



Risk Factors of Social Exclusion Among Older Persons: Evidence from a Cross-Sectional Survey

T. Maheshkumar¹ · S. Irudaya Rajan²

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Abstract

The study examines the exclusion of older people using a multidimensional approach to understand the different domains of exclusion. Particularly, it evaluates the risk factors of old-age social exclusion, focusing on the level of exclusion across three domains such as social relations, economic and material resources, and social activities, as well as the total exclusion score. Using secondary data from the Building Knowledge Base on Population Ageing in India (BKPAI) survey, the study employed bivariate descriptive and multinomial logistic regression models to assess the factors that affect social exclusion for all three domains, as well as the total exclusion score. Results for the total social exclusion score reveal that older people in their later ages, women, from rural areas, without schooling, living alone, without work, and having poor physical health, experienced a severe risk of exclusion. Notably, older people at later ages (70+) from rural areas without schooling experienced both moderate and severe exclusion in all the domains, as well as in the total exclusion score. While analysing exclusion across all three domains, the study found that older people were most at risk of exclusion in the domains of economic and material resources, followed by the domain of social relations. Thus, ageing policies should consider these micro-level risk factors associated with these two domains to combat the exclusion and improve their quality of life.

Keywords Social exclusion · Older people · Social relations · Economic and material resources · Social activities · Tamil Nadu

✉ T. Maheshkumar
maheshcds25@gmail.com

S. Irudaya Rajan
rajan@iimad.org

¹ Centre for Development Studies (CDS), Prasanth Nagar, Ullloor, Thiruvananthapuram, Kerala 695011, India

² The International Institute of Migration and Development (IIMAD), Thiruvananthapuram, Kerala 695011, India

Introduction

The concept of social exclusion has gained significant attention from academic researchers and policymakers, focusing on efforts to address exclusion and promote inclusion. International agencies such as the World Health Organization (WHO) and the United Nations (UN) have also embraced this concept (Popay et al., 2008; United Nations, 2010, 2016). While older individuals are recognized as susceptible to social exclusion (Scharf & Keating, 2012; Scharf et al., 2005), there is a lack of research explicitly targeting this group in developing countries. While developed nations have experienced a higher proportion of an ageing population in tandem with their robust welfare systems, developing nations have reached this demographic milestone before achieving economic prosperity (Barrientos et al., 2003). Similarly, a study by Bhalla and Lapeyre (1997) proposed that people will experience high levels of exclusion from distributional (economic) aspects in developing nations due to inadequate state welfare support, where extended families and social groups serve as minimal safety nets. However, existing studies in the context of developing countries like India evident that the familial support system has been challenged and eroded by various other factors, such as urbanisation, migration, and changing familial system from joint to nuclear (Kumar, 1999; Bhat & Dhruvarajan, 2001; Croll, 2006). Poverty is a stark issue at old age in most developing countries due to restricted access to employment opportunities, healthcare facilities, and household and social networks (Barrientos et al., 2003). Aging is frequently associated with increased economic, health, and social vulnerabilities (Prasad, 2011). Nevertheless, the plight of older people in India has not been adequately addressed within the framework of social exclusion and inclusion. Various factors related to age, such as disability, cognitive decline, low income, widowhood, labour market conditions, economic downturns, local crime rates, and age-based discrimination, greatly increase the likelihood of social exclusion for older people (Phillipson & Scharf, 2004). Negative life events such as the loss of a spouse and widowhood often exacerbate experiences of social exclusion, notably affecting their social connectedness (Cavalli et al., 2007; MacLeod et al., 2019). Although numerous studies have assessed social exclusion globally, there is limited literature specifically addressing this issue in India (Jose & Cherayi, 2017; Mariyam & Jose, 2017; Hossain et al., 2022). Consequently, there is a dearth of understanding regarding the risk factors associated with social exclusion among older people. Therefore, the present study attempts to understand how the accumulation of micro-level risk factors, influenced by changes in socioeconomic characteristics, affects the exclusion of older individuals from various domains and social settings.

Locating Study Area

In the context of aging in Tamil Nadu, recent projections from the report of *Elderly in India 2021* by the National Statistical Office (NSO) indicate a steady increase in the proportion of older people within the state, expected to rise from 13.6% in 2021 to 18.2% by 2031. Presently, the state ranks as the second-most aging state among major states in India (NSO, 2021), signalling substantial demographic shifts with far-reaching implications for both families and society at large. Traditionally, fami-

lies have served as the primary support system for older people, offering a range of services. However, the shift from joint to nuclear family structures poses a formidable challenge to this support system (Rajan & Kumar, 2003). According to the United Nations Population Fund (UNFPA), a notable proportion of older individuals (16.2%) in the state reside alone (UNFPA, 2012). Moreover, recent research underscores an alarming increase in the prevalence of older adults residing alone in Tamil Nadu, with the percentage rising from 4.82 to 8.19% between 2004 and 2005 and 2011–2012 (Barik, 2017). And, the level of co-residence is lower in Tamil Nadu as compared to other states in India (Mandal & Subaiya, 2023). These patterns signify a lack of social connections and familial support among the elderly population in the state. The evolving landscape of family structures and intergenerational support systems has the potential to significantly impact the care and well-being of economically disadvantaged older individuals at large (Lloyd-Sherlock, 2000). Similarly, the long-term changes in the local economy and state policy have widened the need gap, impacted the intergenerational support where increased the needs of younger generations and expected to be limited the needs of older people (Vera-Sanso, 2007). The rapid age-structural transition from younger to the increasing older along with changing socio-economic condition alter the various socio-economic spheres of the older people. These emerging socio-economic and demographic patterns make Tamil Nadu is an important site to examine social exclusion of older people.

Risk Factors of Social Exclusion Among Older Persons

Social exclusion, a process with profound impact on the well-being and health of older people throughout their lifespans (Dahlberg & McKee, 2018; Sacker et al., 2017; Lee, 2021), is characterized by multiple definitions (Atkinson, 1998; Levitas et al., 2007; Walsh et al., 2017) and manifests as a multidimensional phenomenon encompassing exclusion from various domains. It is a subject of widely debated and varied concepts among the studies, depending on context (Burchardt et al., 2002; Silver, 1994). Nevertheless, they are apparently common in using this to explain the disadvantages and marginalisation of people. Building upon theoretical foundations, Atkinson (1998) identified three pivotal facets of social exclusion: relativity, agency, and dynamics. Relativity underscores the importance of considering individuals within the context of their society rather than in isolation, while agency pertains to individuals' ability to either self-exclude or be excluded by others. The dynamic nature of social exclusion recognizes its influence on both present circumstances and future trajectories.

As individuals age, their exposure to the risk of exclusion increases (Becker & Boreham, 2009). It is crucial to highlight that certain age-related characteristics contribute to an elevated risk of experiencing exclusion. Factors such as income loss due to retirement, the loss of a partner, family, or friends, adverse health outcomes, long-term illness, disability, and psychological distress further exacerbate the risk of social exclusion among older people (Kneale, 2012; Tong et al., 2011; Sacker et al., 2017). Older people who experience psychological issues during their middle-aged years are more susceptible to facing economic exclusion as they enter the later stages of life (Nilsen et al., 2022).

