



Implication of Adult Out-Migration on the Health and Healthcare Seeking of the Older Parents in Indian Households: an Exploration

Pravat Bhandari¹ · Shinjini Ray¹ · R. Nagarajan²

Accepted: 14 June 2021 / Published online: 21 June 2021

© The Author(s), under exclusive licence to Springer Science+Business Media, LLC, part of Springer Nature 2021

Abstract

The ageing of population and simultaneous increase in adult out-migration are two contemporary demographic developments that are occurring in many developing countries. Due to inadequate formal care support and social security system, older parents from these countries may experience diminution in wellbeing when their adult children migrate. This study investigates the impact of adult out-migration on various health dimensions of left-behind older parents and their treatment seeking behaviour in Indian context. We utilized survey data from the Building a Knowledge Base on Population Ageing in India (BKPAI). Analysis was restricted to a representative sample of 9263 older adults (60+), who had at least one biological child. Employing OLS and IV regression models, the impact of adult out-migration on physical and psychological health outcomes of older adults were investigated. Using Heckman Probit model, we further investigated the impacts of migration on treatment seeking behaviour of older adults. Findings suggest that the migration of adult children positively influences older individual's subjective health (2SLS $\beta=0.095$, $p\leq 0.05$), functional ability to perform instrumental activities (2SLS $\beta=0.879$, $p\leq 0.001$) and cognitive ability (2SLS $\beta=0.208$, $p\leq 0.05$). At the same time, prevalence of chronic morbidity and depressive symptoms were found to be significantly higher among the older parents with migrant children. Findings also reveal a negative effect of migration on chronic disease related treatment seeking ($\beta=-0.09$, $p\leq 0.05$), which indicates that older individuals with migrant children were less likely to receive medical and other care facilities than older persons without migrating children if they suffer from chronic diseases. Our study provides evidence that absence of adult children due to migration has both positive and negative health impacts on the older parents left behind. Targeted efforts are needed to alleviate depressive symptoms and to improve healthcare utilization among left-behind older adults.

✉ Pravat Bhandari
pravat784@gmail.com

Extended author information available on the last page of the article

Keywords Ageing · Adult out-migration · Left-behind parents · Health effect · Treatment seeking

Introduction

Background

In recent decades, India has been experiencing an accelerated population ageing due to the drastic shifts in demographic trends, including declining fertility and falling mortality rates. An increase in the proportion of older population, further, represents a simultaneous reduction in the proportion of working age population or, in other words, an increased old age-dependency ratio, which indicates an additional requirement of healthcare and infrastructure as well as a strong social security system to ensure the wellbeing of old age persons (Rajan et al., 2003). In the Indian context, although traditional joint family and kinship are considered to be strong sources of social support and care for the older adults, where they are expected to receive intra-family care and financial assistance from their adult children (especially from the adult sons and daughters-in-law). Such dependence is also partly attributable to inadequate institutional support (e.g., institutional geriatric care) and welfare mechanisms (e.g., social security provisions) which would provide older persons both monetary and non-monetary support (Agrawal, 2012). In the last few decades, however, Indian society has witnessed a breakdown of the joint family system into nuclear families. Factors like urbanization and employment related migration have led to adult children and their families moving out of the parental home to bigger Indian cities and international destinations (Bailey et al., 2018). Such mobilities—which have to do with the disintegration of joint family and the rise of nuclear living—can lead to a diminishing levels of co-residence with adult children (Samanta et al., 2015), and may eventually put older adults at risk of being left behind. In the light of India's growing old age population, it is therefore imperative to understand whether the absence of adult children in the household has an implication on health and healthcare seeking of left-behind older parents. There are a few studies from developing countries that focussed on the overall physical and psychological health of left-behind older adults (Abas et al., 2009; Adhikari et al., 2011; Kanaiaupuni, 2000; Knodel & Saengtienchai, 2007; Kuhn, 2005; Yi et al., 2019), but the evidence of possible and specific health and wellbeing outcomes of older Indians in the absence of their adult children in the household are less explored. So far, the studies encompassing the consequences of adult out migration in Indian context have mainly focused on the children and spouses of migrants who stay behind (Coffey, 2013; Desai & Banerji, 2008; Nguyen, 2016).

Older parents with one or more adult out migrant children, staying at the place of origin or place of usual residence—disregard if there are still other family members that remain in the household or not—are considered as left-behind older adults (Adhikari et al., 2011; AO et al., 2016; Thapa et al., 2018). In the present study, older parents were considered as being left behind when one or more adult

sons have migrated. This is because in the context of India's strict patriarchal culture, adult daughters immediately leave parental house after their marriage and start residing in their spouse's house. Accordingly, the day-to-day dependency of older parents remains mainly on adult sons and daughters-in-law (Sathyanarayana et al., 2014). Thus, we focused on migration status of adult male children (sons) to net out the effect of migration on older parents left behind. In the following pages we provide the theoretical perspective on adult out-migration and health outcomes of left-behind older parents.

Adult Out-migration and Left-behind Parents' Health: Theoretical Considerations

Broadly there are three theoretical frameworks that help to understand the relationship between the adult out-migration and the health outcome of the older parents left behind. They are: the classical model of time allocation, the family disruption model and the new economics of labor migration (NELM) model. According to *the time allocation model* (Becker, 1965; Grossman, 1972), migration estranges adult children from their elderly parents and consequently, the former have less time to take care of the latter (Hermalin & Myers, 2002). In fact, migrant children working far from parental residence could not provide physical and emotional support to the older parents during their illness, which makes the left-behind parents feel insecure, isolated and lonely (Kuhn et al., 2011). This ultimately worsens the overall parental health and well-being. Similar to the time allocation model, *the family disruption model* also suggests that migration disrupts the multigenerational family arrangements by separating migrant sons from their older parents. It is, therefore, believed that the instability and disequilibrium caused in the family due to migration can lead to psychological distress and poor subjective health among older parents left behind (Song, 2017). The *new economics of labor migration* (NELM) theory argues that the decision of migration is often a mutually beneficial arrangement between migrants and the left-behind household members (De Haas, 2010). According to this model, the financial assistance that left-behind parents receive from their migrant children in terms of remittances may reduce the financial stress of left-behind older parents by improving the economic situation of the household at the originating place (Song, 2017). Researchers further believe that the increased disposable income from the remittances might play a fundamental role in overcompensating the deleterious effects of migration since, with this additional income, older parents can easily afford a healthy diet, advanced medical facilities and other well-being resources which, in turn, improve their physical and psychological health (Yi et al., 2019).

Potential Impacts of Outmigration on Health and Healthcare Utilization of Left-behind Older Parents

In the following paragraphs, we briefly review the relevant literature on 1) the relationship between migration and physical health; 2) the relationship between migration and mental health; and, 3) migration and healthcare utilization.

