Article

Untreated morbidity and treatment-seeking behaviour among the elderly in India: Analysis based on National Sample Survey 2004 and 2014

Shobhit Srivastava [a,*], Anayat Gill [b]

[a] International Institute for Population Sciences, Govandi Station Road, Deonar, Mumbai, 400088, India
[b] Centre for Research in Rural and Industrial Development, Sector 19, Chandigarh, India

ARTICLE INFO

ABSTRACT

The changing demographic structure in India and worldwide accompanies with it a gamut of problems and opportunities. According to the Census of India, the proportion of elderly in the overall population rose from 5.6 per cent in 1961 to 8.6 per cent in 2011 and is expected to rise to 20 per cent in 2050. Considering the consequent growing challenges in healthcare the main aim of the study is to find essential determinants contributing to untreated morbidity among the elderly. Also, the paper examines treatment-seeking behaviour for infectious and chronic diseases among the elderly in India. Data from the 60th and 71st round of National Sample Survey Organization was used for the analysis. Relative differences were calculated along with logistic regression to study the objectives and the heckprobit model was used to carve out the treatment-seeking behaviour among the elderly in India. It was found that the overall decrease in relative decadal difference was 41% for untreated morbidity. In both the rounds, the elderly living below the poverty line had 42% and 50% more likelihood of untreated morbidities respectively in comparison to elderly not living below the poverty line. The study indicates that elderly who were living with a spouse in comparison to those living alone had less likelihood to have untreated morbidities. Also, elderly from rural areas and having lower levels of education had higher likelihood of untreated morbidity. Similar inequalities were observed in treatment-seeking behaviour as well, where it was found that elderly belonging to lower socio-economic status were less likely to seek treatment. Linking the results from the heckprobit model this study provides the evidence that social and economic factors play a significant role in affecting both untreated morbidity and treatment-seeking behaviour of elderly in India.

Introduction

The changing demographic structure in India and worldwide accompanies with it a gamut of problems and opportunities. The proportion of the elderly population in the total population has been rising globally and India is no stranger to the phenomenon. According to the Census of India, the proportion of elderly in the overall population rose from 5.6% in 1961 to 8.6% in 2011 and is expected to rise to 20% in 2050. This merits the area to be prioritized as an essential topic for research in terms of its impact and challenges for the economy.

The growing demand of health care system, especially in the provision of long term health care for an increasing number of aged people is going to be the biggest problem in the coming decade at National and International level (Richard, Walker, & Alexandre, 2018a; Zeeb, Rothgang, & Darmann-Finck, 2018). As the health dynamics of older age are related to increased needs for health care, it might be expected that

increasing age would be associated with increased health-care utilisation. Given that the burden of disease and declines in the capacity are greater in low and middle-income countries it might also be expected that this trend would be more marked in low-resource settings (Beard, Alana, Anne, & Asamoa-Baah, 2011). According to the Building a Knowledge Base on Population Ageing in India (BKPAI) data on elderly in India, it was found that 648 per 1000 elderly have chronic morbidities wherein there are stark differences in prevalence according to gender, income and place of residence (Building & India a Knowledge Base on Population Ageing in, 2011). However, little consideration has been given to the inequalities in health and well-being among older people within and across countries (Venkatapuram, Ehni, & Saxena, 2017). This emphasises the importance of studying the treatment-seeking behaviour of elderly concerning various social and economic factors that encapsulate inequalities in health care.

It has been stated that health-seeking behaviour depends upon

several underlying factors such as availability, affordability and accessibility of healthcare, healthcare consciousness of the people, the responsiveness of health care service providers, fees charged by healthcare providers and long waiting time to seek treatment (Amente & Kebede, 2016). About 60% of older people in low-income countries did not access health care because of the cost of the visit (Beard et al., 2011). Health seeking behaviour and wealth had a significant relationship with each other, higher the person's wealth quintile the more likely the person can seek care (World Health Organization, 2017). Also, familiarity and accessibility of health care providers play essential roles in health-seeking behaviour of elderly. The flexibility of health care providers in receiving payment was a crucial deciding factor of whether or not to seek treatment, and even the type of treatment sought (Biswas, Nahar Kabir, Nilsson, & Zaman, 2006). It can be stated that untreated morbidity was concentrated among poor people and more so for older than their younger counterpart (Pandey, Ploubidis, Clarke, & Dandona, 2017). It has been found that income-related inequities and inequalities in health care utilisation are a prominent concern for elderly well-being. Moreover, it was found that not only utilisation but also reporting of ailments displays a pro-rich bias, whereas it was expected that sickness will be concentrated among the poorer sections (Li, Dou, Wang, Jing, & Yin, 2017). Certain administrative bottlenecks hinder the elderly to utilise the health care services established fully. Health care utilisation was affected by a person's physical impairments such as hearing loss or visual impairments. Long waiting times and waiting in a queue can be particularly challenging for older people with physical disabilities or mobility restrictions (Albanese et al., 2011; Nipun, Prakash, Kumar, & Danish, 2015; Smith, 2012).

Some studies from rural India have investigated that non-utilisation and administrative factors such as absenteeism among the health staff in the rural areas, as well as the presence of alternative informal sources of medical care, affects the dynamics of health care utilisation among people (Banerjee, Deaton, & Duflo, 2003). Logistic regression model results revealed that urban-rural regional difference was the most important predictor of treatment-seeking behavior, which may be explained by better access to medical services in urban areas (Sharma, Mazta, & Parashar, 2013). This study however focuses on only a particular area i.e. the Shimla hills in Himachal Pradesh and there is need to include other areas of the country for a comprehensive analysis. Also, to bring out the gender dynamics in health care utilisation, it has been found that there are significant differences when data was disaggregated according to gender and geographical location. It has also been proved that poor health and lower healthcare utilisation is noted among older women, compared with men in India, and can be primarily explained by gender differentials in the socioeconomic status and consequent financial empowerment (Roy & Chaudhuri, 2008). Moreover, the power dynamics in the family play an essential role in affecting treatment decision. The interfamily relationship, as well as the level of education of the head of household, exert considerable influence on health-seeking behaviour (Mukherjee & Karmakar, 2014). Along the same lines, several studies found significant differences in health care investment by caste in India (Barua, Borah, Deka, & Kakati, 2017; Luke & Munshi, 2007). Treatment choices could differ across castes due to differences in health beliefs and practices, discrimination by health care providers, and differential returns to health investments. The low castes in Hindu society were historically relegated to menial occupations and faced severe social discrimination. Although the government of India took several steps to remedy these inequities by subsidising education and reserving positions in institutions of higher learning for the low castes, a large caste-gap in education and income continues to be observed in both rural and urban India today (Luke & Munshi, 2007). As such, it can be stated that education plays a vital role in improving an individual's access to health care and treatment-seeking behaviour.

