

The Role of Socio-Economic Inequality in Physical Immobility Among Older Adults: Did the Scenario Changed from 2004-05 to 2017-18?

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Abstract

Background: Despite declining overall growth rate of the population across the world, the number of older adults is rising. To understand the needs and problems faced by older adults, it is imperative to understand the demographic and socio-economic conditions of the individuals. On these lines, physical immobility among older adults is attributed to various risk factors. The living arrangement is found to be one of the critical risk factors along with economic dependency in explaining physical immobility among older adults in India. Therefore, this study is an attempt to explore the role of socio-economic inequality in physical immobility among older adults in India.

Methods: This study utilized 60th and 75th rounds of data from the National Sample Survey conducted in 2004-05 and 2017-18, with a sample size of 34,831 and 42,762 older adults aged 60 and above, respectively. Further, the study decomposes the concentration index using regression-based decomposition technique to understand the relative contribution of various socio-economic factors to the physical immobility of older adults.

Results: Result found a decline of 0.6 points in the prevalence of physical immobility from 2004-05 to 2017-18. The sharpest increase was observed in Puducherry (9.9%) followed by Chandigarh (7.6%), and decline was witnessed in Nagaland (9.2%) followed by Lakshadweep (6.4%) and Delhi (5.3%). Physical immobility was more concentrated among well-off older adults in 2017-18 as compared to in 2004-05. Living alone, chronic diseases, and rich wealth status contributed significantly to explaining the observed socio-economic inequality in physical immobility.

Conclusions: Based on the observations made on the socio-economic inequality in physical immobility among older adults in India, some health interventions are required to cater to the needs of older adults.

Introduction

Despite a declining overall growth rate of the population across the world, the number of older adults is rising (1). Declining fertility levels and increasing life expectancy is attributed to the rise in the population of older adults across the world (2). The old aged population (60 years and above) is anticipated to rise from 901 million in 2015 to 1.4 billion in 2030 (3). In China, the population of older adults has already crossed the threshold for the ageing population (4). The prevalence of the population of older adults is as high as 28.4% in Japan (5) to as low as 4.9% in Israel (6). Moreover, the prevalence of older adults was found to be increasing in every subsequent age group cohorts in most of the European countries suggesting a higher prevalence of older adults at higher ages (7).

Across the developed world, the definition of older adults constitutes a population aged over 65 years (6, 8). However, given the low life expectancy in India than many developed countries, older adults constitute a population aged over 60 years, (9). India is currently undergoing through a demographic transition characterised by decreasing infant mortality and increasing life expectancy; as a result of that, the population ageing problem is soon going to be severe. The proportion of older adults in India has risen

merely in fifty years, from 4.9% in 1901 to 5.5% in 1951. However, it has risen sharply to 7.7% in 2001 and is expected to rise by 12% by 2025 (10). Given the current improvements in life expectancy, the population of older adults is expected to rise sharply in the coming years in India (9, 11).

As the population grows older, it tends to suffer from various diseases; ranging from non-communicable diseases (12, 13) to cognitive diseases (13–15) to various bodily functions disabilities such as vision or hearing loss, joints pain and so on (16, 17). Also, older adults suffer from functional movements (18). An existing piece of literature highlights the growing prevalence of morbidities among Indian older adults (9). Physical immobility among older adults has been a topic of immense interest in developed countries (19, 20), however, in India, there is a scarcity of literature exploring physical immobility among older adults. Moreover, studies in the Indian context is limited to the prevalence and determinants of physical inactivity among older adults, thus ignoring physical immobility among older adults (9, 21).