In studies from China and India, Evandrou et al. (2017) and Falkingham et al. (2017) respectively, observed higher levels of chronic diseases among the left-behind older individuals as compared with their non-left-behind counterparts. Their findings further supported the fact that in the absence of adult sons, left-behind parents expose themselves to several high-risk lifestyle behaviours such as consumption of high fat diet, smoking and alcohol consumption, leading to higher prevalence of chronic morbidities. Further, in a series of Mexico-US migration studies, Antman (2010, 2012, 2016) confirmed a causal relationship between adult children's migration to US and prevalence of chronic illness and higher deterioration of overall physical health status among left-behind older parents. Kanaiaupuni (2000) observed that older parents who had to perform daily routine tasks independently due to lack of physical support from adult children during migration were more likely to suffer from deterioration of physical health. In contrast with these findings, Biao (2007) showed that the positive health outcomes among left-behind older adults are linked to additional income which allowed older parents for a diverse diet and improved living condition. Kuhn et al. (2011) used three rounds of panel survey data from Indonesia Family Life Survey to analyze the association between adult children's international migration and subsequent self-reported health and mobility of their older parents. They found that having migrant children reduces the risk of negative health status of left-behind older individuals. Similar positive self-reported health outcomes were found for other developing countries like Bangladesh (Kuhn, 2005), Tonga (Gibson et al., 2011) and Moldova (Böhme et al., 2015).

In a quantitative meta-analysis on the consequences of adult outmigration on left-behind parents' mental health, Thapa et al. (2018) found that the left-behind parents had a higher level of loneliness and poorer cognitive capacity compared with the non-left-behind parents. Studies by Song (2017) and Lu et al. (2012) concluded that increasing geographical distance from adult children could negatively affect the psychological health of left-behind older adults. Antman (2012) noted that the migration of adult sons puts a high psychological burden on left-behind older people due to the lower frequency of face to face interactions. In contrast to this, several studies have found adult out-migration to be associated with lower level of psychological distress. For instance, in a study from rural Thailand, Abas et al. (2009) investigated the consequences of migration on older parents' mental health and found less depression among left-behind older parents. Research from Indonesia also reported that outmigration of adult children was positively associated with left-behind parents' mental health (Kuhn et al., 2011). Using data from Internal Migration and Health in China (IMHC), Lu et al. (2012) showed that the receipt of remittances partially compensates the absence of an adult son in the household. Remittances improve the living standard and economic well-being of Chinese left-behind older adults that helps to reduce the psychological distresses caused by poverty.

Some research also noted that older parents may have better access to healthcare services when their adult children migrate. For instance, in Thailand, Adhikari et al. (2011) reported a higher utilization of healthcare services among left-behind older parents. In general, the remittances sent by the adult children may provide funds to assist the older parents in terms of accessing better healthcare services, especially in the lower-middle income countries where the provision of free healthcare or universal

health insurance is still missing (Biao, 2007). In contrast to this, migration of adult children in rural China has brought loss of physical and instrumental support to the left-behind older parents which eventually leads to a delay in their healthcare utilization (Yi et al., 2019). Studies have also reported that the older parents having migrated adult children find themselves helpless, especially when they are in need of care yet living alone, and thus, they become comparatively more vulnerable than those older individuals living with their adult children (Antman, 2010, 2012; Connelly & Maurer-Fazio, 2016; Song, 2017).

Although, available literature deals with how migration of adult sons impacts the health and healthcare seeking of their older parents at originating place, empirical evidence on this topic is scarce in the Indian context. At the same time, results of studies from other countries, as we have presented above, are inconclusive, showing both positive and negative consequences of adult out-migration on older parents' health and healthcare seeking. It is hard to predict the consequences of adult children's migration on Indian left-behind parents' health and healthcare seeking. Therefore, there is a need for an empirical analysis of this problem. This study aims to fill this gap by assessing the linkages between migration status of adult children and health outcomes of their left-behind parents as well as the association of these of adult children with healthcare seeking behaviour of older left-behind parents.

Materials and Methods

Data Source

The study is based on a large scale cross-sectional survey data focusing on the old age population—namely, Building a Knowledge Base on Population Ageing in India (BKPAI) conducted during the year 2011 with the financial support from the United Nations Population Fund (UNFPA). The BKPAI was a collaborative project of three social research institutions including the Institute for Social and Economic Change (ISEC), Bangalore; the Institute of Economic Growth (IEG), New Delhi; and the Tata Institute for Social Sciences (TISS), Mumbai. The survey covered the four geographic regions and selected seven demographically progressive states (where the proportion of old age population was higher than national average) stretching across the country. The states comprised of Himachal Pradesh, Punjab (Northern Region); Odisha, West Bengal (Eastern Region); Maharashtra (Western Region); Kerala, and Tamil Nadu (Southern Region). BKPAI is the only available dataset in India that provides information on migrating status of adult children along with their older parent's health and healthcare related behaviour comprehensively. Besides, it collected information on a wide range of socio-demographic and socio-economic characteristics of older adults covering marital status, living arrangement, educational attainment, previous and current working status, household economic condition, etc.

Participants and Sample Design

A total of 9852 eligible older adult (aged 60 and above) respondents from 8329 selected households participated in the face-to-face interview during the survey. It implemented a two-stage Probability Proportion to Size (PPS) sampling scheme to select primary sampling units (PSUs) from both rural and urban areas. A total of 80 primary sampling units (PSUs)—divided equally in rural and urban areas—were chosen. In a next step, within each selected PSU, sample households were chosen following the criteria that sample households should be comprised of at least one 60+ member. Information about the survey design is available elsewhere (UNFPA, 2012). Since this study is concerned with variations in health outcomes and health seeking behaviour of older persons depending on migration status of adult children, we restrict our study sample to respondents who have at least one living adult child (biological), aged 21 years and above. Then, 589 older persons were excluded from the sample who were never married or childless (or with minor children). The final analytical sample comprised of 9263 observations of older parents aged 60 years and above.

Ethical Consent

Our study is based on secondary survey data available on the official website of ISEC (<http://www.isec.ac.in/prc-AginginIndia.html>). Therefore, no formal ethical clearance was required from Institutional Review Board. BKPAI survey was approved by Ethical Review Committee of the ISEC. The survey report also shows that informed consent was obtained by the survey team from each respondent prior to face-to-face interview.

Outcome Variables

Health Indicators

Since health is a multi-dimensional issue, we considered a number of standard measures of both physical and mental health for the older persons. An individual's physical health condition was assessed by investigating five important health indicators: self-rated health (SRH), presence or absence of chronic diseases, acute sickness, activity limitations in daily living (ADLs), and instrumental activity limitations in daily living (IADLs). Psychological health of older parents was assessed by examining cognitive capacity and general depressive symptoms. The description of each indicator is presented below:

Self-rated Health (SRH) In the field of geriatric research, SRH has been extensively used to assess overall health status of an older individual (Razzaque et al., 2010; Singh et al., 2013). The BKPAI survey collected information on SRH from the respondents by asking question: How do you rate your general health condition?