The present study attempts to find the factors causing untreated morbidity and treatment-seeking behaviour among older people in India. Therefore, the main aim of the study is to assess the rate of untreated morbidity among older people and its determinants with special impetus on social and economic factors. Also, the study attempts to reflect the treatment-seeking behaviour among the elderly for chronic and infectious diseases. The study hypothesised that there is no relation between socio-economic status and untreated morbidity among older people in India. A similar hypothesis was undertaken for studying the treatment seeking behaviour wherein it was hypothesised that there was no assoscation between socio-economic status and treatment seeking behaviour of elderly.

Methods

A stratified multi-stage study design was adopted for both rounds of NSSO. The data for the analysis was taken from schedule 25.0 of the 60th (2004–05) and 71st round (2014–15) of the National Sample Survey (NSS) conducted by National Sample Survey Organization (NSSO), India (National Sample Survey Office, 2006, 2014). A total of 73,868 households and 383,338 individuals including 34,831 older persons aged 60 and above were covered in 60th round (2004), and 65, 932 households and 335,499 individuals including 27,245 older persons aged 60 and above were covered in 2014. All states and union territories were covered and the households were selected using multistage stratified sampling procedure (National Sample Survey Office, 2006, 2014). The analysis includes the population aged 60 and above. Both the surveys collected information on particulars of spells of the ailment of household members during the last 15 days including hospitalisation. The total number of outpatients aged 60 and above were 9,973 in 60th round (2004) and 8,567 in 71st round (2014) including deceased. All the spells of ailment that were treated on medical advice in the 15-days reference period were classified as outpatient care. If no treatment was ever taken on medical advice for the spell of ailment reported in the 15-days reference period, it was considered as untreated morbidity. The rate of untreated morbidity was defined as the spells of untreated morbidity per 1000 of the population exposed to the risk.

For analytical purpose, diseases were grouped into two categories which are mentioned in appendix A-1. Covariates based on literature review included age (60–69, 70–79 and 80+ years), sex (male and female), place of residence (urban and rural), caste (scheduled caste/scheduled tribe (SC/ST) and non-scheduled caste/scheduled tribe (SC/ST)), religion (Hindu, Muslim, Christian, others), education (Illiterate/no formal schooling, Primary completed, Secondary completed, Higher secondary completed and Graduate and above), monthly per capita expenditure (MPCE) was grouped as whether the individual was above or below poverty line according to Tendulkar committee estimates (GOI, 2014), availing any insurance scheme (yes or no), duration of ailment (less than 15 days, more than 15 days), economic independence (independent, partially dependent and fully dependent), living arrangement (living alone, living with spouse and living without spouse) and regions (south, north, central, north-east, east and west). The six regions consist of North (Jammu and Kashmir, Himachal Pradesh, Punjab, Haryana, Rajasthan, Delhi, and Uttaranchal), Central (Uttar Pradesh, Madhya Pradesh, and Chhattisgarh), East (Bihar, Jharkhand, West Bengal, and Orissa), Northeast (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, and Tripura), West (Gujarat, Maharashtra, and Goa), and South (Andhra Pradesh, Karnataka, Kerala, and Tamil Nadu).

Descriptive statistics, rate of untreated morbidity and logistic regression were used for the analysis. The rate of untreated morbidity was defined as the spells of untreated morbidity per 1000 of the population exposed to the risk. The dependent variable untreated morbidity (1-yes, 0-no) is in binary form; therefore, logistic regression was used to find out the important determinants for untreated morbidity among the elderly (Hoffman, 2019). The study employs heckprobit selection model which is a two-equation model. First, there is a selection model (in this study, referring to "whether a person is suffering from any disease - Chronic or Infectious (yes or no)"). Secondly, there is an outcome model

with a binary outcome (in this study refers to "whether treatment is taken or not if suffering from chronic or infectious diseases (yes or no)"). The model provides a two-step analysis and deals with the zero-sample issue, based on which it can accommodate the heterogeneity (i.e., shared unobserved factors) between older people and then address the endogeneity (between chronic or infectious diseases and treatment-seeking) for elderly in India. The heckman model is identified when the same independent variables in the selection equation appear in the outcome equation. However, this does not provide precise estimates in the outcome equation because of high multicollinearity; it is suggested to have at least one independent variable that appears in the selection equation and not in the outcome equation. A p-value of less than 0.05 was considered statistically significant (Sartori, 2019).

Results

Table 1 presents the percentage distribution of untreated morbidities among the elderly population concerning some background characteristics in two rounds of NSSO. The rate of untreated morbidities among elderly reduced from 157/1000 in the 60th round to 92/1000 in the 71st round. The overall decrease in relative decadal difference was 41% for untreated morbidity which stood statistically significant.

Table 2 (Model-2) shows that in 2004 the elderly from the age group above 80 years had 38% more likelihood of untreated morbidities when compared to the 60–69 age group [OR = 1.38%, p < 0.05]. Older people who had completed higher secondary education when compared to illiterate had 53% less likelihood in 2004 [OR = 0.47, p < 0.05] and 65% less likelihood in 2014 [OR = 35%, p < 0.05] to have untreated morbidity reiterating the importance of education in accessing healthcare. In both the rounds, it was observed that the elderly living below the poverty line had 42% [OR = 1.42, p < 0.05] and 50% [OR = 1.5, p < 0.05] more likelihood of untreated morbidities respectively in comparison to the elderly not living below the poverty line. This emphasises the importance of economic factors in affecting untreated morbidity. Also, in an attempt to account for other economic aspects, the analysis includes insurance to indicate how economic security can impact untreated morbidity. It is stated that elderly having insurance had 82% more likelihood of untreated morbidities in 2004 [OR = 1.82, p < 0.05]. This might be because the survey does not include all types of insurance. The elderly who were fully economically dependent had 17% less likelihood for untreated morbidities when compared to economically independent elderly in 2004 [OR = 0.83, p < 0.05].

Apart from economic factors, the paper encapsulates the impact of various social factors affecting untreated morbidity such as the institutional arrangement. The study indicates that in the 60th round, elderly who were living with spouse in comparison to those living alone had 47% significantly less likelihood to have untreated morbidities [OR = 0.53, p < 0.05]. Moreover, the elderly suffering from chronic diseases had 35% (OR = 1.35, p < 0.05) more likelihood to be untreated in comparison to those elderly who had infectious diseases in 2004 which changed to 33% (OR = 0.67, p < 0.05) less likelihood in 2014. Inequality in terms of caste was also quite blatant in the 60th round, as the Non- SC/ST population had 29% less risk of having untreated morbidities with respect to the SC/ST population [OR = 0.71, p < 0.05]. Also, to highlight the inequalities in untreated morbidity, the paper includes regional disparities wherein it was found that elderly from rural areas had 42% [OR = 1.42, p < 0.05] and 41% [OR = 1.41, p < 0.05] more likelihood of untreated morbidity in the year 2004 and 2014 respectively.

In Table 3 the analysis employed the heckprobit model for reporting of chronic diseases and sequential decision making to seek treatment. Considering the chronic illness as the dependent variable, the result shows that in the year 2004, older people in the age group 70–79 years were 0.16 times less likely to get treated in comparison to old aged 60–69 years. Older females in 2004 and 2014 were 0.18 and 0.41 times more likely to go for treatment in contrast to males respectively.