A study highlighted that the terms physical inactivity and physical immobility among older adults had been used interchangeably in the literature (22). However, physical inactivity and physical immobility among older adults are two different contexts, and it is necessary to understand the basic difference between these two to explore the context of this research in a meaningful way. Various studies have measured physical inactivity among older adults with the index of activities of daily living (ADL) and Instrumental Activities of daily life (IADL) (9, 23). From the ADL and IADL perspective, physical inactivity is the inability of older adults to perform daily tasks, such as; walking, running, cooking, bathing (9, 24–26). On the other side, Physical immobility is the inability of older adults to perform the tasks that are necessary for living independently (19). In a simpler term, physical inactivity is a behaviour characterised by a lack of physical activities, and physical immobility is more of a clinical state (22). Physical immobilisation, in continuum to physical inactivity, is an extreme situation.

To know the needs and problems faced by older adults, it is imperative to understand the demographic and socio-economic conditions of the individuals. On these lines, physical immobility among older adults is attributed to various risk factors. The living arrangement is found to be one of the important risk factors along with economic dependency in explaining physical immobility among older adults in India (27). Another way round, physical immobility among older adults was also attributed to various psychological problems (28). Studies have also noted chronic diseases as a potential risk factor for higher physical immobility among older adults (29). Age, place of residence, and gender also have a profound impact on physical immobility among older adults (30, 31). Studies have noted that female gender has higher levels of physical immobility (19). Given the scarcity of studies related to physical immobility among older adults in India, this study is an attempt to investigate the role of socio-economic inequality in physical immobility among older adults in India. The study has included functional health indicators to address physical immobility among older adults.

Methods:

This study utilised two (60th and 75th) rounds of data from the National Sample Survey (NSS) conducted in 2004 and 2018, respectively. The NSS is nationally representative cross-sectional household surveys conducted by the National Sample Survey Organization (NSSO), the Department of Statistics of the Government of India (32). The NSS 60th round collected information on *Morbidity, Health Care, and the Conditions of the Aged*, and 75th round was based on *Key Indicators of Social Consumption in India: Health*. The NSS adopted multistage stratified sampling design with census villages and urban blocks as the first-stage units for the rural and urban areas, respectively, and the second-stage units as households for ensuring regional and social group representation. The surveys had a sample of 34,831 older persons from 73,868 households in the 60th NSS Round and 42,762 older persons from 113,823 households in the 75th NSS Round. The present study based on older adults aged 60 years and above. Details of NSSO 60th and 75th rounds data published elsewhere (32, 33)

Outcome variable

The physical mobility of the older adults was the outcome variable of this study and was recorded, with the options being: physical immobile: (1) confined to bed, (2) confined to home, (3) able to move outside but only in a wheelchair and (4) physical mobile. For the analysis purpose, the categories of physical immobile were merged into one and created a dichotomous variable as physical mobile '0' which includes physical mobile, and physical immobile '1' which include confined to bed, confined to the home and able to move outside but only in a wheelchair.

Exposure variable

Covariates of this study were the age of the older adults (60–64, 65–69, 70–74, 75–79 and 80+ years), gender (men and women), educational level (no education and literate), marital status (currently married and others), living arrangement (living alone & spouse and living with others), caste (scheduled tribe, scheduled caste, other backward class and others), religion (Hindu, Muslim, and others), place of residence (rural and urban). Monthly per capita consumer expenditure (MPCE) grouped into three categories: poor, middle, and rich. Chronic disease was classified as to whether suffering from chronic disease or not (34). Geographical regions were classified as south, north, central, north-east, east and west.

Statistical analysis

Descriptive statistics were used to show the distribution of the study population. Further, bivariate and multivariate analysis was used to identify the factors associated with the outcome variables. Moreover, wealth quintile was the key variable to measure the economic status of the household. We used the monthly per capita consumer expenditure (MPCE) variable with 5 quintiles; this is a measure of the level of living of each household based on information collected on its usual monthly consumer expenditure. The study used household monthly consumer expenditure (Rs) for decomposition analysis and for the calculation of Concentration Index (CI), the study used MPCE, which has divided into five equal sizes of the population.

Concentration index

Concentration index represents the magnitude of inequality by measuring the area between the concentration curve and line of equality and calculated as twice the weighted covariance between the outcome and fractional rank in the wealth distribution divided by the variable mean.