The responses were recorded on a five-point Likert scale: “excellent” (1 point), “very good” (2 points), “good” (3 points), “fair” (4 points) and “poor” (5 points). However, we have reversed the value of SRH indicator—that is, “excellent” (5 points), “very good”, “good”, “fair”, and “poor” (1 point)—such that higher values equal better health and thus assumed SRH indicator as a continuous variable in the analyses.

Chronic Diseases Information regarding chronic diseases was based on self-reporting. Each respondent was asked: Has a doctor ever told you that you have any of the following ailments? and the responses (yes or no) were recorded using a pre-coded list of 20 morbidities. However, we considered seven major NCDs—namely, stroke, angina, diabetes, chronic lung disease, asthma, hypertension and cancer—for the study. We assigned a value of 1 for the positive response and 0 for the negative response for each of the selected disease. Further, by summing up these values, we generated disease-score ranging from 0 to 7 and used this variable in its continuous form.

Acute Sickness Respondents were asked: Were you sick during the last 15 days without hospitalization? with two response options: yes or no. Negative responses were coded as 0 while positive responses as 1.

Activity Limitations in Daily Living (ADLs) We measure ADLs based on older individual’s level of difficulties while performing six basic self-care activities including walking, toileting, bathing, dressing, eating and continence. Respondents were asked whether they had any difficulty while performing them and included three response options for each task: do not require assistance, require partial assistance and require full assistance. We assigned a score of 0, 1 and 2 respectively for these responses and then computed an aggregated ADL-score by summing up individual response across the six questions. The final score ranged between 0 and 12, where a higher score indicated a greater need for assistance in day-to-day self-care activities.

Instrumental Activity Limitations in Daily Living (IADLs) The questions on IADL focused on eight basic instrumental activities—dialing and receiving telephone calls, preparing food, regular shopping, participating in housekeeping tasks, travelling, doing laundry, taking medicines and managing personal finance independently—that are necessary to live independently. There were three to five response options for each of the activity which were coded as 0 and 1 on the basis of level of difficulties an older person faces (see [Appendix A](#) for the assigned codes). We further computed an aggregated IADL-score ranging between 0 and 16 by summing up these points for the eight activities.

Cognitive Capacity BKPAI survey team conducted a 10-word short memory test at the time of the interview. The respondents were read out a list of ten simple words such as bus, sun, rice, etc., slowly and clearly and then requested to recall as many words as possible, irrespective of any order. We have generated a variable called

‘cognition test-score’ by counting the number of words recalled by each respondent and further used it as a continuous variable.

Depressive Symptoms A 12-item instrument of the General Health Questionnaire (GHQ-12) was adopted by BKPAI to assess the psychological wellbeing of older individuals. The GHQ-12 is an influential and reliable self-reported screening tool which is commonly used for identifying the non-specific and minor psychiatric disorders in the general population (Goldberg et al., 1997; Gureje & Obikoya, 1990; Hankins, 2008). Reliability, factor structure and external validity of GHQ-12 in BKPAI study have been already assessed by Qin et al. (2018). Each item of GHQ-12 instrument has four response categories: less than usual, no more than usual, rather more than usual and much more than usual which were coded as 0, 0, 1 and 1 respectively. We computed an aggregate score by summing up these values and named this continuous variable as GHQ-score which was ranged between 0 and 12. Therefore, a higher score indicates greater depressive symptoms.

Healthcare Seeking Variables

At the time of BKPAI survey, elder individuals were asked a question whether they received any medical treatment while they suffered either from chronic morbidity or acute sickness. Their responses were coded separately which generated two dichotomous variables where 0 = no treatment received and 1 = any treatment received.

Main Explanatory Variable (Migrant Child)

The survey questions collected information on the place of residence of each child not residing with the older person (the respondent), with four response options: 1) within the district, 2) outside the district but within the state, 3) outside the state but within India, and 4) outside India. We identified the number of total male adult children (sons) aged 21 and above who migrated outside the parental residential districts for each older person. Further, we added our key variable of interest—that is, total number of migrant children (sons)—as a continuous variable instead of a binary variable (i.e., at least one son has migrated) to capture the marginal effect of one additional child’s migration on the health outcome of the left-behind older adults.

Other Control Variables

The other control variables included in the present analysis are based on systematic literature review which have demonstrated a significant association with the health indicators and with healthcare seeking behaviour of older persons (for example, Arokiasamy, 2015; Bhandari & Paswan, 2021; Joshi et al., 2003; Kastor & Mohanty, 2016; Kumar & Pradhan, 2019; Lee & Shinkai, 2005). These variables are indicative of older individuals’ personal characteristics, their adult children’s characteristics, household characteristics and regional characteristics. In terms of personal characteristics, we include older persons’ age, gender, current marital status, educational

attainment, economic dependence, social capital and physical health condition. Older persons' age not only captures the depreciation of physical and mental health capital but is also a strong determinant of healthcare utilization (Lloyd-Sherlock et al., 2012). Thus, to allow for a control of age on health and healthcare seeking indicators, we include older persons' age (in years) as a continuous variable. We also control for the older adults' gender which is likely to differentially affect health and healthcare seeking indicators (Cameron et al., 2010; Singh et al., 2013). Since older persons' health advantage diminishes during widowhood (Perkins et al., 2016), we have included a dummy for being widowed. We further account for the older parents' educational attainment, as studies have frequently noted that a higher level of education may result in better health outcomes among older adults (Grossman, 1972). As subjective health and emotional health are affected by physical health, we control for older individuals' functional limitation, presence of disabilities and presence of NCDs (Bhandari & Paswan, 2021). As older persons' health and healthcare utilization, especially in low and middle income countries, are largely influenced by their personal income due to unavailability of formal old age pensions (Kumar et al., 2016), the present analysis controls this effect by adding a control variable, whether or not older persons are economically independent. Besides, social capital is considered an important vehicle for healthcare support and social integration of older persons, and that can improve both physical and mental health with the enhanced social networks (Samanta, 2018). We have created two social capital variables, reflecting older parent's structural social capital (SSC) and cognitive social capital (CSC). Based on five questions regarding older parent's frequency of community participation (see [Appendix B](#)), we conducted a principal component analysis and then the generated scores were incorporated as an individual-level measure of SSC. The measures of CSC are based on a single question: Do you have someone you can trust and confide? having a binary response option (yes/no). We add a dummy for having someone to trust and confide.

Residential arrangement is a strong determinant of both physical and emotional health of older adults, for example, solitary living is often associated with poor self-rated health, increased degree of chronic morbidity, anxiety and depression, and poor overall health. On the other hand, living with spouse, children and/or others curtail health risks (Samanta et al., 2015). Likewise, we have added dummies for living alone and living with spouse only. A household's economic status, which may play a protective role against several health threats to older parents, was measured from the available estimates on wealth index that was computed using PCA. We categorize household's economic status as poorest, poorer, middle, rich and richest. We include a set of dummies to indicate the religion and caste of older parents as well as regional dummies for north (reference category), east, central and south regions.