Table 1

Untreated morbidity among older people aged 60 years and above (per 1000) in India, 60th and 71st round NSSO.

Background variables	60th round (N = 9973)		71st round (N = 8567)		Relative Decadal Difference (%)
Age (years)	Rate (per 1000)	C.I (95%)	Rate (per 1000)	C.I (95%)	
(Youngest-old) 60-69	152	143–161	100	92–108	−34*
(old-old) 70-79	161	147–174	75	64–86	−53*
(oldest-old) 80+	192	163–220	77	57–97	−60*
Sex					
Male	151	143–159	100	92–107	−34*
Female	172	158–186	74	64–84	−57*
Education					
Illiterate/No formal schooling	196	185–207	119	108–130	−39*
Primary completed	134	123–145	85	75–95	−37*
Secondary completed	69	51–87	48	35–61	−30*
Higher secondary completed	88	57–119	21	Jul-35	−76*
Graduate and above	47	29–67	69	51–87	47*
Below poverty Line (BPL)					
No	143	136–151	79	72–85	−45*
Yes	221	202–241	181	157–205	−18*
Economic independence					
Independent	160	149–170	104	93–114	−35*
Partially dependent	156	138–174	114	99–129	−27*
Fully dependent	155	144–166	69	61–77	−55*
Living arrangement					
Living alone	262	223–300	77	43–111	−71*
Living with spouse	144	136–152	92	85–99	−36*
Living without spouse	176	159–192	93	79–107	−47*
Insurance					
No	150	142–158	87	81–94	−42*
Yes	182	166–198	103	90–166	−43*
Diseases					
Infectious	134	120–149	190	172–209	42
Chronic	156	149–168	54	48–60	−65*
Others	157	142–172	98	80–115	−38*
Duration of ailment					
Less than 15 days	149	137–161	203	185–221	36
More than 15 days	155	146–164	52	47–58	−66*
Caste					
SC/ST	215	197–233	187	168–206	−13*
Non SC/ST	143	135–151	70	64–76	−51*
Religion					
Hindu	161	153–169	97	90–104	−40*
Islam	174	153–196	77	62–93	−56*
Christianity	130	99–160	97	71–124	−25*
others	64	41–87	18	Apr-32	−72*
Type of Residence					
Urban	102	92–111	47	41–53	−54*
Rural	180	170–189	119	109–128	−34*
Region					
South	167	154–180	50	42–57	−70*
North	89	74–103	83	68–98	−07*
Central	195	177–212	130	111–149	−33*
East	186	167–205	170	152–189	−9*
North East	179	151–208	265	213–316	48
West	107	90–124	38	26–49	−64*
Total	**157**	**150–164**	**92**	**86–98**	**−41***

BPL is calculated using Tendulkar committee estimates for the year 2004 and 2012.

BPL is at individual level as it has been divided by household size.
SC/ST: Scheduled caste/Scheduled tribe; Non- SC/ST: Others.

Respondents who were graduate and above were 0.89 times more likely to go for treatment in 2004 in comparison to illiterate. Older poeple from BPL category were 0.25 and 0.12 times less likely to suffer from chronic diseases in 2004 and 2014 but their treatment-seeking behaviour was ambiguous as the coefficients were insignificant. Elderly who were fully dependent were 0.27 times more likely to get treated for chronic diseases. Also, older people living with their spouse were 0.24 and 0.27 times more likely to go for treatment in contrast to elderly who live alone in 2004 and 2014 respectively. If the duration of chronic disease was more than 15 days, the chances of treatment were 0.18 times less likely in the year 2004 but 0.27 times more likely in the year 2014. Reiterating the regional disparities, it was indicated that older people who belong to rural areas were 0.14 and 0.26 times less likely to go for treatment in 2004 and 2014 in comparison to urbanites respectively.

In Table 4 the analysis followed the heckprobit model for reporting of infectious diseases and sequential decision making to seek treatment. In 2004, the elderly in the age group 80+ (old-old) were 0.42 times less likely to get treatment in comparison to elderly aged 60–69 years. However, in 2014 elderly in the age group, 80+ were 0.26 times more likely to go for treatment in contrast to old aged 60–69 years but the results were insignificant. Elderly females in the year 2014 were 0.27 times more likely to go for treatment for infectious diseasesand elderly who belong to BPL category were 0.26 times less likely to go for treatment in contrast to their counterparts. Considering the institutional arrangement it was observed that older people living with a spouse were 0.67 times more likely to go for treatment for infectious diseases in comparison to those who live alone in the year 2014. Also,Older people having insurance were 0.30 times less likely to go for the treatment of contagious illnesses in comparison to their counterpart in the year 2014; however, the result was ambiguous and needs further analysis. If the duration of infectious disease was more than 15 days, then the respondents were 0.44 times more likely to go for treatment in comparison to those whose duration of infectious disease was less than 15 days in the year 2004. Respondents from rural areas in 2014 were 0.24 times less likely to go for treatment in comparison to urbanites in 2014.

Discussion

Firstly, focussing on the untreated morbidity among older people the paper indicates that the decline in relative decadal difference for untreated morbidity was 41% which was statistically significant. After controlling for socio-economic and demographic factors, it was found that in the year 2004 elderly who were economically fully dependent were significantly less likely to be untreated, whereas in 2014 elderly who were economically partially dependent were insignificantly more likely to be untreated. Also, it was found that older people who suffer from chronic diseases were less likely to go for treatment. This was probably because of high OOPE in private hospitals, people either do not go for treatment as found in the analysis, or they prefer public facilities which were comparatively cheaper in terms of service cost. It was argued that OOPE was high if an individual suffers from a chronic disease and goes for treatment in a private hospital (Kastor & Mohanty, 2018; Richard, Walker, & Alexandre, 2018b; Tolla et al., 2017). In terms of the institutional arrangement, it was observed in both rounds of the survey that the elderly who were living alone were more likely to have untreated morbidity, but the results were insignificant in 2014. This emphasises the importance of social factors such as institutional arrangements in affecting untreated morbidity. This was also evident from the heckprobit model that older people who live alone and were economically independent were less likely to go for treatment in both the rounds of the survey. These two results can be explained in relation to each other, as there were higher chances that the elderly who were living alone were economically independent too. In previous literature,

Table 2
Determinants for untreated morbidity among older people aged 60 years and above in India: NSSO 60th and 71st round (using Binary Logistic Regression).