Place is one of the important parameters in social exclusion research, as older people are believed to be spending longer time in their neighbouring places and moving to other places vulnerable to them than younger people. Place includes the integration of physical, social, emotional, and symbolic aspects, which interact to varying extents in the lives of older adults (Burns et al., 2012; Dahlberg, 2020). Thus, it can be both subjective and objective, and place-based exclusion may be possible in both rural and urban areas. In subjective aspects, qualitative studies revealed that gentrification has caused social exclusion among older individuals, leading to the disappearance of spaces specifically designed for them, social isolation, a lack of visibility, reduced political power, feelings of safety, and physical surroundings in neighbourhood development (Burns et al., 2012; Dahlberg, 2020). Some empirical debates (Scharf et al., 2005; Sacker et al., 2017; Dahlberg, 2018; Key & Culliney, 2018) have incorporated either neighbourhood or primarily geographical location, such as place of residence (rural or urban), in explaining the relationship between place and social exclusion of older people. Older adults in rural areas are more vulnerable to disadvantages compared to those in urban settings. Factors such as lower population densities, migration outflows, and changing social structures can disrupt the connectedness of rural older individuals throughout their lives (Walker et al., 2013; Burholt & Scharf, 2014).

Research on old-age social exclusion has shown several risk factors, such as providing care for individuals with disabilities, experiencing personal disabilities, having a low level of education, being less engaged in the workforce, residing in disadvantaged areas, facing poor health, having a low socioeconomic status, and living in low-income neighbourhoods (Miranti & Yu, 2015). Similarly, age, widowhood, living alone, and belonging to tribal and dalit communities are associated with a severe level of social exclusion (Jose & Cherayi, 2017). Gender has also been found to play a significant role in social exclusion (Ogg, 2005; Becker & Boreham, 2009; Walsh et al., 2017; Jose & Cherayi, 2017). Studies have explored the potential mediating effects of car ownership, mobile phone usage, and social pension in mitigating the risk of social exclusion (Sacker et al., 2017; Key & Culliney, 2018; Lloyd-Sherlock et al., 2012). Numerous studies have examined multiple domains of exclusion among older people (Walsh et al., 2017; Scharf et al., 2005; Prattley et al., 2020; Jose & Cherayi, 2017; Dahlberg & McKee, 2018; Dahlberg et al., 2020; Nilsen et al., 2022). Older people experience a higher level of social exclusion and lower participation in social activities compared to the co-residents (Feng & Philips, 2022). Findings revealed a decline in social activities among older people, primarily attributed to health deterioration rather than personal choice. Despite this decline, their relationships with family and friends have remained relatively stable (Cavalli et al., 2007).

It is clear from the above discussion that the experience of exclusion varies depending on indicators and domains, but uncertainty remains regarding whether the risk of exclusion for older people is greater from a relational or distributional standpoint. The experience of exclusion can vary depending on the situation and differ across countries due to their distinct social and cultural contexts. However, the risk factors and severity levels across domains of exclusion are still underexplored, especially in developing countries.

Conceptual Framework

The study adopts the following definition for the operationalization of the concept: “*Social exclusion is a complex and multi-dimensional process. It involves the lack or denial of resources, rights, goods and services, and the inability to participate in the normal relationships and activities, available to the majority of people in a society, whether in economic, social, cultural or political arenas. It affects both the quality of life of individuals and the equity and cohesion of society as a whole*” (Levitas et al., 2007: 9). Given the interconnected nature of social exclusion, it becomes challenging to disentangle the relationship between different domains, risk factors, and outcomes of exclusion (Sacker et al., 2017). To examine the various domains and determinants, the study conceptualizes social exclusion into three key domains: economic and material resources, social relationships, and social activities. These domains are drawn from the work of Dahlberg and McKee (2018) and Scharf et al. (2005). *Exclusion from social relations* pertains to the lack of contact and interaction with family members, highlighting the disconnection experienced by older people in relation to their familial ties. *Exclusion from economic and material resources* indicates insufficient financial means and resources to meet the fundamental needs of older people, recognizing the importance of personal earnings, savings, and assets in addressing basic needs during old-age. *Exclusion from social activities* is defined as the lack of participation in social activities, such as religious or community organization meetings, and the lack of trusted individuals within society with whom older people can confide and seek support. It underscores the absence of social connections for active social participation.

Some studies have included social activities as indicators within the domain of social relations (Levitas et al., 2007; Cavalli et al., 2007), but the present study used social activities as a distinct domain to distinguish the exclusionary settings for older people. The domain of social relations focuses on detachment from familial relations, while the domain of social activities emphasizes lack of participation in social settings. Poor health can increase the likelihood of exclusion in later life, and, conversely, social exclusion can also negatively impact health, forming a reciprocal relationship. Health serves as a complex risk factor in social exclusion research, functioning as both a cause and an effect (Miranti & Yu, 2015; Sacker et al., 2017; Key & Culliney, 2018). Similarly, mental health problems have been identified as risk factors for social exclusion (Nilsen et al., 2022). Therefore, our assessment of social exclusion in old-age takes into account both physical and mental health factors. This endeavour is scant in the exclusion studies, especially in Indian literature (Jose & Cherayi, 2017). Despite the recognition of multiple disadvantages faced in later life, there has been limited research examining the degrees of exclusion across different domains (Dahlberg & McKee, 2018; Nilsen et al., 2022).

Data and Methods

The study utilized data from the Building Knowledge Base on Population Ageing in India (BKPAI) survey conducted in 2011. This cross-sectional survey was carried out in seven Indian states, namely Himachal Pradesh, Punjab, West Bengal, Odisha, Maharashtra, Kerala, and Tamil Nadu. The BKPAI data set comprises various indicators for measuring exclusion and covers a wide range of topics, including subjective well-being, physical and mental health status, employment, and various social and economic indicators. The sample respondents for this study were individuals aged 60 and above residing in Tamil Nadu. There were 1444 total older respondents covered under this BKPAI survey. We used factor analysis to construct our social exclusion measure from the entire sample. Upon examination of the selected variables (as detailed in Supplementary Table 1), we found no missing cases prior to constructing the social exclusion measure. Therefore, there were no missing values in our factor analysis for any of the three domains, including total exclusion. This is shown in Supplementary Table 4, which has the full sample of 1444 respondents. This was the first phase of our analysis.

In the second phase, we used these domains and the total exclusion measure as dependent variables in our multinomial logit model. During the selection of our independent variables, we identified missing values in the variables ‘work’ and ‘mental health,’ with 377 and 11 missing cases, respectively. To ensure the reliability and accuracy of our results, we excluded these missing cases. This adjustment resulted in a focused and manageable sample size of 1056 respondents for the present study. Notably, this sample, drawn from the BKPAI survey, achieved the highest response rate for the state of Tamil Nadu (Alam et al., 2012). As a result, the study effectively avoids the non-response problem and minimizes selection bias.

Measures

Exclusion from Social Relations

The survey in this domain included four specifically designed items to assess exclusion from social relations. It collected responses from older people who either lived alone or did not reside with family members. Participants were asked to indicate the frequency of their meetings and communication with their family members: (1) how often family members meet them, (2) how often they meet family members, (3) how often family members communicate with them, and (4) how often they communicate with family members. The purpose of these questions was to measure the level of closeness in their family relationships. The response options ranged from “never” to “3 years and above.” To quantify social exclusion, we assigned a value of 1 to negative responses indicating a lack of contact, while positive responses indicating regular contact were assigned a value of 0. This scoring system allowed for a higher value to represent a greater degree of social exclusion experienced by the participants.