Statistical Analysis

We initially used descriptive statistics to show the variation in health outcome measures and other key variables between two old age cohorts—that is, without migrant children and with migrant children. Next, we assessed the correlation of adult

children's migration with selected health indicators of older persons using ordinary least square (OLS) and probit regression. The OLS model takes the following form:

$$Health_i = \alpha + \beta MigrantChild_i + \gamma X_i + \varepsilon_i$$

where the dependent variable, $Health_i$, indicates a health outcome of elder parents. α is a regression constant and ε_i is the error term. $MigrantChild_i$ is the main explanatory variable of interest, which accounts the number of migrant children of the respondent and its coefficient β captures the marginal effect of one additional child's migration on the health outcome of the left-behind older individuals. X_i indicates the other control variables including the characteristics of the older individual (age, sex, marital status, etc.), the household (wealth status, religion, etc.), and the children (number of children, their mean age, etc.).

Our main variable of interest—the migration of adult children, is often reported to have endogeneity issues (Antman, 2012; Böhme et al., 2015; Waidler et al., 2018). This is because children whose decision to migrate outside parental residential districts might not be independent, rather be affected by several endogenous factors. Therefore, OLS/probit models may produce biased estimations. To address the endogeneity of the adult children's migration decision, we employed an instrumental variable strategy with two instrumental variables: the proportion of migrant children in the village and proportion of intra-district migrant children in the village. Similar instrumental variables were employed by Antman (2012), Böhme et al. (2015), and Yi et al. (2019).

Healthcare seeking by an individual depends on the occurrence of diseases. Therefore, sample selection is necessary to avoid the selection bias (Heckman, 1979). We employed a Heckman probit regression model to assess the impact of adult children's migration on healthcare seeking behavior of older parents. The model includes a two stage calculation procedure, with an outcome equation (in this case probit equation) in the first stage that predicts the probability of care seeking and a selection equation including the probability of suffering from sickness (chronic diseases and acute sickness) in the second stage.

The probit equation is defined as:

$$HCS_i = (X_i\beta + \varepsilon_{1i} > 0)$$

The selection equation is defined as:

$$Z_i\gamma + \varepsilon_{2i} > 0$$

with the following applies:

$$\varepsilon_1 \sim N(0, \sigma)$$

$$\varepsilon_2 \sim N(0, 1)$$

$$\text{corr}(\varepsilon_1, \varepsilon_2) = \rho$$

where HCS_i indicates the dependent variables. X_i is the observable feature of the independent variables. β denotes the coefficients of the attributes in the probit equation. ε_{1i} is a normally distributed error term with a mean of zero and a standard deviation (SD) σ . Z_i is the observable feature including the overlapping variables with X_i . γ denotes the coefficients of the attributes in the selection equation. ε_{2i} is a normally distributed error term with a mean of zero and a SD one. ρ represents the correlation between the two error terms.

More details on Heckman probit regression including formulas of likelihood estimation can be obtained from Van de Ven and Van Praag (1981).

Analyses were performed using the software package STATA 14.2 MP (Stata-Corp LLC, College Station, Texas, USA).

Results

Descriptive Results

In Table 1, we present the summary statistics for main variables included in the analysis for our sample of 9263 older individuals. While disaggregating the total study sample on the basis of migration status of adult children, we observed that there are 1474 older respondents who had at least one adult migrant son who had migrated outside their district, amounting to nearly 16% of the total sample. For full sample, average number of migrant children was 0.22, whereas the average number of migrant children among the left-behind cohort was 1.36. With regards to physical and psychological health indicators, a significant variation is present between two cohorts, though confounding factors were not controlled for. The old age cohort with migrant children had a better score on subjective health (SRH) and IADL compared with old age cohort without migrant children (SRH = 2.50 vs. 2.48; IADL = 5.35 vs. 4.88 respectively). Result, at the same time, shows that a number of chronic diseases prevail more among the older parents with migrant children than those without them. The depression score has a mean of 8.59 and shows a difference of 0.50 for two different cohorts. On an average, our respondents recalled 4.19 words within two minutes which was slightly higher among elder parents with migrant children. However, the difference of cognition test score between two cohorts was not statistically significant.

Apart from health outcome variables, descriptive results show that the mean age of our respondents was 68.02 years. On an average, more than half (52%) of our respondents were female, around 39% of older adults were either divorced or separated, and the average year of schooling among the respondents was 4.16. The older adults have an average of 3.41 living children. This is slightly higher among the cohort with migrated children having an average of 3.88 living children. Majority of our respondents were Hindus at nearly 79%, followed by others religious group (12.7%). In terms of household wealth, a significant variation is noticed between two old age cohorts with left-behind parents having more household wealth. Southern region has the highest share of left-behind parents—nearly 36% of the total.

Table 1 Summary statistics

	Full sample	Without migrant children	With migrant children	Mean/percentage difference between two groups
	Mean (SD)/%	Mean (SD)/%	Mean (SD)/%	
Health measures				
SRH	2.48 (1.01)	2.48 (1.01)	2.50 (1.04)	-0.02*
Number of chronic diseases	0.80 (0.91)	0.76 (0.88)	0.97 (0.98)	-0.21***
IADL score	4.96 (2.27)	4.88 (2.26)	5.35 (2.27)	-0.47***
Acute sickness	0.13 (0.33)	0.12 (0.33)	0.13 (0.34)	-0.01
ADL score	11.73 (1.31)	11.73 (1.30)	11.73 (1.37)	0.00
Cognitive score	4.19 (1.69)	4.16 (1.66)	4.35 (1.82)	-0.19***
Depression score	8.59 (3.71)	8.51 (3.55)	9.01 (3.73)	-0.50***
Migration characteristics				
Number of migrant children	0.22 (0.56)	-	1.36 (0.64)	-
Number of migrant children sending regular remittance	0.08 (0.34)	-	0.51 (0.02)	-
Individual characteristics				
Age	68.02 (7.25)	67.84 (7.16)	68.95 (7.66)	-1.11***
Female (%)	52.32	52.74	50.07	2.67*
Widowed/divorced/separated (%)	39.31	39.93	36.02	3.91**
Years of schooling	4.16 (4.83)	3.91 (4.67)	5.46 (5.38)	-1.55***
Economic dependence				
Fully dependent (%)	50.70	51.17	48.17	3.00***
Partially dependent (%)	24.64	25.19	21.74	3.45***
Not dependent (%)	24.66	23.64	30.10	-6.46***
Have someone to trust and confide (%)	83.55	83.14	85.73	-2.59***
Structural social capital	0.00 (1.57)	-0.01 (1.57)	0.03 (1.59)	-0.04
Number of children	3.41 (1.76)	3.32 (1.75)	3.88 (1.79)	-0.56***
Number of living sons	1.80 (1.18)	1.70 (1.16)	2.32 (1.18)	-0.63***
Number of living daughters	1.60 (1.32)	1.61 (1.34)	1.55 (1.23)	0.06
Mean age of male children	36.91 (8.77)	36.67 (8.80)	38.21 (8.46)	-1.54***
Mean years of schooling of male children	8.35 (5.06)	7.90 (5.03)	10.73 (4.53)	-2.83***
Household characteristics				
Living alone (%)	5.25	5.02	6.45	-1.43***
Living with spouse only (%)	14.18	11.99	25.75	-13.76***
Living with others (%)	80.57	82.99	67.80	15.19***
Poorest (%)	19.15	20.02	14.59	5.43***
Poorer (%)	20.20	21.22	14.79	6.43***