Background variables	60th round (N = 9973)		71st round (N = 8567)	
	Model-1	Model-2	Model-1	Model-2
Age (years)				
(Youngest-old) 60-69	Ref.	Ref.	Ref.	Ref.
(old-old) 70-79	1.03	1.03	0.84	0.97
	(0.91,1.17)	(0.9,1.18)	(0.69,1.03)	(0.78,1.19)
(oldest-old) 80+	1.35*	1.38*	0.9	1.09
	(1.1,1.66)	(1.11,1.72)	(0.65,1.24)	(0.78,1.53)
Sex				
Male	Ref.	Ref.	Ref.	Ref.
Female	1.21*	1.07	0.89	0.97
	(1.06,1.38)	(0.92,1.26)	(0.74,1.09)	(0.77,1.22)
Education				
Illiterate/No formal schooling	Ref.	Ref.	Ref.	Ref.
Primary completed	0.79*	0.75*	0.72*	0.76*
	(0.69,0.91)	(0.65,0.87)	(0.59,0.89)	(0.62,0.94)
Secondary completed	0.6*	0.51*	0.47*	0.52*
	(0.45,0.79)	(0.38,0.69)	(0.32,0.68)	(0.35,0.76)
Higher secondary completed	0.51*	0.47*	0.32*	0.35*
	(0.33,0.77)	(0.3,0.73)	(0.17,0.59)	(0.18,0.65)
Graduate and above	0.38*	0.29*	0.72	0.83
	(0.25,0.57)	(0.18,0.45)	(0.49,1.05)	(0.56,1.24)
Below poverty Line (BPL)				
No	Ref.	Ref.	Ref.	Ref.
Yes	1.36*	1.42*	1.67*	1.5*
	(1.18,1.56)	(1.23,1.65)	(1.34,2.09)	(1.2,1.89)
Economic independence				
Independent	–	Ref.	–	Ref.
Partially dependent	–	0.83*	–	1.13
		(0.7,0.99)		(0.89,1.43)
Fully dependent	–	0.86*	–	0.80
		(0.74,0.99)		(0.64,1.00)
Living arrangement				
Living alone	–	Ref.	–	Ref.
Living with spouse	–	0.53*	–	0.70
		(0.41,0.67)		(0.42,1.17)
Living without spouse	–	0.53*	–	0.80
		(0.41,0.68)		(0.48,1.36)
Insurance				
No	–	Ref.	–	Ref.
Yes	–	1.82*	–	1.1
		(1.57,2.12)		(0.88,1.37)
Diseases				
Infectious	–	Ref.	–	Ref.
Chronic	–	1.35*	–	0.67*
		(1.13,1.6)		(0.52,0.86)
Others	–	1.17	–	0.73*
		(0.98,1.41)		(0.55,0.97)
Duration of ailment				
Less than 15 days	–	Ref.	–	Ref.
More than 15 days	–	1.03	–	0.36*
		(0.89,1.18)		(0.29,0.45)
Caste				
SC/ST	Ref.	Ref.	Ref.	Ref.
Non SC/ST	0.71*	0.71*	0.78*	0.83
	(0.62,0.82)	(0.61,0.82)	(0.64,0.96)	(0.67,1.03)
Religion				
Hindu	Ref.	Ref.	Ref.	Ref.
Islam	0.97	0.96	0.98	1.07
	(0.82,1.16)	(0.8,1.16)	(0.75,1.29)	(0.81,1.41)
Christianity	1.06	1.05	1.84*	1.87*
	(0.81,1.4)	(0.79,1.41)	(1.28,2.64)	(1.28,2.71)
others	0.82	0.85	0.77	0.79
	(0.58,1.15)	(0.59,1.22)	(0.46,1.28)	(0.47,1.32)
Type of Residence				
Urban	Ref.	Ref.	Ref.	Ref.
Rural	1.34*	1.42*	1.52*	1.41*
	(1.18,1.53)	(1.24,1.64)	(1.26,1.85)	(1.15,1.71)
Region				

Table 2 (*continued*)

Background variables	60th round (N = 9973)		71st round (N = 8567)	
	Model-1	Model-2	Model-1	Model-2
South	Ref.	Ref.	Ref.	Ref.
North	0.5*	0.5*	1.27	1.11
	(0.4,0.63)	(0.4,0.63)	(0.92,1.76)	(0.79,1.54)
Central	1.16	1.14	1.94*	1.64*
	(0.98,1.36)	(0.96,1.35)	(1.47,2.56)	(1.23,2.2)
East	1.27*	1.22*	3.04*	2.49*
	(1.07,1.5)	(1.02,1.45)	(2.38,3.87)	(1.93,3.2)
North East	1.2	1.06	3.82*	2.46*
	(0.96,1.51)	(0.82,1.36)	(2.63,5.54)	(1.66,3.66)
West	0.75*	0.75*	1.06	0.95
	(0.61,0.92)	(0.61,0.93)	(0.75,1.5)	(0.66,1.36)

* if P < 0.05.
Ref: Reference category.
BPL is calculated using Tendulkar committee estimates for the year 2004 and 2012.
BPL is at individual level as it has been divided by household size.
SC/ST: Scheduled caste/Scheduled tribe; Non- SC/ST: Others.

it was found that older persons who live alone were more vulnerable because they were characterised by difficult living situations, limited resources, and lack of support (Haslbeck, McCorkle, & Schaeffer, 2012). Lack of family support, caregivers and social services creates the mismanagement of treatment among elderly i.e. if more older people were living alone, they were more prone to be untreated and because of that, there must be a greater risk of getting deceased among them. With respect to the previous statement about elderly living alone, in spite of their economic independence, they were more prone to death because of chronic diseases being probably untreated (Bucholz & Krumholz, 2012; Ng et al., 2015). It has been argued in one of the study that treatment-seeking was highest among elderly living with spouse along with other members of the family and lowest among those living with others (without spouse in the family) (Paul & Verma, 2016; Prohaska & Glasser, 1996; Wolff & Kasper, 2006); this study confirms the findings of our study that untreated morbidity was less likely to happen if the elderly people were living with spouse. It was evident from the study that untreated morbidity was concentrated among older-aged 80 and above in 2004, this was because they generally associate their illness with the ageing process and neglect medical treatment (Mukherjee & Karmakar, 2014). Untreated morbidity was concentrated among older people belonging to BPL category in comparison to their counterpart in both rounds of the survey. Previous studies confirm that economic status was a strong independent determinant of healthcare utilization in India. The untreated morbidity was disproportionately higher among the poor and more so for the older population (Pandey et al., 2017).

Linking the results of heckprobit model and private health care utilisation this study provides evidence that the elderly who belong to BPL category were less likely to go for treatment in case of both chronic and infectious diseases. Moreover, private health care utilisation was less among respondents who belong to BPL category status in comparison to their counterpart. Fig. 1 carves the information that people do not go for treatment because either the ailment was not severe or services to treat illness were too expensive. Moreover, from Fig. 2, it was evident that older people do not go for public/government health care facility because they are either not satisfied with the services or they find long waiting time for the appointment with the doctor. Similar findings were visible in other studies too that utilisation of private health facility was less among poor, and treatment-seeking was also low among poor because of the problems of quality and accessibility of public sector (Levesque, Haddad, Narayana, & Fournier, 2006). It was argued in another study that CHE was high among older people suffering from chronic diseases and that was because of more health care utilisation in the private health facility.

Further, household's seeking care in public health care facilities were

Table 3
Heckprobit model for chronic disease and treatment seeking behaviour among older people aged 60 years and above in India, NSSO 60th and 71st round.