Exclusion from Economic/Material Resources

This domain encompassed three items aimed at assessing exclusion from economic and material resources. Participants were asked a series of questions to gauge their access to such resources: (1) whether they currently owned houses; (2) whether they possessed gold or jewellery; and (3) whether they had savings in the bank, at the post office, or in their possession. The response options ranged from “yes, previously” to “no.” A value of 1 was assigned to negative responses indicating a lack of ownership or savings, while positive responses indicating possession were assigned a value of 0.

Exclusion from Social Activities

This domain included three items that aimed to assess the participants’ lack of social activities. Three questions posed to capture their level of engagement in social activities: (1) Did they attend any religious programs in the last 12 months? (2) Did they visit their friends and relatives in the last 12 months? (3) Did they have someone in society whom they trusted and confided in? The response options for the first two questions ranged from “never” to “once or twice per week,” while the third question had response options of “yes” or “no.” Negative responses were assigned a score of 1, while all other responses were assigned a score of 0.

Social Exclusion Total

Social exclusion total score is the summation of all three domains: social relations, economic and material resources and social activities. These three domains generated with the help of factor analysis. All these three domains have multiple (items) indicators (see in Supplementary Table 2).

Using factor analysis, we assigned predicted scores for these three domains as well as the social exclusion total score, thereby transforming them into four variables. To ensure that the higher the score, the greater the exclusion, the study appropriately recoded negative responses as having the highest values.¹

Dependent Variables

The study used the exclusion from social relations, the exclusion from economic and material resources, the exclusion from social activities, and the total social exclusion score as the dependent variables. These dependent variables represent the range of exclusion levels from “no” to “severe.” We divided each dependent variable into tertiles. Thus, they have three values: 1, 2, and 3. These values are then recoded into 0, 1, and 2 respectively. The first quartile corresponds to the lowest score (0), “no,” while the second (1) and third quartiles (2) indicate the “moderate” and “severe” levels of exclusion, respectively. The “no” exclusion refers to older people who have an advantageous position in the listed items under various domains. Conversely, the

¹ The variables used to measure social exclusion are provided in Supplementary Tables 1 and Table 2 in the supplementary file.

“moderate” and “severe” levels of exclusion indicate a disadvantageous situation for older individuals.

Independent Variables

The study has considered the following independent variables in its analysis: Age: 60–64 (reference), 65–69, and 70+. Gender: women and men (reference). Sector: rural and urban (reference). Marital status: married (reference), and “separated, divorced, widowed, or never married.” Schooling: participant attended school (reference) and not attended. Social groups (castes): non-SC/ST (reference), SC/ST. Living status: living with family (reference), and living alone. Work status: not working (reference) and engaged in work. Income level was considered a potential variable and measure in the quintile (Q), which refers to one of five equal parts (20%) of the older individuals, sorted by income from lowest to highest: Q1 (the poorest), Q2 (the poor), Q3 (middle income), Q4 (the richer), and Q5 (the richest) (reference). Additionally, physical health status was considered a risk factor of exclusion and was assessed on a five-point scale. It was recoded as 1 (Poor: poor and fair) and 0 (Good: good, very good, and excellent) (reference). Finally, mental health status was included as a potential risk factor of social exclusion and was evaluated using the 12-item General Health Questionnaire (GHQ-12). We measured psychological distress on a scale from 0 to 12, which indicates the severity of stressful symptoms. We recoded the scores, classifying a score of 6 or higher as “high” (good) and assigning it a code of 0, while we classified a score of 5 or lower as “low” (poor), assigning it a code of 1 (Muhammad et al., 2021; Srivastava et al., 2021) (Cronbach alpha: 0.93). In our analysis, good mental health served as the reference category. The questions used to assess physical health and mental health are provided separately in the supplementary information (SI) file.

Data Analysis

In the first phase, the data were filtered and transformed to explore the indicators and domains of the social exclusion index using factor analysis. This technique reduced the number of variables and provided uncorrelated linear combinations of variables that captured greater variations. A social exclusion index comprising ten items was constructed to assess old-age exclusion, considering items with loadings above 0.3 in an oblique-rotated component matrix. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) yielded a value of 0.76, indicating moderate and acceptable sampling adequacy for the factor analysis (Supplementary Tables 3 & Table 6). The Cronbach alpha was employed to assess the reliability and internal consistency of all domains prior to aggregation (Supplementary Table 4). This statistical technique is widely accepted to determine the extent to which the exclusion index aligns with the global standard. The factor analysis identified ten reliable items/indicators distributed across three components (Supplementary Fig. 1 & Table 5).

The first domain, exclusion from social relations ($\alpha=0.78$), consisted of four items: no family members meet you, not meeting others, lack of communication with others, and lack of communication from others. The second domain, exclusion from

economic and material resources ($\alpha=0.72$), included three items: no ownership of a house, no ownership of gold/jewellery, and no savings. The third domain, exclusion from social activities ($\alpha=0.74$), encompassed three items: non-participation in social programs, no visits to friends/relatives' homes, and absence of someone to trust and confide in within society. These three domains collectively accounted for 51.83% of the total variance in the social exclusion measure (Supplementary Table 5).

The study examined the relationship between these three domains and various individual-level socioeconomic factors using descriptive analysis (see Table 1). Also, it employed multinomial logit models to assess the predictive factors of old-age exclusion, considering the three domains and the total social exclusion score. Furthermore, a coefficient plot used for the multinomial logit model, depicting confidence intervals, and subsequently created a margins plot to visualize the most fitted domains in relation to the social exclusion measurements. The mean variance inflation factor (VIF) is 1.44 for all models (Supplementary Table 7), which is well within the acceptable range, and thus there is no problem of multicollinearity in our model. The entire analysis was performed using Stata version 17.

Results

The descriptive results presented in Table 1 summarize the socioeconomic and demographic characteristics of the participants across the domains of exclusion. The levels of exclusion were categorized as “no,” “moderate,” and “severe.” The Kruskal-Wallis test indicated significant variations in median values among the groups for all four domains of exclusion, with the majority of differences being statistically significant (Table 1). These findings suggest that the groups differ significantly in terms of their experiences of exclusion across these domains. However, it should be noted that several variables, such as social group, living status (in all domains), work status (in social relations and total social exclusion score), income quintile, physical health, and mental health (in the social relations domain), had significant differences in median values. These results indicate that there are significant variations in the levels of exclusion across different groups in various domains (Table 1).

Risk Factors of Social Exclusion: Multinomial Logit Regression Results

In the multinomial logistic regression analysis, the study explored the predictor variables associated with “moderate” and “severe” levels of exclusion from social relations, economic and material resources, social activities, and total social exclusion among older people in Tamil Nadu. The regression models, presented in Table 2, consist of four separate models, each with odds ratios and standard errors. We observed that variables like age, gender, residence, schooling, and poor physical and mental health were significantly associated with the exclusion of older people, but their effects varied across the exclusion domains (Table 2). To enhance the comprehension of our findings, we employed marginal effects derived from multinomial logistic regression (Figs. 1, 2, 3, 4 and 5). Marginal effects allow us to understand how the

probability of an outcome changes when a predictor variable varies by one unit while holding all other variables constant. The obtained marginal effects results (Figs. 1, 2, 3, 4 and 5) align with the odds ratio presented in Table 2. In the subsequent analysis, we interpret the results of the marginal effects to gain further insights.