Table 1 (continued)

	Full sample	Without migrant children	With migrant children	Mean/percentage difference between two groups
	Mean (SD)/%	Mean (SD)/%	Mean (SD)/%	
Middle (%)	19.87	20.68	15.60	5.08***
Rich (%)	20.11	19.37	24.02	-4.65***
Richest (%)	20.66	18.71	31.00	-12.29***
Hindu (%)	78.95	80.05	73.13	6.92***
Muslim (%)	8.38	7.69	12.01	-4.32***
Other religions (%)	12.67	12.26	14.86	-2.60**
SCs/STs (%)	23.96	25.15	17.64	7.51***
OBCs (%)	34.41	34.55	33.65	0.90
Other castes (%)	41.64	40.30	48.71	-8.41***
Regional characteristics				
Rural (%)	51.98	51.70	53.46	-1.76
North (%)	28.59	28.62	28.43	0.19
East (%)	28.33	29.08	24.36	4.72***
West (%)	14.54	15.21	10.99	4.22***
South (%)	28.54	27.09	36.23	-9.14***
Total observations	9263	7789	1474	

Authors' calculation based on 2011 BKPAI data

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Effect of Adult Children Migration on Physical Health of Older Adults

Table 2 presents the coefficients from OLS and IV regression estimation with respect to five physical health variables of our interest. The OLS result shows that the migration of adult children has a positive ($\beta = 0.014$, $p = 0.450$) but statistically insignificant relationship with the subjective health (SRH) of older individuals. It is worth noting that this result is inconclusive given the endogenous problem in our explanatory variable. However, this relationship turned statistically significant as well as prominent ($\beta = 0.095$, $p = 0.028$) once we addressed the endogeneity problem by using the instrumental strategy. Results from both OLS as well as IV regression show that the prevalence of chronic disease was positively and significantly associated with the migration of adult children. We also find a strong positive association between IADL and migration of adult children, indicating that older parents with more migrant children are able to perform instrumental activities more independently compared with the older individuals without them. Compared with the IV results, the lower OLS coefficient estimate is an expected consequence of self-selection into migration, as the latter is more common among the poor whose older parents are on an average less healthy. However, no statistically significant relationship was found for ADLs and acute sickness with the migration of adult children.

Table 2 Effect of adult children's migration on indicators of physical health of older parents

		Physical health markers				
		SRH ^a	NCDs ^a	ADLs ^a	Acute Sickness ^b	IADLs ^a
OLS/Probit	Coefficient	0.014	0.050**	-0.002	-0.003	0.213***
	SE	0.018	0.016	0.024	0.031	0.035
	R-squared	0.223	0.394	0.061	-	0.314
	Constant	3.321***	-0.329***	13.784***	-1.580	10.790***
	F	67.791***	48.841***	25.833***	-	218.551***
IV 2SLS/IV Probit	Coefficient	0.095*	0.285***	-0.034	-0.153**	0.879***
	SE	0.051	0.051	0.075	0.098	0.113
	R-squared	0.230	0.381	0.059	-	0.290
	Constant	3.347***	-0.293**	14.138***	-1.647***	11.223***
	Wald χ^2	1294.224***	894.510***	543.615***	226.200***	3993.431***
	Wu-Hausman F	2.757*	21.249***	0.242	7.020**	41.348***

Authors' calculation based on 2011 BKPAI data

^aEstimates are based on OLS/IV 2SLS regression model

^bEstimates are based on probit/IV probit regression model

SRH included into the analyses as a continuous variable (higher values equal better health); "SE" denotes standard error; "F" denotes F statistic; all the estimations include the following control variables: age, sex, marital status, years of schooling, economic dependence, number of alive children, mean age of male children, mean years of schooling of male children, social capital, living arrangement, household wealth, religion, caste, type of residence and geographical region

* = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$

Effect of Migration on Mental Health of Older Adults

In Table 3, we present the results from OLS and IV estimates for two psychological health indicators of older parents: depression and cognitive capacity. They indicate that having more adult migrant children of an older individual significantly increases the likelihood of being psychologically depressed among older adults. The estimation from IV regression shows that an additional migrant child increases nearly 0.9 points ($\beta = 0.89$, $p \leq 0.001$) more depression for a left-behind older individual. We also find a positive association between migration and cognitive capacity, meaning that older parents with migrating children recalled more words than those without migrant children.

Effect of Migration on Healthcare Seeking by Older Adults

Tables 4, 5 present the coefficients from Heckman Probit regression model which are intended to show the impact of adult children's migration on older parent's health-care seeking while suffering from chronic morbidity and acute sickness. Model 1

Table 3 Effect of adult children's migration on indicators of psychological health of older parents

		Psychological health markers	
		Cognitive Capacity	Depression
OLS	Coefficient	0.092**	0.088*
	SE	0.029	0.062
	R-squared	0.241	0.295
	Constant	5.873***	9.320
	F	152.001***	129.413
IV 2SLS	Coefficient	0.208*	0.894***
	SE	0.087	0.170
	R-squared	0.236	0.331
	Constant	6.450***	11.052***
	Wald χ^2	2842.221***	2321.609***
	Wu-Hausman F	1.834	38.425***

Authors' calculation based on 2011 BKPAI data; "SE" denotes standard error; "F" denotes F statistic; all the estimations include the following control variables: age, sex, marital status, years of schooling, economic dependence, number of alive children, mean age of male children, mean years of schooling of male children, social capital, number of chronic disease, functional limitation, disability, living arrangement, household wealth, religion, caste, type of residence and geographical region.

* = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$.

presents the bi-variate association between outcome variables and migration status of adult children without considering the effects of confounding factors. We find that the migration of adult children was to a significant extent negatively associated ($\beta = -0.09$, $p \leq 0.05$) with chronic disease related treatment seeking among older parents. This indicates that older individuals with more number of migrant children who suffered from chronic disease were less likely to receive medical and other care facilities. The effect of migration although attenuated ($\beta = -0.05$, $p \leq 0.05$), but was statistically significant once the household level socio-economic factors were controlled in model 2. However, we did not find any statistically significant relationship between migration and care seeking during acute sickness of older adults.