Background variables	Chronic disease (Outcome equation)		Treatment seeking (Selection Equation)	
	60th round	71st round	60th round	71st round
Age (years)				
(Youngest-old) 60-69	Ref.	Ref.	Ref.	Ref.
(old-old) 70-79	0.11*	0.07	−0.16*	0.01
	(0.06,0.16)	(-0.02,0.16)	(-0.27,-0.05)	(-0.2,0.23)
(oldest-old) 80+	−0.06	−0.1	−0.17	0.19
	(-0.15,0.03)	(-0.24,0.03)	(-0.36,0.01)	(-0.15,0.53)
Sex				
Male	Ref.	Ref.	Ref.	Ref.
Female	−0.42*	−0.48*	0.18*	0.41*
	(-0.48,-0.37)	(-0.56,-0.39)	(0.01,0.36)	(0.15,0.66)
Education				
Illiterate/No formal schooling	Ref.	Ref.	Ref.	Ref.
Primary completed	0.24*	0.34*	0.13	−0.19
	(0.18,0.3)	(0.24,0.44)	(-0.08,0.33)	(-0.43,0.05)
Secondary completed	0.3*	0.42*	0.37*	0.08
	(0.19,0.42)	(0.27,0.57)	(0.05,0.69)	(-0.28,0.44)
Higher secondary completed	0.4*	0.44*	0.39	0.36
	(0.25,0.56)	(0.23,0.65)	(-0.06,0.84)	(-0.02,0.74)
Graduate and above	0.36*	0.47*	0.89*	−0.30
	(0.23,0.5)	(0.29,0.65)	(0.4,1.38)	(-0.78,0.19)
Below poverty Line (BPL)				
No	Ref.	Ref.	Ref.	Ref.
Yes	−0.25*	−0.12*	−0.08	−0.11
	(-0.32,-0.19)	(-0.24,-0.06)	(-0.29,0.13)	(-0.33,0.11)
Economic independence				
Independent	–	–	Ref.	Ref.
Partially dependent	–	–	0.24*	0.27
			(0.02,0.46)	(-0.21,0.75)
Fully dependent	–	–	0.24*	0.04
			(0.01,0.47)	(-0.5,0.57)
Living arrangement				
Living alone	–	–	Ref.	Ref.
Living with spouse	–	–	0.06	0.14
			(-0.1,0.21)	(-0.16,0.45)
Living without spouse	–	–	0.12*	0.12
			(0,0.25)	(-0.14,0.38)
Insurance				
No	–	–	Ref.	Ref.
Yes	–	–	−0.3*	−0.06
			(-0.45,-0.14)	(-0.3,0.17)
Duration of ailment				
Less than 15 days	–	–	Ref.	Ref.
More than 15 days	–	–	−0.18*	0.27
			(-0.32,-0.05)	(-0.06,0.61)
Caste				
SC/ST	Ref.	Ref.	Ref.	Ref.
Non SC/ST	0.12*	0.06	0.12	0.43*
	(0.06,0.19)	(-0.05,0.17)	(-0.05,0.29)	(0.18,0.69)
Source: drinking water				
Improved	Ref.	Ref.	–	–
Tap	−0.06*	−0.18*	–	–
	(-0.12,0)	(-0.28,-0.09)		
Unimproved	−0.09	−0.17	–	–
	(-0.2,0.03)	(-0.36,0.02)		
Religion				
Hindu	Ref.	Ref.	Ref.	Ref.
Islam	0.18*	0.25*	−0.15	−0.26
	(0.1,0.26)	(0.13,0.38)	(-0.32,0.02)	(-0.57,0.04)
Christianity	0.3*	0.14	−0.18	−0.06
	(0.17,0.42)	(-0.05,0.32)	(-0.43,0.07)	(-0.44,0.32)
others	0.23*	0.3*	0.16	0.12
	(0.11,0.35)	(0.11,0.5)	(-0.16,0.47)	(-0.26,0.51)
Type of Residence				
Urban	Ref.	Ref.	Ref.	Ref.

Table 3 (*continued*)

Background variables	Chronic disease		Treatment seeking	
	(Outcome equation)		(Selection Equation)	
	60th round	71st round	60th round	71st round
Rural	−0.24*	−0.18*	−0.14	−0.26*
	(-0.29,-0.18)	(-0.27,-0.09)	(-0.32,0.04)	(-0.51,-0.02)
Region				
South	Ref.	Ref.	Ref.	Ref.
North	−0.42*(-0.5,-0.35)	−0.7* (-0.83,-0.58)	0.37* (0.16,0.57)	0.52* (0.18,0.85)
Central	−0.53*(-0.6,-0.46)	−0.94* (-1.07,-0.8)	0.17 (-0.1,0.44)	0.06 (-0.29,0.4)
East	−0.45* (-0.52,-0.38)	−0.75* (-0.87,-0.62)	0.15 (-0.27,0.28)	0.18 (-0.1,0.47)
North East	−0.49* (-0.62,-0.35)	−1.52* (-1.78,-1.26)	0.45* (0.18,0.73)	0.73* (0.31,1.14)
West	−0.1*(-0.18,-0.02)	−0.73* (-0.85,-0.6)	0.17* (0.02,0.33)	0.32 (-0.05,0.69)
athrho	−0.79*	−1.63*		
	(-1.66,-0.52)	(-2.8,-0.47)		
rho	−0.66	−0.93		
	(-0.93,0.08)	(-0.99,-0.44)		
Wald chi2	129.60*	82.77*		
Number of obs	34,760	27,107		
Censored obs	29,420	21,450		
Uncensored obs	5,340	5,657		

*if P < 0.05.
Ref: Reference category.
BPL is calculated using Tendulkar committee estimates for the year 2004 and 2012.
BPL is at individual level as it has been divided by household size.
SC/ST: Scheduled caste/Scheduled tribe; Non- SC/ST: Others.

increasingly asked to buy expensive drugs and diagnostics from private outlets citing unavailability of these facilities in the existing set-up (Brinda, Kowal, Attermann, & Enemark, 2015; Selvaraj & Karan, 2009). The respondents from rural areas were less likely to go for treatment even if they suffer from either chronic or infectious diseases.

This is a significant public health concern that even after numerous health programmes target rural residents health care utilisation remains low amongst them. One of the previous studies argued that even after the launch of programmes like NRHM and RSBY, the condition of the health system has declined from the year 1986–87 to 2004 (Selvaraj & Karan, 2009). In India, the common belief that the private sector offers better quality care, coupled with inadequate public provision has led many people to use private facilities and bear high out-of-pocket costs (Goeppel, Frenz, Grabenhenrich, & Tinnemann, 2016, pp. 276–285).

Conclusion

In conclusion, this study provides evidence of untreated morbidity and treatment-seeking behaviour among elderly who suffer from chronic or infectious diseases. Policy initiatives should be taken to motivate them further to undergo treatment by improving public care facilities and making more investment in the public health sector. The focus should be on geriatric health care needs by giving it special policy impetus.

Limitations

There are some limitations of this study which should be kept in mind while interpreting the results. Firstly, the morbidity is self-reported, which may suffer from perception bias and also social group classification was self-reported and not cross checked with the certificates of being SC/ST. Secondly, as the data was cross-sectional, there

Table 4

Heckprobit model for Infectious disease and treatment seeking behaviour among older people aged 60 years and above in India, NSSO 60th and 71st round.