The concentration index can be written as follows:

$$C = \frac{2}{\mu} \text{cov}(y_i, R_i)$$

Where, C is the concentration index; y_i is the outcome variable index; R is the fractional rank of individual i in the distribution of socio-economic position; μ is the mean of the outcome variable of the sample and cov denotes the covariance (35). The index value lies between - 1 to + 1.

Further, study decomposes the concentration index to understand the relative contribution of various socio-economic factors to the physical immobility of older adults. For this, the study used a regression-based decomposition technique, which was proposed by Wagstaff et al. (36). In this model, physical immobility is considered the outcome variable for assessing the effect of socio-economic status (SES) on inequalities.

Results

Table-1 represents the socio-economic profile of older adults in India as per NSSO 2004-05 and 2017-18 estimates. It was found that the prevalence of physical immobility reduced by 0.6 points from 2004-05 to 2017-18. About 8.4% and 8% of older adults belonged to age group 80 and above in 2004-05 and 2017-18 respectively. Both the rounds of the survey had an equal percentage of men and women respondents. In 2004-05, 34% of older adults were educated, whereas in 2017-18 the figure raised by almost 12 points. There was a slight increase (0.9 points) in the percentage of respondents living alone/with a spouse from 2004-05 to 2017-18. The burden of chronic diseases decreased by 4.1 points among older adults over the last 14 years. Surprisingly, the percentage of older adults from poor wealth quintile increased from 40.6–49.5% in the last 14 years.

[Insert Table 1 here]

Figure-1 represents the change in prevalence of physical immobility among older adults in states of India from 2004-05 to 2017-18. The sharpest increase was witnessed in Puducherry (9.9%) followed by Chandigarh (7.6%) and Gujarat (3.8%). Additionally, the sharpest decline was witnessed in Nagaland (9.2%) followed by Lakshadweep (6.4%) and Delhi (5.3%).

[Insert Fig. 1 here]

Table-2 represents the estimates of bivariate analysis representing the unadjusted association between physical immobility by background characteristics in India. Older adults aged 80 years and above had a higher percentage of physical immobility than in any other age group. Women were having a higher burden of physical immobility than men. Older adults who were not educated had a higher percentage of physical immobility. Older adults who were currently married were having a lower percentage of physical immobility, and older adults who were living alone/with spouse had a lower burden of physical immobility. Older adults suffering from chronic diseases were having a higher percentage of physical immobility. Older adults from rich wealth quintile had a higher burden of physical immobility; however, the results were insignificant in 2017-18. Interestingly place of residence and regions of India had no significant association with physical immobility. However, the estimates are unadjusted.

[Insert Table 2 here]

Table-3 depicts the logistic regression estimates for physical immobility among older adults in India. Older adults aged 80 years and above had higher odds for physical immobility than older adults aged 60–64 years (2004-05 [OR: 8.07, $p < 0.05$] and 2017-18 [OR: 8.21, $p < 0.05$]). Women were 15% and 12% significantly more likely to suffer from physical immobility than men (2004-05 [OR: 1.15, $p < 0.05$] and 2017-18 [OR: 1.12, $p < 0.05$]). Educated older adults were having 18% and 19% lower likelihood to suffer from physical immobility than older adults who were not educated (2004-05 [OR: 0.82, $p < 0.05$] and 2017-18 [OR: 0.81, $p < 0.05$]). Older adults who were suffering from chronic diseases were having higher odds for physical immobility than who were not suffering from any chronic diseases (2004-05 [OR: 3.52, $p < 0.05$] and 2017-18 [OR: 1.58, $p < 0.05$]). In 2004-05 respondents from urban areas were having lower odds for suffering from physical immobility [OR: 0.93, $p < 0.05$], however, the results were opposite, but insignificant in 2017-18 [OR: 1.03, $p > 0.05$]. Older adults from the north-east region of India had 64% and 15% higher likelihood to suffer from physical immobility than older adults from the southern region (2004-05 [OR: 1.64, $p < 0.05$] and 2017-18 [OR: 1.15, $p < 0.05$]).