Robustness Check

The BKPAI survey dataset do not include any direct information regarding the remittances received by older members. Therefore, we measured the number of children sending regular remittances to left-behind parents and that serves as a proxy variable to show the effect of remittances on older parents' health and healthcare seeking behavior. We further adjusted for regular receipt of remittances as a robustness check on our findings. Similar to our main analytical strategy, we employed both OLS/probit and IV 2SLS/probit regression models to present our robust estimates

Table 4 Effect of adult children's migration on healthcare seeking behaviour of older parents in chronic diseases

Explanatory variables	Model 1 [‡]		Model 2 [‡]		Model 3 [‡]	
	Coeff (SE)	p-value	Coeff (SE)	p-value	Coeff (SE)	p-value
Number of migrant children	-0.090 (0.041)	0.028	-0.051 (0.063)	0.046	-0.038 (0.094)	0.688
Age			-0.009 (0.016)	0.483	-0.006 (0.019)	0.759
Female			0.080 (0.085)	0.320	0.067 (0.080)	0.374
Widowed/divorced/separated			-0.038 (0.078)	0.028	-0.034 (0.085)	0.034
Years of schooling			0.031 (0.023)	0.017	0.015 (0.008)	0.058
Number of children			0.028 (0.077)	0.659	0.031 (0.070)	0.659
Mean age of male children			0.012 (0.004)	0.094	0.005 (0.005)	0.334
Mean years of schooling of children			0.017 (0.016)	0.408	0.004 (0.008)	0.594
Partially dependent			-0.061 (0.050)	0.044	-0.056 (0.034)	0.043
Fully dependent			-0.189 (0.081)	0.039	-0.089 (0.052)	0.036
Have someone to trust and confide			0.038 (0.040)	0.076	0.020 (0.061)	0.129
Structural social capital			0.117 (0.026)	0.163	0.038 (0.027)	0.314
Living with spouse only					0.084 (0.034)	0.072
Living with others					0.171 (0.102)	0.020
Wealth score					0.167 (0.091)	0.048
Muslim					0.404 (0.205)	0.040
Others					0.125 (0.094)	0.083
SCs/STs					0.029 (0.145)	0.421
OBCs					-0.077 (0.114)	0.645
Rural					-0.054 (0.110)	0.624
North					0.067 (0.184)	0.187
East					-0.054 (0.182)	0.485

Table 4 (continued)

Explanatory variables	Model 1 [‡]		Model 2 [‡]		Model 3 [‡]	
	Coeff (SE)	p-value	Coeff (SE)	p-value	Coeff (SE)	p-value
West					0.171 (0.152)	0.260
Constant	1.787 (0.027)	0.000	1.130 (0.117)	0.038	-0.151 (0.216)	0.157

Authors' calculation based on 2011 BKPAl data; standard errors are presented in parentheses.

[‡] Heckman probit model with care seeking in chronic diseases as dependent variable and occurrence of chronic morbidities as selection variable.

on migration effects on health indicators. The results from these models are shown in Supplementary Tables (S1–S4). While the main results remain qualitatively unchanged, we note some marginal shifts in statistical significance. For example, comparing the migration effect on subjective health, the remittance-adjusted result shows that there is a non-significant positive association ($\beta=0.129$, $p=0.089$), while the main result shows a significant, positive association ($\beta=0.095$, $p=0.028$). There was a close association between regular remittances from children and older parents' subjective health. Left-behind parents receiving regular remittances from their migrant children reported better subjective health compared with those who did not.

Given that migration levels and health of elderly vary across regions, we have additionally conducted a sensitivity analysis by undertaking separate regression for regional samples. Abbreviated results of the sensitivity analysis are presented in Supplementary Tables (S5, S6).

Results of the Heckman Probit model including regular receipt of remittances as an additional control variable are presented in Supplementary Tables (S3, S4). They were remarkably similar to those in Table 2. They confirm that regular receiving of remittances tends to have no significant impact on healthcare utilization improvement among left-behind parents.

Discussion

Utilizing data from a large representative sample for older adults in India, we aimed to explore if adult out-migration was associated with health outcomes and healthcare seeking behaviour of older parents left-behind. Considering older individuals' health as a multidimensional phenomenon, we have investigated into the role of adult children's migration on several physical (includes SRH, ADLs, IADLs, chronic diseases and acute sickness) and psychological health (includes cognitive capacity and depression) outcomes of older parents. The empirical finding shows that migration of adult children may have a significant association with older parents' health outcomes. Furthermore, results suggest that the impact of adult children's migration on

Table 5 Effect of adult children's migration on healthcare seeking behaviour of older parents in acute sickness

Explanatory variables	Model 1 [‡]		Model 2 [‡]		Model 3 [‡]	
	Coeff (SE)	p-value	Coeff (SE)	p-value	Coeff (SE)	p-value
Number of migrant children	-0.023 (0.123)	0.849	-0.044 (0.082)	0.557	-0.029 (0.068)	0.667
Age			-0.002 (0.008)	0.811	-0.002 (0.006)	0.764
Female			-0.006 (0.169)	0.890	-0.003 (0.103)	0.841
Widowed/divorced/separated			-0.188 (0.145)	0.043	-0.173 (0.094)	0.061
Years of schooling			-0.014 (0.050)	0.751	-0.015 (0.011)	0.242
Number of children			-0.009 (0.087)	0.847	-0.025 (0.023)	0.300
Mean age of male children			-0.006 (0.008)	0.484	-0.007 (0.006)	0.329
Mean years of schooling of children			0.028 (0.013)	0.046	0.009 (0.008)	0.258
Partially dependent			-0.247 (0.142)	0.328	-0.114 (0.091)	0.367
Fully dependent			-0.180 (0.121)	0.037	-0.102 (0.104)	0.044
Have someone to trust and confide			0.059 (0.037)	0.401	0.010 (0.044)	0.173
Structural social capital			0.084 (0.074)	0.039	0.069 (0.081)	0.077
Living with spouse only					0.166 (0.089)	0.006
Living with others					0.333 (0.147)	0.040
Wealth score					0.201 (0.042)	0.016
Muslim					0.060 (0.137)	0.625
Others					0.052 (0.089)	0.330
SCs/STs					-0.005 (0.097)	0.841
OBCs					0.081 (0.089)	0.517
Rural					0.031 (0.107)	0.669
North					0.285 (0.112)	0.028
East					0.279 (0.129)	0.021

Table 5 (continued)

Explanatory variables	Model 1 [‡]		Model 2 [‡]		Model 3 [‡]	
	Coeff (SE)	p-value	Coeff (SE)	p-value	Coeff (SE)	p-value
West					0.331 (0.101)	0.038
Constant	1.351 (0.384)	0.855	2.158 (0.317)	0.355	2.008 (0.347)	0.003

Authors' calculation based on 2011 BKPAI data; standard errors are presented in parentheses.