Background variables	Infectious diseases		Treatment seeking	
	(Outcome equation)		(Selection Equation)	
	60th round	71st round	60th round	71st round
Age (years)				
(Youngest-old) 60-69	Ref.	Ref.	Ref.	Ref.
(old-old) 70-79	−0.21* (-0.28,-0.13)	−0.2* (-0.32,-0.08)	−0.14 (-0.43,0.15)	0.03 (-0.22,0.29)
(oldest-old) 80+	−0.33* (-0.46,-0.21)	−0.18 (-0.37,0.01)	−0.42* (-0.84,0)	0.26 (-0.17,0.69)
Sex				
Male	Ref.	Ref.	Ref.	Ref.
Female	−0.52* (-0.58,-0.45)	−0.49* (-0.61,-0.38)	−0.29 (-0.9,0.32)	0.27* (0.04,0.51)
Education				
Illiterate/No formal schooling	Ref.	Ref.	Ref.	Ref.
Primary completed	0.14* (0.06,0.22)	0.18* (0.05,0.3)	−0.05 (-0.38,0.28)	−0.08 (-0.3,0.13)
Secondary completed	0.13 (-0.04,0.29)	0.08 (-0.13,0.3)	0.39 (-0.06,0.85)	−0.14 (-0.48,0.19)
Higher secondary completed	0.10 (-0.13,0.32)	−0.2 (-0.46,0.07)	0.03 (-0.65,0.72)	0.28 (-0.46,1.01)
Graduate and above	−0.16 (-0.36,0.03)	−0.02 (-0.3,0.25)	−0.1 (-0.89,0.68)	0.19 (-0.22,0.6)
Below poverty Line (BPL)				
No	Ref.	Ref.	Ref.	Ref.
Yes	−0.06 (-0.14,0.02)	0.08 (-0.06,0.22)	−0.19 (-0.4,0.03)	−0.26* (-0.51,-0.01)
Economic independence				
Independent	–	–	Ref.	Ref.
Partially dependent	–	–	0.51 (-0.03,1.04)	−0.67* (-1.2,-0.14)
Fully dependent	–	–	0.38 (-0.1,0.86)	−0.59* (-1.13,-0.06)
Living arrangement				
Living alone	–	–	Ref.	Ref.
Living with spouse	–	–	0.22 (-0.08,0.52)	−0.13 (-0.36,0.1)
Living without spouse	–	–	0.08 (-0.14,0.31)	0.17 (-0.05,0.39)
Insurance				
No	–	–	Ref.	Ref.
Yes	–	–	−0.11 (-0.37,0.16)	−0.30* (-0.54,-0.06)
Duration of ailment				
Less than 15 days	–	–	Ref.	Ref.
More than 15 days	–	–	0.21 (-0.05,0.47)	0.44* (0.21,0.68)
Caste				
SC/ST	Ref.	Ref.	Ref.	Ref.
Non SC/ST	−0.01 (-0.09,0.07)	0.05 (-0.08,0.18)	0.15 (-0.1,0.4)	0.02 (-0.23,0.26)
Source: drinking water				
Improved	Ref.	Ref.	–	–
Tap	−0.07 (-0.15,0)	0.01 (-0.11,0.12)	–	–
Unimproved	−0.19* (-0.36,-0.02)	−0.18 (-0.37,0.02)	–	–
Source: Cooking Fuel				
Clean	Ref.	Ref.	–	–
Unclean	0.07 (-0.04,0.19)	0.23* (0.12,0.34)	–	–
Nosocomial				
No	Ref.	Ref.	–	–
Yes	−0.004 (-0.28,0.27)	−0.04 (-0.25,0.16)	–	–
Religion				
Hindu	Ref.	Ref.	Ref.	Ref.
Islam				

Table 4 (*continued*)

Background variables	Infectious diseases		Treatment seeking	
	(Outcome equation)		(Selection Equation)	
	60th round	71st round	60th round	71st round
	0.06	0.04	−0.02	−0.18
	(-0.04,0.16)	(-0.13,0.21)	(-0.32,0.29)	(-0.47,0.1)
Christianity	−0.01	0.18	−0.12	−0.60*
	(-0.18,0.15)	(-0.08,0.44)	(-0.62,0.38)	(-1.01,-0.18)
others	0.09	−0.05	0.3	0.86*
	(-0.08,0.26)	(-0.34,0.24)	(-0.31,0.92)	(0.48,1.25)
Type of Residence				
Urban	Ref.	Ref.	Ref.	Ref.
Rural	0.09*	−0.03	−0.20	−0.24*
	(0.01,0.18)	(-0.15,0.1)	(-0.63,0.24)	(-0.48,-0.01)
Region				
South	Ref.	Ref.	Ref.	Ref.
North	0.12*	0.19*	0.46*	−0.59*
	(0.01,0.23)	(0.02,0.36)	(0.07,0.85)	(-0.91,-0.28)
Central	0.16*	0.17*	−0.35	−0.36*
	(0.07,0.26)	(0,0.34)	(-0.97,0.27)	(-0.68,-0.04)
East	−0.03	0.31*	−0.16	−0.84*
	(-0.13,0.07)	(0.15,0.47)	(-0.48,0.16)	(-1.11,-0.57)
North East	0.22*	−0.03	−0.38	−0.42
	(0.09,0.36)	(-0.36,0.3)	(-1.07,0.32)	(-1.02,0.18)
West	−0.03	0.002	0.41	0.24
	(-0.14,0.08)	(-0.18,0.17)	(-0.13,0.96)	(-0.05,0.53)
athrho	**0.57**	**−1.9***		
	(-1.2,2.34)	**(-2.69,-1.11)**		
rho	**0.51**	**−0.96**		
	(-0.83,0.98)	**(-0.99,-0.8)**		
Wald chi2	**72.32***	**126.72***		
Number of obs	**34,761**	**27,205**		
Censored obs	**32,661**	**25,459**		
Uncensored obs	**2,100**	**1,746**		

*if p < 0.05.
Ref: Reference category.
BPL is calculated using Tendulkar committee estimates for the year 2004 and 2012.
BPL is at individual level as it has been divided by household size.
SC/ST: Scheduled caste/Scheduled tribe; Non- SC/ST: Others.

could not be any causal inference. Thirdly, question on insurance was

asked only for government funded insurance scheme and employer related insurance schemes whose benefits were very limited and also people were not well aware of those schemes. Therefore, some discrepancies in data were possible; however, it was important to control for the insurance variable. Lastly, all factors which affect the treatment-seeking behaviour of the elderly could not be included in the study. Some survey related limitations were also observed. For example, non-coverage errors in states like Jammu-Kashmir and Nagaland (Agrawal, Kumar, & Premji, 2017). Even after these limitations, this study provides large-scale evidence of how socio-economic and demographic factors affect treatment-seeking behaviour among the elderly.

Ethical approval

No ethical approval needed for this data.