[Insert Table 3 here]

Figure-2 represents a change in concentration curve for physical immobility among older adults in India from 2004-05 to 2017-18. It was visible through the graph that the concentration of physical immobility was concentrated among well-off older adults. The value of the concentration index increased by 3% from 2004-05 to 2017-18.

[Insert Fig. 2 here]

Figure-3 presents the change in concentration index for physical immobility among older adults across states of India, NSSO 2004-05 and 2017-18. The highest increment in the index value was witnessed in Chandigarh (0.737 points) followed by Mizoram (0.458 points) and Jammu & Kashmir (0.386 points). However, the highest decrement in the index value was observed in Manipur (-0.614 points) followed by Pondicherry (-0.562 points) and Dadar and Nagar Haveli (-0.369 points).

[Insert Fig. 3 here]

Table-4 represents estimates of decomposition analysis for the contribution of selected background factors to physical immobility among older adults in India. NSSO 2004-05 and 2017-18. Column for "coefficients" represents regression coefficients as they help to better understand the decomposition results. The absolute contribution was obtained by multiplying the column of elasticity and CI whereas percentage contribution was obtained by dividing the absolute contribution of each category by total contribution. Interestingly 60.3% of inequality for physical immobility was explained by older adults aged 80 years, and above in 2004-05; however, the contribution declined to 25% in 2017-18. The contribution of education was negative as the older adults who were educated had lower odds for physical immobility, and the CI was concentrated among educated. The contribution changed from - 22.5% in 2004-05 to -10.5% in 2017-18. In 2004-05 about 50% of inequality was explained by older adult's living alone/with a spouse, but the contribution diminished to 40% in 2017-18. Surprisingly, the contribution to explaining inequality by chronic diseases decreased from 48% in 2004-05 to 9.5% in 2017-18. Such high decrement was due to the change in elasticity and CI in the respective years. Moreover, similar results were witnessed in the case of older adults from rich wealth quintile, i.e. older adults from rich wealth quintile explained - 18.2% of inequality in 2004-05, and the contribution changed to 48.6% in 2017-18. The change was due to the change in values of elasticity, and also CI got more concentrated among well-off older adult.

[Insert Table 4 here]

Discussion:

The current study, to the best of our knowledge, is among the few to examine the role of socio-economic inequality in the prevalence of physical immobility among older adults in India. Based on the state representative data set collected in 2004-05 and 2017-18, this study not only provides socio-economic inequalities in the prevalence of physical immobility among older adults in India but also explored the change in physical immobility over the decade. The epidemiological transformation has led to an increase in life expectancy, which in turn has led to an increase in the number of older adults in India. Previously, minimal research has focussed on physical immobility among older adults in India, and so this study is vital in understanding this scenario in the Indian context. This study has attempted to understand the role of socio-economic inequality in physical immobility among older adults in India. Several novel findings emerged from this study in the Indian context; 1. Physical immobility among older adult's increases with an increase in age; 2. Physical immobility among older adults is higher in women than in men; 3. Physical immobility is higher among uneducated older adults; 4. Living arrangements also impact physical immobility among older adults; 5. Age, living arrangements, and wealth contributes highly to the observed inequality in physical immobility among older adults.

Results are critical in finding that physical immobility is higher among older adults at higher ages. As individuals move into older ages, sustaining their physical mobility defines not only their quality of life but also mark their well-being. Previous studies have highlighted that people at higher ages find difficulty

in maintaining physical mobility (19, 29, 31). Physical immobility has been understood as a part of the ageing process, but quite a few studies have demonstrated that age is not associated with immobility (37). Older adults suffer from a higher number of degenerative diseases (38), which can sometimes lead to physical immobility (27, 39). Results highlighted that physical immobility was higher among female older adults than in male older adults. Our findings concord with the previous studies (19, 20, 31). However, quite a few studies have noticed the higher physical immobility among older males than in older females (40). Women tend to live longer than men as they have a higher life expectancy (41), and this higher life expectancy can be attributed to the higher physical immobility among females than in males (42). In line with gender differential in life expectancy, studies have suggested that older women tend to live with a higher risk of non-life-threatening but disabling conditions, whereas men have a higher prevalence of life-threatening conditions (43, 44). Also, studies have noticed that women have lesser probabilities of recovering from functional limitations (45), and as a result, they may develop more disabilities throughout life, which can lead to higher physical immobility among them (46).