[‡] Heckman probit model with care seeking in acute sickness as dependent variable and occurrence of acute sickness as selection variable.

left-behind parents' health variedly surfaces across different health outcome measures of older parents. We found that migration has a direct and beneficial impact on older individuals' subjective health. Earlier studies finding similar results concluded that the income channel of migration could play a positive role in improvement in the life satisfaction and subjective wellbeing among the left-behind parents (Böhme et al., 2015; Wahba & Wang, 2019). We noted that the migration of adult children increases the probability of being diagnosed with chronic morbidity among the older parents left-behind. Available research from India suggests that soon after migration takes place, older adults are exposed to poor lifestyle behaviour avoiding age related restrictions regarding their diet, physical activity, and consumption of tobacco and alcohol. This might increase the level of NCDs among the older parents left-behind. The result also suggests that migration has a direct and positive influence on older individuals' functional ability to perform the instrumental activities. One possible explanation would be that migration of adult children might increase the self-dependency among left-behind parents. In response, older parents do their routine tasks independently which may reflect better instrumental health status in left-behind older parents (Hacihasanoglu et al., 2012).

The impact of adult children's migration on parental psychological health was substantial and indicated a higher prevalence of general psychological disorder such as depression among the older parents left-behind. Negative association between migration and poor mental health outcomes is commonly interpreted as an impact of geographical isolation on maintaining a regular personal interaction between older parents and their children (Rossi & Rossi, 2017). Furthermore, in the absence of adult children, older parents may feel loneliness or may experience social isolation due to reduced family role (e.g., nurturing grandchildren) and declined psychosocial resources in the context of family separation (Cudjoe et al., 2020). In the long run, this loneliness and isolation may lead to symptoms of poor mental health like constant worrying, anxiety and depression (Miltiades, 2002; Vullnetari & King, 2008). Our study also revealed that older individuals with migrant children had a better cognitive capacity as compared with those without them. This finding is consistent with an earlier migration study conducted in rural China which reported that

older parents with one or more sons migrating to city are more likely to have a good memory (Wahba & Wang, 2019).

Consistent with the time allocation model, our test of relationship between adult children's migration and healthcare utilization among older parents indicated a lower rate of healthcare utilization among left-behind older individuals. The utilization of medical care services among left-behind parents while suffering from chronic morbidity was to a significant extent negatively associated even after controlling the effects of a broad array of confounding factors. In India, adult children have been a continuous source to provide required care and support for their older parents. Therefore, co-residence with adult children and their families is likely to ensure healthcare needs for the older persons (Ugargol et al., 2016). Since migration typically breaks down this co-residence with adult children, the older parents' healthcare utilization might be restricted in times of need. However, there was no evidence of attenuated healthcare utilization among left-behind older parents while they suffered from acute sickness that occurred fifteen days preceding the survey. This might be because of the availability of strong neighborhood or community support at the time of major health crises, particularly in the rural India. In a recent study, Ugargol and colleagues (2016) found that for older persons living alone or living with spouse only, the receiving of healthcare from relatives and other family members at the time of immediate care-requiring situations such as hospitalization and acute sickness was high in India.

Strengths and Limitations

Our findings have several methodological strengths. First, we have estimated our results from a large survey data which is nationally representative of Indian old age population aged sixty years and above. Our dataset comes with detailed information on individuals' health measures, migration status of adult children, and important demographic and socioeconomic characteristics. This provides us an opportunity to explore the potential impacts of migration of adult children on health and healthcare seeking of left-behind older parents. Second, regarding choice of regression models, our instrumental strategy helped to circumvent the endogeneity issues underlying such an analysis. Third, we have used Heckman regression model to avoid the selection bias among older parents without chronic morbidity.

Despite these strengths, our study has limitations which should be taken care of while interpreting the results. First, our analysis consisted of self-rated health variables which may produce biased estimation since no clinical diagnosis had been made further for reliability and validity assessment. Second, BKPAI provides data for select states of India and the results presented may be interpreted with caution. Third, we are unable to control several important aspects of adult migration including the duration of migration, distance between places of origin and destination, types of out migration (i.e., skilled or unskilled), amount of remittances received from adult children and usual time-interval to meet parents which are important in the assessment of health and wellbeing of older parents. Fourth, cross-sectional design of survey data restricted us

to predict the health condition of older adults before adult children's migration. Finally, unavailability of longitudinal data prevented us from assessing reverse-causation association between adult migration and older parents' health outcomes which could have provided valuable information for understanding how older parent's health condition is associated with adult children's decision on migration.

Conclusion

This study provides empirical evidence on how migration of adult children is associated with the health and treatment seeking among those older parents who have been left behind. Its results acknowledge that the migration of adult son could play an important role in improving the subjective health, cognitive capacity and functional health of older parents. At the same time, a dramatic increase in chronic morbidity and depressive symptoms, as well as poor utilization of healthcare among the left-behind parents, reflect the adverse effects of adult migration on promoting geriatric health and wellbeing. Given the rising proportion of ageing population in India combined with an increasing trend in rural–urban adult migration, our findings suggest that the policy makers should pay more attention to the migration status of children to keep track of the health and welfare among Indian older adults. From the intervention perspective, public health policies that focus on alleviating depressive symptoms in left-behind parents are needed in order to enhance psychological wellbeing in this vulnerable group. Greater attention should also be paid to the lower utilization of healthcare among older parents left-behind. The provision of mobile healthcare facilities combined with geriatric welfare services in the primary healthcare centers (PHCs) could be useful in reducing the prevalence of underutilization of healthcare services in left-behind older adults. Furthermore, a robust longitudinal study focusing on left-behind parents' health using clinically recognized instruments would be more useful for understanding the role of additional factors that negatively impact older individuals' physical and mental health.

Appendix A

Sl. No	Tasks included in IADL list	Response Options	Points
1	Ability to use phone	Operates phone on own initiative	1
		Dials a few well known numbers	1
		Answers the phone but does not dial	1
		Cannot use phone at all	0
2	Shopping	Takes care of all shopping needs independently	1
		Shops independently for small purchases	0
		Needs to be accompanied on any shopping trip	0
		Completely unable to shop	0

Sl. No	Tasks included in IADL list	Response Options	Points
3	Food preparation	Plans, prepares and serves adequate meals independently	1
		Prepares adequate meals if supplied with ingredients	0
		Heats, serves meals; does not maintain adequate diet	0
		Needs to have meals prepared and served	0
4	Housekeeping	Maintains house alone or with help for heavy work	1
		Performs light daily tasks e.g. dish washing, bed making	1
		Performs light daily tasks but cannot maintain cleanliness	1
		Needs help with all home maintenance tasks	1
		Does not participate in any housekeeping tasks	0
5	Laundry	Does personal laundry completely	1
		Launders small items, rinses socks, etc	1
		All laundry must be done by others	0
6	Transportation	Travels independently on public transport/own car	1
		Travels on public transport when accompanied by others	1
		Travel limited to car with assistance from another person	0
		Does not travel at all	0
7	Medication	Is capable of taking medicines in correct dosage at correct time	1
		Takes medicine if given in separate dosage	0
		Is not capable of dispensing own medicines	0
8	Finances	Manages financial matters independently (budget, cheques, bills)	1
		Manages day to day purchases, but need help with banking, etc	1
		Incapable of handling money	0

Based on 2011 BKPAI survey schedule.