CRediT authorship contribution statement

Shobhit Srivastava: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Software, Supervision, Validation, Visualization, Writing - original draft, Writing - review & editing. **Anayat Gill:** Writing - original draft, Writing - review & editing.
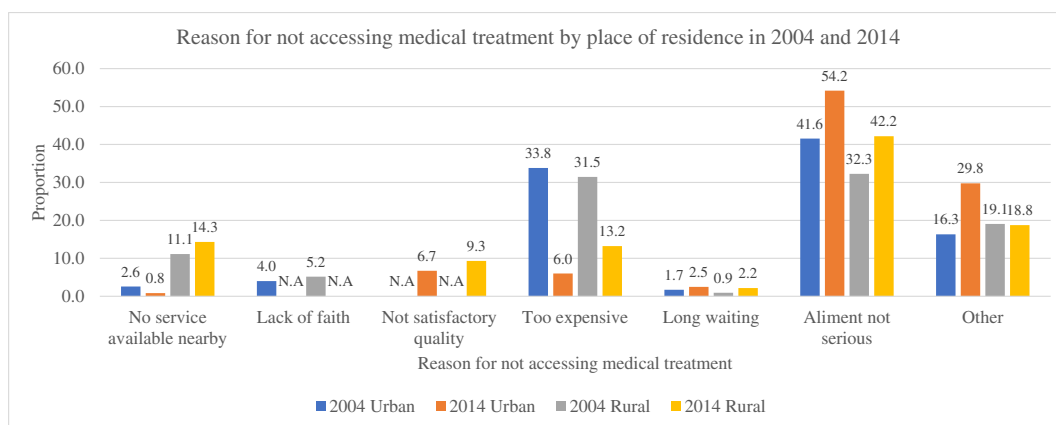
List of abbreviations

NRHM National Rural Health Mission
RSBY Rashtriya Swasth Bima Yojana
OOPE Out of Pocket Expenditure

Fig. 1. Reason for not accessing medical treatment by place of residence in 2004 and 2014
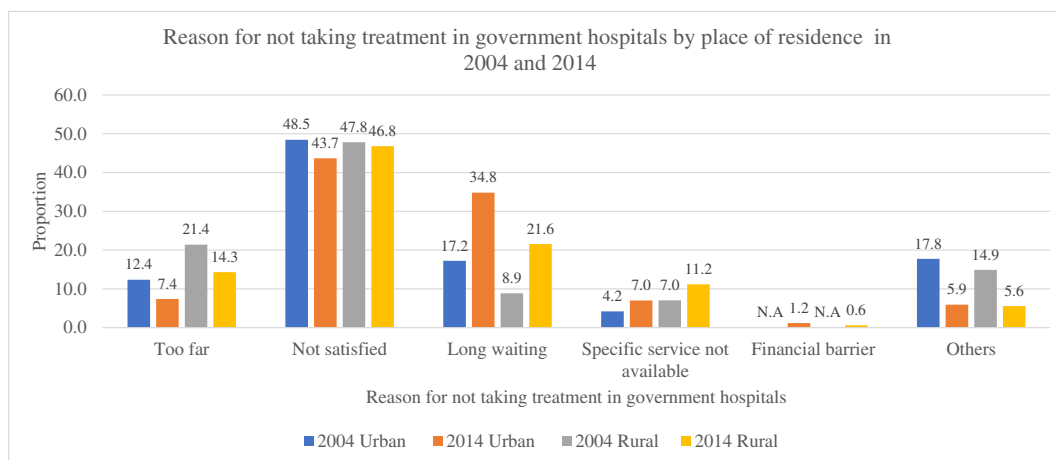N.A: Not Available.

Fig. 2. Reason for not taking treatment in government hospitals by place of residence in 2004 and 2014
N.A: Not Available.

CHE	Catastrophic Health Expenditure
OR	Odds Ratio
BPL:	Below Poverty Line
SC/ST	Scheduled caste/Scheduled tribe
NSSO	National Sample Survey Organization
BKPAI	Building a knowledge Base on Population Ageing in India

Appendix B. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ssmph.2020.100557.

Appendix A-1

Classification of chronic and infectious diseases used in this study according to ICD - 10	
Chronic diseases	Infectious Diseases
Cancer	Fever with loss of consciousness or altered consciousness
Anaemia	Fever with rash/eruptive lesions
Diabetes	Fever due to Diphtheria, Whooping Cough
Goitre and other diseases of thyroid	All other fevers: (Includes malaria, typhoid and fevers of unknown origin, all specific fevers that do not have a confirmed diagnosis)
Obesity	Tuberculosis
Psychiatric and Neurological: (Mental retardation and Mental disorder, Headache, Seizures or known epilepsy, Stroke/hemiplegia/sudden onset weakness or loss of speech in half of body and memory loss/confusion.	Filariasis
Cataract	Tetanus
Glaucoma	HIV/AIDS
Decreased vision (chronic)	Other sexually transmitted diseases
loss of hearing	Jaundice
CVD (Hypertension and heart diseases)	Diarrhea/dysentery/increased frequency of stools with or without blood and mucus in stools
Bronchial asthma/recurrent episode of wheezing and breathlessness with or without cough over long periods or known asthma)	Worms infestation
Musculo-skeletal: (Joint or bone disease/pain or swelling in any of the joints, or swelling or pus from the bones and back or body aches)	Skin infection: (boil, abscess, itching) and other skin disease
	Respiratory Infections: [Cough with sputum with or without fever and not diagnosed as Tuberculosis(TB), acute upper respiratory infections (cold, runny nose, sore throat with cough, allergic colds included)]

References

Agrawal, A., Kumar, V., & Premji, A. (2017). *NSSO surveys along India's periphery: Data quality and its implications*.

Albanese, E., Liu, Z., Acosta, D., Guerra, M., Huang, Y., Jacob, K. S., et al. (2011). Equity in the delivery of community healthcare to older people: Findings from 10/66 dementia research group cross-sectional surveys in Latin America, China, India and Nigeria. *BMC Health Services Research, 11*, 153. https://doi.org/10.1186/1472-6963-11-153.

Amente, T., & Kebede, B. (2016). Determinants of health service utilization among older adults in bedele Town,Illubabor zone, Ethiopia. *Journal of Diabetes & Metabolism, 7* (11), 1–7. https://doi.org/10.4172/2155-6156.1000713.

Banerjee, A., Deaton, A., & Duflo, E. (2003). *Wealth, health, and health services in rural Rajasthan*.

Barua, K., Borah, M., Deka, C., & Kakati, R. (2017). Morbidity pattern and health-seeking behavior of elderly in urban slums: A cross-sectional study in Assam, India. *Journal of Family Medicine and Primary Care, 6*(2), 345. https://doi.org/10.4103/2249-4863.220030.

Beard, J., Alana, O., Anne, W., & Asamoa-Baah, A. (2011). *World report on ageing and health*.

Biswas, P., Nahar Kabir, Z., Nilsson, J., & Zaman, S. (2006). Dynamics of health care seeking behaviour of elderly people in rural Bangladesh. *International Journal of Ageing and Later Life, 1*(1), 69–89. https://doi.org/10.3384/ijal.1652-8670.061169.