Exclusion from Social Relations

Figure 1 illustrates that older people without work (14.7%) and those from low-income quintiles (poor: 11% and middle: 11.1%) had a higher probability of experiencing moderate exclusion. Additionally, a negative and significant association is observed among older people in the age groups of 65–69 (-11.5%), 70+ (-16.4%), and those with poor mental health (-8.3%). Similarly, the model analysing severe exclusion from social relations reveals that older people in the age groups of 65–69 (8.7%), 70+ (18.9%), and those residing in rural areas (11%) had a higher probability of experiencing severe exclusion from social relations.

Exclusion from Economic and Material Resources

Figure 2 represents the domain of exclusion from economic and material resources at moderate and severe levels of exclusion, it is observed that older people from rural areas (10%) without schooling (7.3%) had a higher probability of experiencing moderate exclusion. Furthermore, older people in the age groups of 65–69 and 70+ (9.8% and 8.3%), from rural areas (7%), and with poor physical (7.3%) and mental health (7.9%), had a higher probability of experiencing severe exclusion from economic and material resources. Conversely, older people from the SC/ST social group (-6.1%), those without work (-9.5%), and those belonging to richer income quintiles (-7.9%) display a lower probability of experiencing severe levels of exclusion from economic and material resources.

Exclusion from Social Activities

Figure 3 depicts the average marginal effects of exclusion from social activities. It shows that older people in the age group of 70+ (9.6%), those from rural areas, and individuals belonging to the SC/ST social group have a higher probability of experiencing moderate levels of exclusion. Moreover, older women (7.7%), those from rural areas (15.2%), individuals without schooling (14.8%), individuals without work (14.1%), and those with poor physical health (9.6%) had a higher probability of severe levels of exclusion from social activities.

Social Exclusion Total Score

Figure 4 represents the average marginal effects of the social exclusion total score. It shows that older people in the age group of 70+ (17.4%) had a higher probability of experiencing moderate levels of exclusion. Additionally, older people in the later age groups of 60–65 (7.0%) and 70+ (7.4%), older women (8.3%), those from rural areas (15.9%), individuals without schooling (14%), those living alone (6.2%), individuals

Table 1 Descriptive statistics for the independent variables

Variables	Sample (n-1056)	Exclusion from social relations		Exclusion from economic and material resources		Exclusion from social activities		Social exclusion total score					
		No	Moderate	Severe	No	Moderate	Severe	No	Moderate	Severe			
Age group													
60-64	480 (45.4)	46.56	55.96	32.58	61.46	39.23	33.18	59.11	40.18	30.68	66.68	38.76	30.09
65-69	275 (26.0)	27.07	23.64	28.02	21.01	26.07	31.69	22.89	26.36	30.22	22.96	23.45	31.93
70+	301 (28.5)	26.37	20.40	39.40	17.53	34.70	35.13	17.99	33.45	39.10	10.36	37.79	37.98
Gender													
Men	655 (62.0)	63.75	70.92	50.32	82.72	52.02	49.22	81.05	49.73	46.19	86.13	55.74	44.07
Women	401 (38.0)	36.25	29.08	49.68	17.28	47.98	50.78	18.95	50.27	53.81	13.87	44.26	55.93
Residence													
Urban	437 (41.4)	49.4	40.64	25.86	64.33	24.24	26.28	60.31	27.18	20.20	67.38	30.85	18.91
Rural	619 (58.6)	50.60	59.36	74.14	35.67	75.76	73.72	39.69	72.82	79.80	32.62	69.15	81.09
Marital status													
Married	697 (66.0)	64.93	76.23	56.72	83.91	60.47	52.72	82.28	56.17	52.77	86.39	61.09	51.18
Sep/div/wid®	359 (34.0)	35.07	23.77	43.28	16.09	39.53	47.28	17.72	43.83	47.23	13.61	38.91	48.82
Schooling													
Yes	511 (48.4)	52.48	57.76	34.91	76.00	35.05	32.95	70.54	40.37	26.89	78.73	42.31	25.50
No schooling	545 (51.6)	47.52	42.24	65.09	24.00	64.95	67.05	29.46	59.63	73.11	21.27	57.69	74.50
Social group (caste)*													
Non-SC/ST	836 (79.2)	76.61	80.75	84.63	78.35	80.6	83.41	82.24	75.53	82.78	78.58	79.28	84.20
SC/ST	220 (20.8)	23.39	19.25	15.37	21.65	19.4	16.59	17.76	24.47	17.22	21.42	20.72	15.80
Living status*													
Living with family	574 (54.4)	62.12	50.74	50.27	51.62	56.72	54.34	55.72	57.84	50.11	55.04	59.73	48.50
Alone	482 (45.6)	37.88	49.26	49.73	48.38	43.28	45.66	44.28	42.16	49.89	44.96	40.27	51.50
Work status*													
Working	292 (27.6)	33.99	17.89	28.46	21.32	27.35	31.85	30.07	34.74	18.01	23.31	37.17	20.68
Not in work	764 (72.4)	66.01	82.11	71.54	78.68	72.65	68.15	69.93	65.26	81.99	76.69	62.83	79.32
Income quintile*													

Table 1 (continued)

Variables	Sample (n-1056)	Exclusion from social relations			Exclusion from economic and material resources			Exclusion from social activities			Social exclusion total score		
		No	Moderate	Severe	No	Moderate	Severe	No	Moderate	Severe	No	Moderate	Severe
Age group													
Richest	176 (16.7)	20.71	13.05	15.79	20.71	13.42	15.45	22.07	12.42	12.94	21.82	13.71	14.38
Poorest	251 (23.8)	19.47	24.68	29.84	15.68	30.05	28.71	17.53	26.98	31.81	14.57	27.78	31.30
Poor	235 (22.3)	21.48	22.01	21.59	16.35	21.07	27.41	18.97	25.79	22.01	18.14	22.76	23.84
Middle	215 (20.4)	20.03	24.87	20.13	23.05	23.93	17.93	20.42	21.69	22.87	22.65	21.05	21.16
Richer	179 (17.0)	18.30	15.39	12.66	24.21	11.53	10.49	21.02	13.13	10.37	22.82	14.70	9.32
Physical health*													
		(p > 0.05)											
Good	507 (48.0)	50.42	56.35	38.57	71.91	37.73	34.93	65.53	48.03	28.03	73.45	45.26	28.07
Poor	549 (52.0)	49.58	43.65	61.43	28.09	62.27	65.07	34.47	51.97	71.97	26.55	54.74	71.93
Mental health													
		(p > 0.05)											
Good	631 (59.8)	52.86	72.31	59.53	78.24	55.33	51.12	68.75	57.14	55.96	73.96	54.44	56.74
Poor	425 (40.3)	47.14	27.69	40.47	21.76	44.67	48.88	31.25	42.86	44.04	26.04	45.56	43.26

Source Authors' own calculation using BKPAI data, 2011. Note: The values in parentheses are unweighted, while all other percentage values are weighted using the sampling weights; ® Sep-Separated, div-divorced, wid-widowed; Most of the median differences in the three domains of exclusion by covariates measures are statistically significant at 0.05 level (Kruskal-Wallis test). ** indicates the p-values are greater than 0.05

Table 2 Multinomial logistic regression estimates for individual variables on social exclusion domain

