.66-4.27]	0.03 [0.01-0.06]
Primary	73.32*** [71.77-74.88]	20.35*** [19.19-21.51]	6.26*** [5.68-6.23]	0.05*** [0.01-0.09]
Secondary	74.35*** [72.61-76.10]	19.63*** [18.34-20.93]	5.95*** [5.34-6.55]	0.05*** [0.01-0.09]
Higher Secondary	72.87*** [69.91-75.83]	20.66*** [18.56-22.76]	6.39*** [5.43-7.35]	0.05*** [0.01-0.10]
Marital Status				
Married®	78.14 [77.19-79.08]	16.86 [16.11-17.62]	4.94 [4.56-5.32]	0.04 [0.01-0.07]
Widowed	78.85 [77.50-80.20]	16.35 [15.32-17.38]	4.74 [4.29-5.19]	0.04 [0.01-0.07]
Others	78.47 [73.35-83.59]	16.62 [12.93-20.32]	4.85 [3.39-6.30]	0.04 [0.01-0.07]
Religion				
Hindu®	77.76 [76.59-78.93]	17.18 [16.26-18.09]	5.00 [4.58-5.43]	0.04 [0.01-0.07]
Others	79.68* [78.88-80.48]	15.79* [15.13-16.44]	4.48* [4.14-4.81]	0.04* [0.01-0.06]
Muslims	77.59 [75.65-79.53]	17.30 [15.87-18.73]	5.05 [4.44-5.66]	0.04 [0.01-0.07]
Christian, Jain, Sikh	69.83*** [66.83-72.84]	22.66*** [20.59-24.73]	7.42*** [6.37-8.48]	0.07*** [0.02-0.01]
Wealth Quintile				
Poorest®	88.42 [78.86-81.97]	15.26 [14.08-16.43]	4.27 [3.79-4.76]	0.03 [0.01-0.06]
Poorer	80.69 [79.26-82.12]	15.06 [13.97-16.14]	4.20 [3.75-4.65]	0.03 [0.01-0.06]
Middle	79.43 [78.07-80.79]	15.98 [14.94-17.01]	4.54 [4.09-4.99]	0.04 [0.01-0.07]
Richer	76.63*** [75.29-77.96]	17.99*** [16.97-19.02]	5.32*** [4.84-5.79]	0.04*** [0.01-0.08]
Richest	76.39*** [74.97-77.81]	18.16*** [17.07-19.25]	5.38*** [4.89-5.87]	0.01*** [0.01-0.08]
Living Arrangement				
Living Alone®	77.78 [76.78-78.78]	17.12 [16.32-17.91]	5.04 [4.64-5.44]	0.04 [0.01-0.07]
Living with Family	79.08 [78.05-80.10]	16.19 [15.38-16.99]	4.68 [4.30-5.06]	0.04 [0.01-0.07]

®-reference category; *** p<0.001, **p<0.05, *p<0.10

Table 19: Ordered Logistic regression: Adjusted morbidity prevalence among elderly in India -IHDS-II

Background Characteristics	No Morbidity	One Morbidity	Two to Four Morbidity	More than Four Morbidity
Sex				
Male®	68.78 [67.83-69.72]	21.37 [20.69-22.05]	9.62 [9.14-10.10]	0.21 [0.15-0.27]
Female	63.49*** [62.52-64.47]	24.31*** [23.61-25.00]	11.90*** [11.34-12.46]	0.27*** [0.20-0.35]
Residence				
Rural®	67.62 [66.84-68.40]	22.11 [21.51-22.71]	10.03 [9.58-10.48]	0.22 [0.16-0.28]
Urban	63.04*** [61.85-64.23]	24.64*** [23.83-25.45]	12.02*** [11.40-12.65]	0.08*** [0.20-0.35]
Age				
60-65®	69.09 [68.18-69.99]	21.22 [20.57-21.88]	9.46 [9.00-9.93]	0.21 [0.15-0.27]
66-74	64.25*** [63.13-65.36]	23.95*** [23.19-24.71]	11.52*** [10.93-12.12]	0.26*** [0.19-0.33]
>=75	62.37*** [60.99-63.75]	24.95*** [24.07-25.82]	12.38*** [11.65-13.11]	0.29*** [0.21-0.36]
Education				
Illiterate®	69.65 [68.78-70.52]	20.96 [20.32-21.59]	9.18 [8.73-9.62]	0.20 [0.15-0.26]
Primary	62.01*** [60.50-63.51]	25.23*** [24.30-26.16]	12.46*** [11.68-13.24]	0.29*** [0.21-0.37]
Secondary	60.46*** [58.82-62.10]	26.02*** [25.04-27.01]	13.19*** [12.33-14.05]	0.31*** [0.22-0.36]
Higher Secondary	61.59*** [59.00-64.18]	25.45*** [24.10-26.89]	12.65*** [11.40-13.91]	0.29*** [0.21-0.38]
Marital Status				
Married®	66.03 [65.09-66.97]	22.94 [22.26-23.61]	10.77 [10.26-11.29]	0.24 [0.18-0.31]
Widowed	66.10 [64.81-67.40]	22.89 [22.05-23.74]	10.74 [10.10-11.37]	0.24 [0.18-0.31]
Others	67.29 [63.39-71.18]	22.23 [19.98-24.48]	10.23 [8.56-11.91]	0.23 [0.15-0.30]
Religion				
Hindu®	66.34 [65.12-67.56]	22.87 [22.05-23.69]	10.53 [9.94-11.13]	0.24 [0.17-0.30]
Others	67.94** [67.13-68.75]	21.96** [21.34-22.57]	9.86** [9.41-10.31]	0.22** [0.16-0.28]
Muslims	59.53*** [57.49-61.56]	26.49*** [25.35-27.63]	13.64*** [12.58-14.71]	0.32*** [0.23-0.41]
Christian, Jain, Sikh	53.30*** [50.04-56.57]	29.34*** [27.82-30.87]	16.92*** [15.05-18.79]	0.41*** [0.29-0.54]
Wealth Quintile				
Poorest®	68.42 [66.91-69.94]	21.66 [20.70-22.61]	9.69 [8.99-10.38]	0.21 [0.15-0.27]
Poorer	67.43 [65.97-68.89]	22.23 [21.30-23.15]	10.09 [9.41-10.78]	0.22 [0.16-0.29]
Middle	68.12 [66.70-69.53]	21.83 [20.92-22.74]	9.81 [9.16-10.47]	0.22 [0.16-0.28]
Richer	64.53*** [63.15-65.90]	23.86*** [22.97-24.74]	11.34*** [10.66-12.02]	0.26*** [0.19-0.33]
Richest	63.17*** [61.75-64.59]	24.59*** [23.67-25.50]	11.95*** [11.24-12.66]	0.27*** [0.20-0.35]
Living Arrangement				
Living Alone®	66.24 [65.16-67.32]	22.82 [22.08-23.56]	10.68 [10.12-11.24]	0.24 [0.17-0.31]
Living with Family	65.97 [65.06-66.88]	22.97 [22.30-23.64]	10.80 [10.29-11.30]	0.24 [0.18-0.31]

®-reference category; *** p<0.001, **p<0.05, *p<0.10