Brinda, E. M., Kowal, P., Attermann, J., & Enemark, U. (2015). Health service use, out-of-pocket payments and catastrophic health expenditure among older people in India: The WHO study on global AGEing and adult health (SAGE). *Journal of Epidemiology & Community Health, 69*(5), 489–494. https://doi.org/10.1136/jech-2014-204960.

Bucholz, E. M., & Krumholz, H. M. (2012). Loneliness and Living Alone: What Are We Really Measuring? *NIH, 172*(14), 1084–1085. https://doi.org/10.1001/archinternmed.2012.2649.

Building, & India a Knowledge Base on Population Ageing in 2011. (2011). *Report on the status of elderly in select states of India, 2011*.

Goeppel, C., Frenz, P., Grabenhenrich, L., & Tinnemann, P. (2016). *Assessment of universal health coverage for adults aged 50 years or older with chronic illness in six middle-income countries. January*.

GOI. (2014). *Report of the expert group to review the methodology for measurement of poverty government of India planning commission*.

Haslbeck, J. W., McCorkle, R., & Schaeffer, D. (2012). Chronic illness self-management while living alone in later life: A systematic integrative review. *Research on Aging, 34*(5), 507–547. https://doi.org/10.1177/0164027511429808.

Hoffman, J. I. E. (2019). *Logistic regression analysis - an overview | ScienceDirect topics*. Retrieved December 24, 2019, from https://www.sciencedirect.com/topics/med icine-and-dentistry/logistic-regression-analysis.

Kastor, A., & Mohanty, S. K. (2018). *Disease-specific out-of-pocket and catastrophic health expenditure on hospitalization in India: Do Indian households face distress health financing?*. https://doi.org/10.1371/journal.pone.0196106.

Levesque, J.-F., Haddad, S., Narayana, D., & Fournier, P. (2006). Outpatient care utilization in urban Kerala, India. *Health Policy and Planning, 21*(4), 289–301. https://doi.org/10.1093/heapol/czl013.

Li, C., Dou, L., Wang, H., Jing, S., & Yin, A. (2017). Horizontal inequity in health care utilization among the middle-aged and elderly in China. *International Journal of Environmental Research and Public Health, 14*(8), 1–13. https://doi.org/10.3390/ijerph14080842.

Luke, N., & Munshi, K. (2007). Social affiliation and the demand for health services: Caste and child health in South India. *Journal of Development Economics, 83*(2), 256–279. https://doi.org/10.1016/j.jdeveco.2006.07.005.

Mukherjee, N. A., & Karmakar, K. (2014). Untreated morbidity and demand for healthcare in India : An analysis of national sample survey data. *Economic and Political Weekly, 43*(46), 71–77.

National Sample Survey Office. (2006). *Morbidity, health care and the condition of the aged*.

National Sample Survey Office. (2014). *Health in India*.

Ng, T. P., Jin, A., Feng, L., Shwe, M., Nyunt, Z., Chow, K. Y., et al. (2015). Mortality of older persons living alone : Singapore longitudinal ageing studies. *BMC Geriatrics*, 1–9. https://doi.org/10.1186/s12877-015-0128-7.

Nipun, A., Prakash, S. V., Kumar, S. A., & Danish, I. (2015). Healthcare services utilization by geriatric population in rural area of District Bareilly , India. *International Journal of Current Microbiology and Applied Sciences, 4*(5), 720–727.

Pandey, A., Ploubidis, G. B., Clarke, L., & Dandona, L. (2017). Horizontal inequity in outpatient care use and untreated morbidity: Evidence from nationwide surveys in India between 1995 and 2014. *Health Policy and Planning, 32*(7), 969–979. https://doi.org/10.1093/heapol/czx016.

Paul, A., & Verma, R. K. (2016). Does living arrangement affect work status , morbidity , and treatment seeking of the elderly Population ? A study of south Indian states. https://doi.org/10.1177/2158244016659528.

Prohaska, T. R., & Glasser, M. (1996). Patients' views of family involvement in medical care decisions and encounters. *Research on Aging, 18*(1), 52–69. https://doi.org/10.1177/0164027596181004.

Richard, P., Walker, R., & Alexandre, P. (2018a). The burden of out of pocket costs and medical debt faced by households with chronic health conditions in the United States. *PloS One, 13*(6), e0199598. https://doi.org/10.1371/journal.pone.0199598.

Richard, P., Walker, R., & Alexandre, P. (2018b). The burden of out of pocket costs and medical debt faced by households with chronic health conditions in the United States. *PloS One, 13*(6), e0199598. https://doi.org/10.1371/journal.pone.0199598.

Roy, K., & Chaudhuri, A. (2008). Influence of socioeconomic status, wealth and financial empowerment on gender differences in health and healthcare utilization in later life: Evidence from India. *Social Science & Medicine, 66*(9), 1951–1962. https://doi.org/10.1016/j.socscimed.2008.01.015.

Sartori, A. E. (2019). An estimator for some binary-outcome selection models without exclusion restrictions. *Political Analysis, 11*, 111–138. https://doi.org/10.1093/pan/mpg001.

Selvaraj, S., & Karan, A. K. (october 2009). Deepening Health insecurity in india: evidence from National sample surveys since 1980s. *Economic & Political Weekly EPW, 3*(40). http://www.jstor.org/stable/25663657.

Sharma, D., Mazta, S., & Parashar, A. (2013). Morbidity pattern and health-seeking behavior of aged population residing in Shimla hills of North India: A cross-sectional study. *Journal of Family Medicine and Primary Care, 2*(2), 188. https://doi.org/10.4103/2249-4863.117421.

Smith, J. P. (2012). *Preparing for population aging in Asia: Strengthening the infrastructure for science and policy. Aging in Asia: Findings from new and emerging data initiatives*. Retrieved from http://www.nap.edu.

Tolla, M. T., Norheim, O. F., Verguet, S., Bekele, A., Amenu, K., Abdisa, S. G., et al. (2017). Out-of-pocket expenditures for prevention and treatment of cardiovascular disease in general and specialised cardiac hospitals in Addis Ababa, Ethiopia: A cross-sectional cohort study. *BMJ Global Health, 2*(2), e000280. https://doi.org/10.1136/bmjgh-2016-000280.

Venkatapuram, S., Ehni, H. J., & Saxena, A. (2017). Equity and healthy ageing. *Bulletin of the World Health Organization, 95*(11), 791–792. https://doi.org/10.2471/BLT.16.187609.

Wolff, J. L., & Kasper, J. D. (2006). Caregivers of frail elders: Updating a national profile. *The Gerontologist, 46*(3), 344–356. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/16731873.

World Health Organization. (2017). *WHO | WHO Study on global AGEing and adult health (SAGE)*. WHO. Retrieved from https://www.who.int/healthinfo/sage/en/.

Zeeb, H., Rothgang, H., & Darmann-Finck, I. (2018). Ageing, health and equity—broad perspectives are needed to understand and tackle health challenges of ageing societies. *International Journal of Environmental Research and Public Health, 15*(3). https://doi.org/10.3390/ijerph15030457.