Results noticed education as a safety net against the physical immobility among older adults. Higher physical immobility among illiterate's older adults has been found in several previous studies (31, 47). Results also noticed that living arrangements impact physical immobility. Results are in coordination with previous studies in finding that older adult who stay with families were less likely to have physical immobility than older adults who stay alone (29, 31, 48). Living arrangements determine the amount of care older adults receive. Living with spouse and children means a higher level of care, which leads to lower levels of physical immobility (48). During 2004-05, physical immobility was found to be lower among older adults in urban areas than their counterparts; however, rural-urban differences in physical immobility among older adults were not significant for 2017-18. This shows improvements in health-care services in rural areas over time. Studies have found that after the launch of the National Rural Health Mission (NRHM) in 2005, the inequality in health care utilisation narrowed between rural and urban areas (49).

Interestingly and not consistent with previous studies (50, 51), it was found that physical immobility was highly concentrated among well-off older adults. Age of the older adult was the highest contributor to the observed inequality in physical immobility among older adults in India during 2004-05, whereas, monthly Per capita expenditure (MPCE) was the highest contributor to the observed inequality in physical immobility among older adults during 2017-18. Older adults of 80 + age contributed nearly 60 per cent to the observed inequality in physical immobility among older adults during 2004-05; however, nearly 25 per cent of the observed inequality in physical immobility was explained by older adults of age 80 + during 2017-18. During 2004-05, physical immobility among older adults aged 80 + was concentrated among richer households as explained by the value of concentration index (value of CI: 0.165, corresponding to age 80 + during 2004-05 in column CI of table 4). The previous study gives similar results that disability was highly concentrated in the oldest old ages and continues to concentrate on an increase in age (52). The living arrangement also contributed significantly to the observed inequality in physical immobility among older adults during both the survey periods. Studies have noted an association between living arrangement and economic dependency (30), which is further associated with physical immobility

among older adults (29). Result noticed a significant decline in contribution to inequality in physical immobility among older adults in India by chronic diseases; contribution declined from 48 per cent in 2004-05 to nearly 10 per cent in 2017-18. During 2004-05, the physical immobility among older adults by chronic diseases was concentrated among the poor population, whereas, it was concentrated among the rich population during 2017-18 and this shift of inequality from pro-poor to pro-rich signifies a decline in the contribution of physical immobility by chronic diseases. Previously studies have highlighted the decline in chronic diseases by an increase in the age of older adults (34). Observed inequality in physical immobility among older adults by MPCE has significantly increased between the two survey periods. Studies have noted a higher life expectancy among rich people (53), and higher life expectancy signifies higher physical immobility (54).

There are a few limitations to this study. However, the data used in this study were drawn from two time-periods, but data were cross-sectional. The cross-sectional nature of data limits our understanding of causal interpretation. Further, the data related to chronic diseases were self-reported. Another limitation of the study is the use of MPCE as a proxy indicator for measuring relative economic positions of households. The information related to MPCE is based on the household consumption expenditure in the last 30 days, which could be affected by recall bias. However, these potential limitations could not undermine the importance of this study. This study attempted to understand the role of socio-economic inequalities in physical immobility among older adults in India.

Conclusion

Immobility too often ignored in the care of older adults. Based on the observations made on the socio-economic inequality in physical immobility among older adults in India, it can be concluded that some health interventions are required to cater to the needs of older adults. On a preferential basis, there is a need to keep a close vigil on those who are living alone to meet their care needs. The study calls for special attention among older adults, especially focussing on female, uneducated, living alone, and with chronic diseases.