Variables	Exclusion from social relations						Exclusion from economic and material resources						Exclusion from social activities						Social exclusion total score						
	Moderate		Severe		SE		Moderate		Severe		SE		Moderate		Severe		SE		Moderate		Severe		SE		
	OR	SE	OR	SE	OR	SE	OR	SE	OR	SE	OR	SE	OR	SE	OR	SE	OR	SE	OR	SE	OR	SE	OR	SE	
Age group																									
65–69	0.64**	(0.124)	1.27	(0.250)	1.70**	(0.364)	2.24***	(0.485)	1.51**	(0.318)	1.61**	(0.337)	1.64**	(0.350)	1.99***	(0.448)									
70+	0.61**	(0.130)	1.98***	(0.404)	2.15***	(0.479)	2.42***	(0.552)	2.52***	(0.561)	2.24***	(0.491)	5.62***	(1.368)	4.81***	(1.235)									
Gender																									
Women	0.94	(0.208)	1.37	(0.289)	2.06***	(0.490)	1.87***	(0.452)	2.18***	(0.505)	2.23***	(0.504)	2.39***	(0.596)	2.77***	(0.706)									
Residence																									
Rural	1.52**	(0.276)	2.10***	(0.384)	2.74***	(0.531)	2.56***	(0.503)	2.87***	(0.551)	3.71***	(0.730)	3.29***	(0.645)	5.02***	(1.081)									
Marital status																									
Sep/div/wid [®]	0.81	(0.183)	1.12	(0.236)	0.96	(0.231)	1.33	(0.320)	1.45	(0.338)	1.36	(0.310)	1.33	(0.335)	1.58*	(0.409)									
Schooling																									
No schooling	1.11	(0.216)	1.46**	(0.277)	2.11***	(0.426)	2.02***	(0.412)	1.62**	(0.321)	2.78***	(0.550)	1.77***	(0.363)	3.07***	(0.667)									
Social group																									
(caste)																									
SC/ST	0.90	(0.172)	0.55***	(0.109)	0.69*	(0.145)	0.58**	(0.127)	1.41*	(0.288)	0.89	(0.189)	0.77	(0.165)	0.51***	(0.119)									
Living status																									
Alone	1.38**	(0.222)	1.29	(0.209)	0.73*	(0.130)	0.81	(0.146)	1.01	(0.177)	1.31	(0.230)	0.74	(0.136)	1.16	(0.225)									
Work status																									
Not in work	2.23***	(0.419)	1.03	(0.183)	0.68*	(0.136)	0.50***	(0.099)	0.93	(0.175)	2.18***	(0.437)	0.51***	(0.099)	1.04	(0.225)									
Income quintile																									
Poorest	1.80**	(0.497)	1.35	(0.355)	1.16	(0.339)	0.93	(0.277)	1.34	(0.392)	1.55	(0.450)	1.52	(0.460)	1.42	(0.455)									
Poor	1.67**	(0.438)	0.87	(0.224)	0.92	(0.267)	1.21	(0.344)	1.20	(0.337)	1.09	(0.309)	0.94	(0.271)	0.94	(0.288)									
Middle	1.81**	(0.478)	1.02	(0.270)	1.01	(0.289)	0.78	(0.230)	1.36	(0.396)	1.53	(0.443)	1.08	(0.317)	1.08	(0.338)									
Richer	1.22	(0.327)	0.90	(0.240)	0.69	(0.200)	0.53**	(0.159)	1.09	(0.320)	0.90	(0.275)	0.94	(0.273)	0.66	(0.217)									
Physical health[®]																									
Poor	1.00	(0.179)	1.23	(0.216)	1.71***	(0.320)	1.99***	(0.376)	1.01	(0.189)	1.71***	(0.320)	1.36	(0.261)	2.01***	(0.410)									

Table 2 (continued)

Variables	Exclusion from social relations						Exclusion from economic and material resources						Exclusion from social activities						Social exclusion total score						
	Moderate		Severe		Moderate		Severe		Moderate		Severe		Moderate		Severe		Moderate		Severe		Moderate		Severe		
	OR	SE	OR	SE	OR	SE	OR	SE	OR	SE	OR	SE	OR	SE	OR	SE	OR	SE	OR	SE	OR	SE	OR	SE	
Mental health																									
Poor	0.52***	(0.092)	0.61***	(0.103)	1.87***	(0.354)	2.17***	(0.414)	1.06	(0.196)	0.99	(0.179)	1.27	(0.244)	1.03	(0.207)									
Constant	0.39***	(0.105)	0.33***	(0.086)	0.25***	(0.072)	0.25***	(0.073)	0.10***	(0.031)	0.03***	(0.010)	0.24***	(0.071)	0.05***	(0.019)									
Observations	1,056		1,056		1,056		1,056		1,056		1,056		1,056		1,056										
Log-Likelihood	-1067		-986.3		-948.4																				
Chi-square test	184.6		374.3		489.2																				
Pseudo R2	0.0796		0.150		0.165																				

Source same as in Table 1; Note: [®] denotes self-reported health; OR -Odds Ratio; SE- Standard Errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; Base outcome (No)

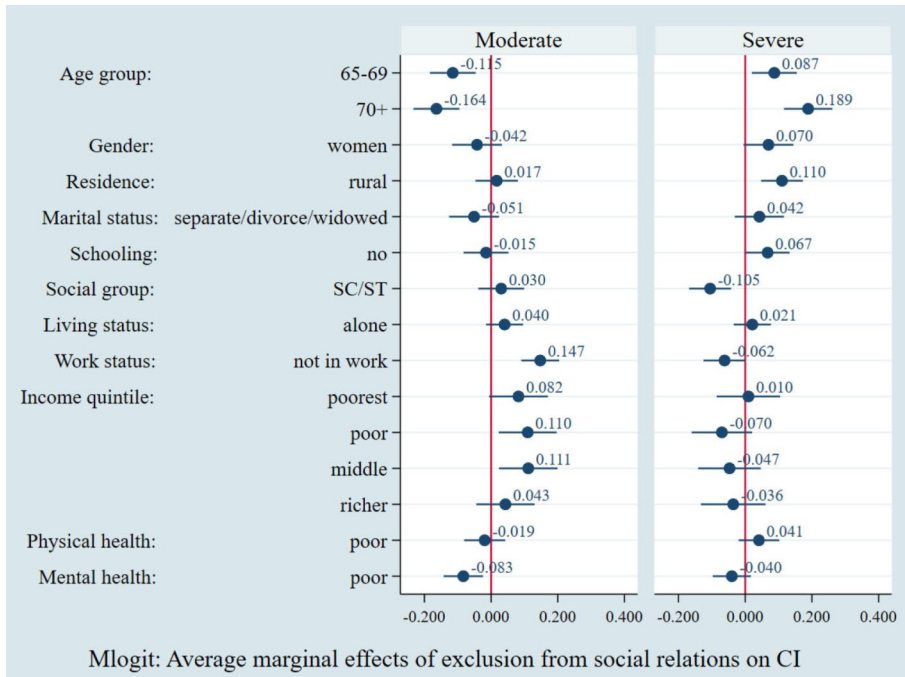


Fig. 1 Mlogit: Average marginal effects of exclusion from social relations on CI; Base outcome (No exclusion). *Source* Same as in Table 2

without work (8.9%), and those with poor physical health (9%) had a higher probability of severe levels of exclusion in the social exclusion total score.