Abbreviations

ADL

Activities of daily living

IADL

Instrumental Activities of Daily Living

NSS

National Sample Survey

NSSO

National Sample Survey Organization

MPCE

Monthly Per capita Consumer Expenditure

CI

Concentration Index

SES

Socio-Economic Status

OR

Odds Ratio

Declarations

1. **Ethics approval and consent to participate:** The study is based on secondary data, which is in public domain and available on request. Therefore, ethical approval and consent to participate was taken by MoSPI.
2. **Funding:** We declare that we did not receive any funding for this work.
3. **Availability of data and material:** We have provided details of the data in the methodology section. The NSS 60th and 75th round data can be obtained from the Ministry of Statistics and Programme Implementation (MoSPI), Government of India. The report and the survey tools are also available on the website: <http://www.mospi.gov.in/download-tables-data>
4. **Authors' contributions:** Conception and design of the study: SS and PK; analysis and/or interpretation of data: SS and PK; drafting the manuscript: SC and RP; revising the manuscript critically for important intellectual content: PD; reading and approving the manuscript: SS, PK, SC, RP and PD.
5. **Competing interests:** Authors declare that they do not have any competing interest.
6. **Consent for publication:** Not applicable.

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Figures

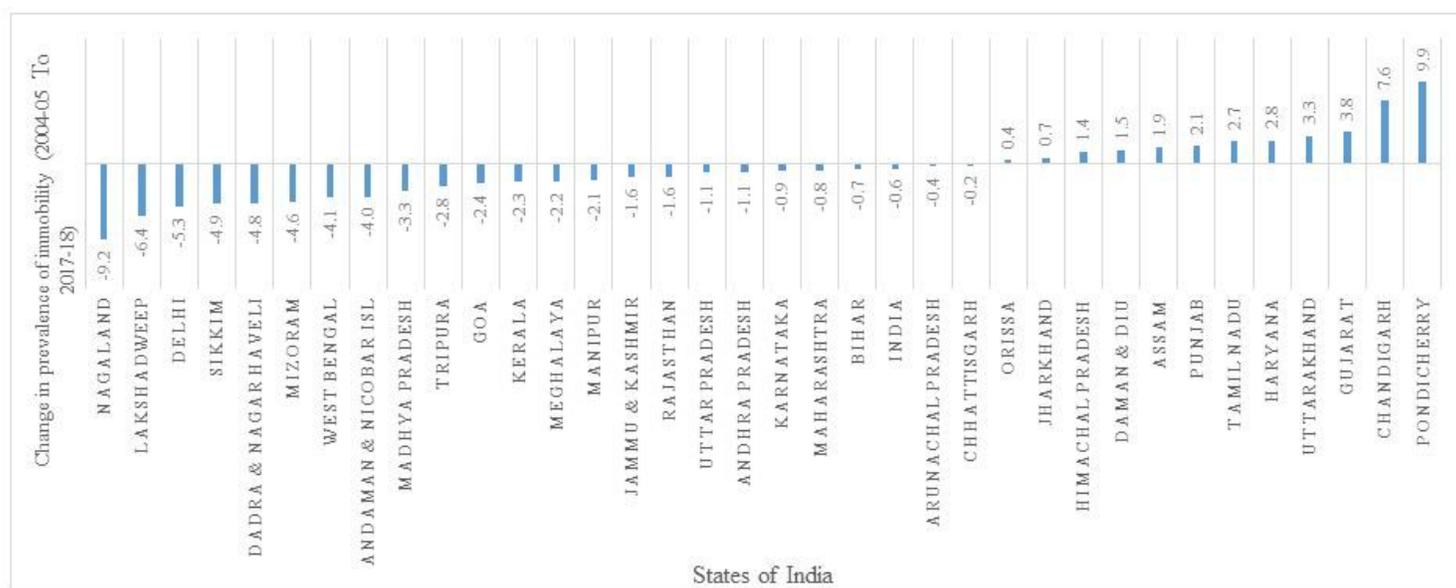


Figure 1

Estimates the changes of prevalence of physical immobility among older adults in states of India, NSSO 2004-05 and 2017-18

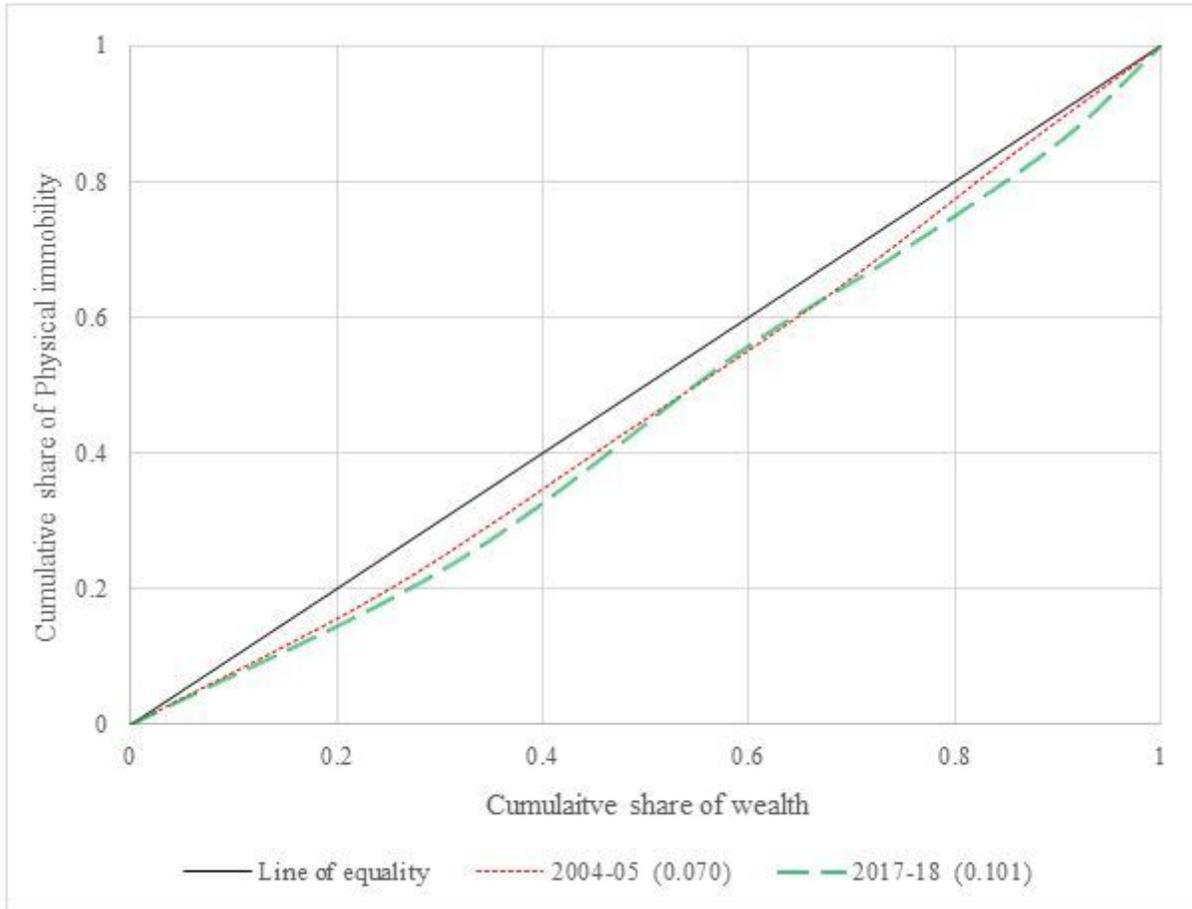


Figure 2

Change in concentration curve for physical immobility among older adults in India, NSSO 2004-05 and 2017-18



CI: Concentration Index

Figure 3

Change in concentration index for physical immobility among older adults across states of India, NSSO 2004-05 and 2017-18