Predictive Margins for all Models

Figure 5 presents the predicted margins of all four models. It was discovered that older people were more likely to experience “severe” levels of exclusion in the domains of social relations (8.7%) and economic and material resources (9.8%), as indicated by the total social exclusion score (7.0%) (Fig. 5). Although older people were also at risk of exclusion from social activities, this finding is insignificant in our model. Overall, the present findings reveal that older people in Tamil Nadu are vulnerable to severe levels of exclusion, particularly in the domains of social relations and economic and material resources.

Discussion

While analysing the extent and risk factors associated with old-age social exclusion, findings reveal that older people in the later age groups of 65–69 and 70+, particularly older women, those residing in rural areas, without schooling, living alone, without employment, and with poor physical health, were more vulnerable to severe

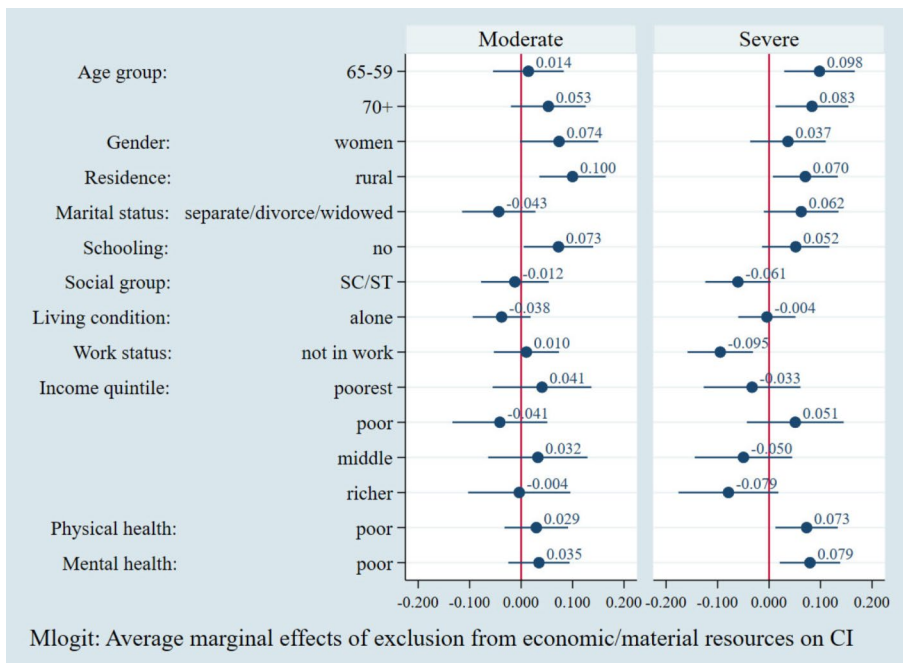


Fig. 2 Mlogit: Average marginal effects of exclusion from economic and material resources on CI; Base outcome (No exclusion). *Source* Same as in Table 2

level of total social exclusion. Notably, rural residence and without schooling emerge as the predominant driving factors behind this severe level of total social exclusion. It is important to note that the impact of these factors varies across different domains of exclusion (Figs. 1, 2 and 3). These findings align with and reinforce previous studies that have consistently emphasized the influence of individual characteristics on the risk of social exclusion (Barnes et al., 2006; Kneale, 2012; Sacker et al., 2017; MacLeod et al., 2019; Prattley et al., 2020).

The study identified the risk factors and their differing effects on old-age exclusion across the domains. It revealed that older people face a higher risk of social exclusion as they reach later stages of life, specifically within the age groups of 65–69 and 70+. This increased risk of exclusion is observed in social relations, where a positive effect was found among individuals in the older age group (70+), suggesting a higher risk of experiencing severe levels of exclusion. Interestingly, when considering the moderate level of exclusion, the negative effects indicate that older people in the later stages of life (70+) were less likely to be excluded from social relations (Fig. 1). This suggests a mixed pattern of both moderate and severe levels of exclusion within the domain of social relations for older people in the later stages of life. This mixed result makes it difficult to explain further subjective aspects of familial relationships using the available secondary data, which necessitates a primary-level study with a qualitative approach. In addition, present findings show that older people face an increased risk of severe exclusion from economic and material resources as they advance into later stages of life (Fig. 2).

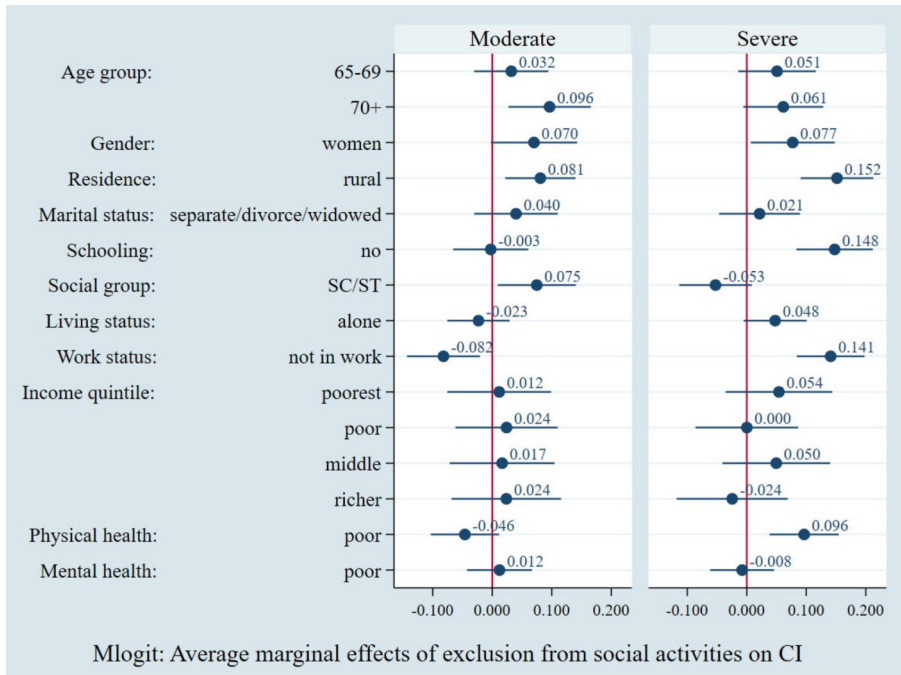


Fig. 3 Mlogit: Average marginal effects of exclusion from social activities on CI; Base outcome (No exclusion). *Source* Same as in Table 2

Place of residence, particularly for older people from rural areas, had a higher probability of severe levels of exclusion from social relations, economic and material resources, and social participation. This finding, consistent with the existing studies, suggests that older people residing in rural areas often face challenges associated with exclusion from essential services, limited social relationships, and reduced participation in social activities (Barnes et al., 2006; Walsh et al., 2012). Existing research has put forth the proposition that older people residing in rural areas are uniquely vulnerable to social isolation, and this could be partly attributed to the outmigration of younger individuals from such regions (Moffatt & Glasgow, 2009; Scharf & Bartlam, 2008). In addition, some other studies revealed that rural older adults are more susceptible to disadvantage than their urban counterparts for various reasons, like lower population densities, migration outflows, and changing social structures (Walker et al., 2013; Burholt and Scharf, 2014).

Drawing on previous Western studies (Barnes et al., 2006; Ogg, 2005; Scharf et al., 2005) and a study conducted in Kerala, a neighbouring state of Tamil Nadu (Jose & Cherayi, 2017), our study further supports the observation that women face higher levels of social exclusion, encompassing both moderate and severe levels, compared to men. The present findings align with the studies conducted by Becker and Boreham (2009) and Kneale (2012), which highlight that women experience greater exclusion in terms of economic and material resources as well as social activities. These disparities can be attributed to their limited access to the labour force and their

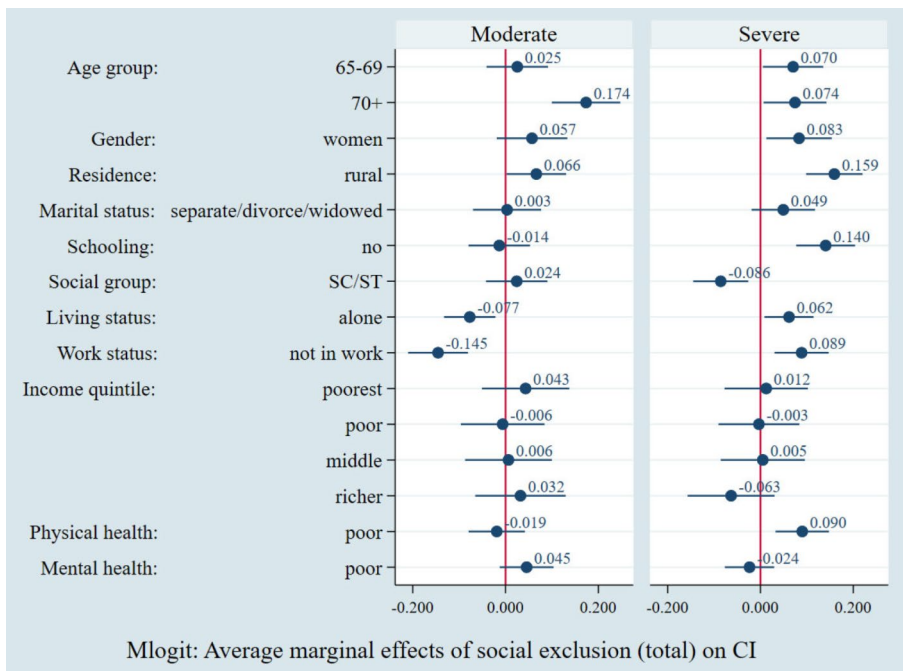


Fig. 4 Mlogit: Average marginal effects of social exclusion (total) on CI; Base outcome (No exclusion).

Source Same as in Table 2

traditional roles as primary carers within the family. Consequently, economic insecurity and limited engagement in activities beyond the household significantly restrict their connections and involvement outside the family sphere.

The present findings highlight a clear association between older people without schooling and experiencing severe levels of total social exclusion. Specifically, we observed that older people without schooling were moderately excluded from economic and material resources, while facing severe exclusion from social activities. These results suggest that education plays a vital role in facilitating economic and social participation for older people. Several propositions can explain this phenomenon. Firstly, it is evident that older people without schooling are more vulnerable to old-age social exclusion (Miranti & Yu, 2015). Additionally, education is linked to increased social participation, particularly in navigating interactions with public authorities (Dahlberg et al., 2020).

The study reveals that older people without work had positive effects on severe levels and negative effects on the moderate level of total social exclusion (Fig. 4), with statistical significance observed primarily at the moderate level. This suggests that work plays a moderate role in influencing old-age exclusion. However, it is important to acknowledge that the impact of work varies across different domains. Notably, they experience a moderate level of exclusion from social relations and a severe level from social activities. Contrarily, older people without work had a higher probability of experiencing negative effects on economic and material resources, indicating a reduced likelihood of exclusion in this domain (Figs. 1 and 2).

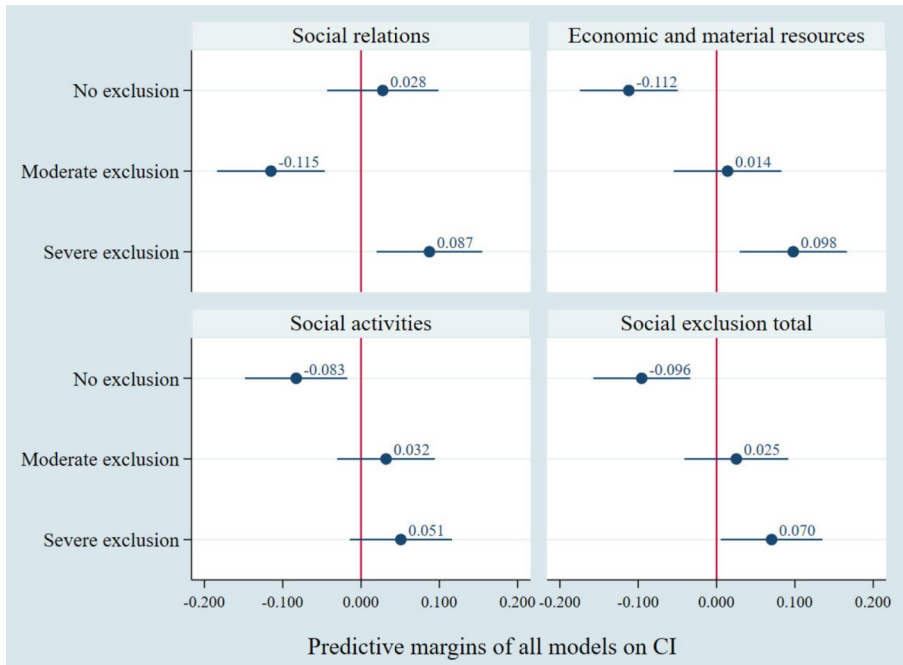


Fig. 5 Predictive margins for all domains of exclusion on CI; Base outcome (No exclusion). *Source* Same as in Table 2

The study observed significant negative effects of older people from the Scheduled Caste/Scheduled Tribe (SC/ST) community on total social exclusion (Fig. 4). This effect is primarily driven by the domain of social relations, as illustrated in Fig. 1. Additionally, they exhibited a higher risk of experiencing a moderate level of exclusion from social activities, as depicted in Fig. 3. These findings can be attributed to the presence of adequate familial connections and support within (inside family) the SC/ST community, which contributes to their reduced likelihood of being excluded from social relations. On the other hand, their moderate level of exclusion from social activities can be associated with their limited participation in social settings (outside family), possibly influenced by caste affiliations. This finding is in line with a previous study that revealed the exclusion from social participation among older people belonging to the SC/ST community (Jose & Cherayi, 2017).

The study assessed the health (physical and mental) and social exclusion linkages across various domains, which is rare in empirical research on old-age exclusion. Findings suggest that older people with poor physical health experienced a severe level of social exclusion, whereas the effect was negative for poor mental health (Fig. 4). However, older people with poor physical and mental health experienced a severe level of exclusion from economic and material resources. Findings from this study highlight that older people with poor mental health are less likely to be socially excluded while facing a higher risk of exclusion from economic and material resources. This suggests that during periods of poor mental health, older people receive familial support, mitigating their social exclusion. However, the combination

of poor physical and mental health constraints their economic activities, leading to adverse effects on their economic well-being and limited access to material resources. This finding aligns with existing research, which also highlights the notable impact of psychological health issues during late midlife on the occurrence of economic exclusion in early late life (Nilsen et al., 2022). Also, the present finding shows that older people with poor physical health were more likely to experience severe levels of exclusion from social activities. This finding supports the existing study showing that a decline in social activities among older people is primarily attributed to health deterioration (Cavalli et al., 2007).

Our research indicates that the most vulnerable to exclusion from social activities are older individuals without work, those without schooling, older women, those living in rural areas, those from lower socioeconomic status, and those with poor physical and mental health. Previous research in India (Tripathi & Samanta, 2023, 2024; Irshad et al., 2023) is consistent with this. They emphasized the importance of social activities through various forms of social engagement and leisure practices. They found that social engagement activities significantly influence the relationship between subjective well-being and depression symptoms among older people in India. Participating in activities such as eating outside, taking part in leisure activities, and visiting friends significantly improves the overall welfare of older individuals. Nevertheless, individuals with lower levels of education, living in rural areas, and belonging to lower socio-economic classes face limited opportunities to engage in these activities (Tripathi & Samanta, 2023, 2024), resulting in social exclusion and poor well-being. Health also impedes participation in social activities; factors such as inadequate sleep, morbidity, and disability impede the ability of older persons to achieve active and productive ageing (Irshad et al., 2023).

We found that older individuals in Tamil Nadu are more at risk of exclusion from economic and material resources, with social relations following closely behind. These two domains are associated with quality of life, particularly the health and well-being of older individuals. For instance, material deprivation is associated with the depressive symptoms of older individuals. A study found that there is a persistent link between these two. This material deprivation impacts more than income poverty (Cheung & Chou, 2019). According to Nilsen et al. (2022), middle-aged individuals who face psychological problems are at a higher risk of experiencing economic exclusion in their later years. Material resources and health-related services are the strongest predictors of the health and subjective well-being of older individuals in Europe (Lee, 2021). A subjective sense of exclusion is associated with older people's property ownership. A study found that there is a declining subjective feeling of exclusion if older individuals have owned their property (Feng & Phillips, 2024). Similarly, the domain of social relations is attributed to personal attributes, biological and neurological risk, socio-economic status, material resources, and other factors. It incorporates health, well-being, and functioning outcomes, social opportunities, and the cohesion of older individuals (Burholt et al., 2020). Consequently, a lower level of exclusion from social relationships led to a lower level of poor health (Feng et al., 2019). Exclusion from social relations can intensify feelings of loneliness and result in a lack of social support, both of which are important variables that increase the risk of poor well-being (Precupetu et al., 2019).

Implications of the Study

The present study provides an empirical assessment of social exclusion and its associated risk factors to identify the most vulnerable older people to exclusion from various domains like economic and material resources, social relations, and social activities at a localized scale. The exclusion/inclusion approach assessment reveals that older people face not only economic but also social deprivation. These findings have significant policy implications, particularly in terms of effectively targeting interventions towards the most vulnerable in old-age policies in the Indian context (Rajan & Mishra, 2011). These findings seem to suggest an alternative policy approach to the conventional income-poverty criteria for identifying vulnerable segments. Notably, the findings of exclusion from social relations require urgent attention from policymakers as the state experiences a growing trend of living alone or a diminishing co-residence pattern among older people. Thus, it is essential to promote consistent communication between family members and older people. Additionally, it should enable older people to engage in regular communication with their children and actively participate in social interactions. State-level policy actions should include an age-friendly approach to mitigate the exclusionary processes that older people undergo in their later life stages. These priorities should take into account the exclusion of older people, not only from economic but also social aspects. Especially older women, from rural areas, without schooling, without work, and with poor health, should be the top priorities, as these are most vulnerable to social exclusion. Arranging collective employment opportunities for older people in their immediate living environment is essential, which not only helps them economically, but also fosters social engagement and connection with other older people. Incorporating the place and their immediate environment (United Nations, 2002) when formulating policies that would address the unique needs and concerns of older people in their later stages of life. Therefore, we recommend initiating various programs at the community level aimed at enhancing the interrelationships and social connections among older individuals, thereby creating an inclusive environment and ensuring their well-being.

Strength and Limitations of the Study

The construction of a multidimensional exclusion measure using factor analysis in our study significantly strengthens the research. By capturing multiple dimensions of exclusion, it enhances construct validity and precision. The study used the BKPAI survey, which is a representative sample of older people with the highest response rate for the state of Tamil Nadu (Alam et al., 2012). The highest response rate helps to avoid the non-response problem and reduce the selection bias. It recognized the significance of the living environment by incorporating a rural-urban sub-sample in our analysis. While empirical research on social exclusion often incorporates physical health but overlooks mental health, older people are more prone to both in later life; our study fills this gap and provides valuable insights into their differential roles across various domains of exclusion.

The study's limitations include the examination of only a small number of exclusion domains due to constraints in the available secondary data. The use of cross-sectional data is another limitation, as it restricts the ability to establish causal relationships and capture the dynamic nature of social exclusion. The complex results of some older people being more likely to be excluded and some being less likely to be excluded in social relationships make it challenging to explain the subjective aspects of family relationships using the existing secondary data. Primary-level research using a qualitative approach may be required. Lastly, the study focused on subpopulations with adequate sample sizes, leading to the exclusion of certain subgroups, such as those receiving social pensions and individuals based on religion. These limitations should be considered when interpreting the findings of this study and when designing future research.

Conclusion

This study provides insights into the risk factors of social exclusion among older people at the microlevel, examining various domains of exclusion. The findings underscore that older people in rural areas, particularly those without schooling, experiencing poor physical health, are most vulnerable to severe level in terms of overall social exclusion. And, it revealed that older people experience a severe level of exclusion from the domains of economic and material resources and social relations. Older people in rural areas face greater risks of social exclusion due to limited access to services, diminished social connections, and limited employment opportunities. These exacerbate the challenges faced by older people in maintaining family ties and economic stability. Moreover, it emphasizes the impact of health, both physical and mental, on social exclusion among older people. Poor physical and mental health increase the risk of severe exclusion, particularly in economic and material domains. Notably, poor physical health impedes active participation in both economic and social activities.

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Data Availability The data that support the findings of this study are available from [demography@isec.ac.in] but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of [demography@isec.ac.in or india.office@unfpa.org].

Declarations

Conflict of Interest The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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T. Maheshkumar is a doctoral fellow in economics at the Centre for Development Studies (CDS), affiliated with Jawaharlal Nehru University (JNU), New Delhi. He completed his MPhil in Applied Economics from CDS through JNU with the dissertation, 'Understanding Health Care Utilisation among the Elderly in Tamil Nadu'. His research interests are health, social policy, and social exclusion among the older persons in India.

S. Irudaya Rajan is Chair of the International Institute of Migration and Development (IIMAD), India. He was the President of the Association of Gerontology (AGI, India) as well as Kerala Economic Association (KEA). He has close to four decades of research experience and has published extensively in national and international journals on demographic, economic, social and health implications of aging. He is the lead author of the book named *India's Elderly: Burden or Challenge?* (1999) and has edited/co-edited various books; *Social Security for the Elderly: Experiences from South Asia* (2008); *India's Aged: Needs and Vulnerability* (2017); *Elderly Care in India: Societal and State Responses* (Springer, 2017) and *Abuse and Neglect of the Elderly in India* (Springer, 2018). He developed the first longitudinal Ageing Survey in Kerala (India) in 2004; repeated every three years, it completed its seventh wave in 2022. The second longitudinal Ageing Survey in Kerala started in 2013, completed its fourth wave in 2022.