Appendix B

Sl. No	Questions that were asked older adults on their social activities	Response Options
1	How often in the last 12 months have you attended a public meeting with discussion on local, community or political affairs?	(a) Never (b) Rarely (c) Occasionally (d) Frequently
2	How often in the last 12 months have you attended any group, club, society, union or organizational meeting?	(a) Never (b) Once or twice per year (c) Once or twice per month (d) Once or twice per week (e) Daily
3	How often in the last 12 months have you worked with other people in your neighbourhood to fix or improve something?	(a) Never (b) Once or twice per year (c) Once or twice per month (d) Once or twice per week (e) Daily

Sl. No	Questions that were asked older adults on their social activities	Response Options
4	How often in the last 12 months have you attended or participated in any religious programs/services etc.?	(a) Never (b) Once or twice per year (c) Once or twice per month (d) Once or twice per week (e) Daily
5	How often in the last 12 months have you gone out of the house to visit friends or relatives?	(a) Never (b) Once or twice per year (c) Once or twice per month (d) Once or twice per week (e) Daily

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s12126-021-09413-1>.

Funding This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declarations

Conflict of Interest Present study has no conflict of interest.

References

- Abas, M. A., Punpung, S., Jirapramukpitak, T., Guest, P., Tangchonlatip, K., Leese, M., & Prince, M. (2009). Rural-urban migration and depression in ageing family members left behind. *British Journal of Psychiatry*, *195*(1), 54–60. <https://doi.org/10.1192/bjp.bp.108.056143>
- Adhikari, R., Jampaklay, A., & Chamratrithirong, A. (2011). Impact of children's migration on health and health care-seeking behavior of elderly left behind. *BMC Public Health*, *11*(1), 143. <https://doi.org/10.1186/1471-2458-11-143>
- Agrawal, S. (2012). Effect of living arrangement on the health status of elderly in India: Findings from a national cross sectional survey. *Asian Population Studies*, *8*(1), 87–101. <https://doi.org/10.1080/17441730.2012.646842>
- Antman, F. M. (2010). Adult child migration and the health of elderly parents left behind in Mexico. *American Economic Review*, *100*(2), 205–208. <https://doi.org/10.1257/aer.100.2.205>
- Antman, F. M. (2012). Elderly care and intrafamily resource allocation when children migrate. *Journal of Human Resources*, *47*(2), 331–363. <https://doi.org/10.3368/jhr.47.2.331>
- Antman, F. M. (2016). How Does Adult Child Migration Affect the Health of Elderly Parents Left Behind? Evidence from Mexico. SSRN Electronic Journal. <https://doi.org/10.2139/ssrn.1578465>
- Ao, X., Jiang, D., & Zhao, Z. (2016). The impact of rural-urban migration on the health of the left-behind parents. *China Economic Review*, *37*(1), 126–139. <https://doi.org/10.1016/j.chieco.2015.09.007>
- Arokiasamy, P., Uttamacharya, & Jain, K. (2015). Multi-morbidity, functional limitations, and self-rated health among older adults in India: Cross-sectional analysis of LASI pilot survey, 2010. *SAGE Open*. <https://doi.org/10.1177/2158244015571640>.
- Bailey, A., Hallad, J., & James, K. S. (2018). “They had to go”: Indian older adults' experiences of rationalizing and compensating the absence of migrant children. *Sustainability*, *10*(6), 1–15. <https://doi.org/10.3390/su10061946>

- Becker, G. S. (1965). A Theory of the Allocation of Time. *The Economic Journal*, 75(299), 493–517. <https://doi.org/10.2307/2228949>
- Bhandari, P., & Paswan, B. (2021). Lifestyle behaviours and mental health outcomes of elderly: modification of socio-economic and physical health effects. *Ageing International*, 46(1), 35–69. <https://doi.org/10.1007/s12126-020-09371-0>.
- Biao, X. (2007). How Far are the Left-Behind Left Behind. *Population, Space, and Place*, 13(1), 179–191. <https://doi.org/10.1002/psp.437>
- Böhme, M. H., Persian, R., & Stöhr, T. (2015). Alone but better off? Adult child migration and health of elderly parents in Moldova. *Journal of Health Economics*, 39, 211–227. <https://doi.org/10.1016/j.jhealeco.2014.09.001>
- Cameron, K. A., Song, J., Manheim, L. M., & Dunlop, D. D. (2010). Gender disparities in health and healthcare use among older adults. *Journal of Women's Health*, 19(9), 1643–1650. <https://doi.org/10.1089/jwh.2009.1701>.
- Coffey, D. (2013). Children's Welfare and Short-term Migration from Rural India. *Journal of Development Studies*, 49(8), 1101–1117. <https://doi.org/10.1080/00220388.2013.794934>
- Connelly, R., & Maurer-Fazio, M. (2016). Left behind, at-risk, and vulnerable elders in rural China. *China Economic Review*, 37, 140–153. <https://doi.org/10.1016/j.chieco.2015.10.005>
- Cudjoe, T. K. M., Roth, D. L., Szanton, S. L., Wolff, J. L., Boyd, C. M., & Thorpe, R. J. (2020). The Epidemiology of Social Isolation: National Health & Aging Trends Study. *The Journals of Gerontology: Series B, Psychological Sciences and Social Sciences*, 75(1), 107–113. <https://doi.org/10.1093/geronb/gby037>
- De Haas, H. (2010). Migration and development: A theoretical perspective. *International Migration Review*, 44(1), 227–264. <https://doi.org/10.1111/j.1747-7379.2009.00804.x>
- Desai, S., & Banerji, M. (2008). Negotiated identities: Male migration and left-behind wives in India. *Journal of Population Research*, 25(3), 337–355. <https://doi.org/10.1007/BF03033894>
- Evandrou, M., Falkingham, J., Qin, M., & Vlachantoni, A. (2017). Children's migration and chronic illness among older parents 'left behind' in China. *SSM - Population Health*, 3, 803–807. <https://doi.org/10.1016/j.ssmph.2017.10.002>
- Falkingham, J., Qin, M., Vlachantoni, A., & Evandrou, M. (2017). Children's migration and lifestyle-related chronic disease among older parents 'left behind' in india. *SSM - Population Health*, 3, 352–357. <https://doi.org/10.1016/j.ssmph.2017.03.008>
- Gibson, J., Mckenzie, D., & Stillman, S. (2011). The impacts of international migration on remaining household members: omnibus results from a migration lottery program. *The Review of Economics and Statistics*, 93(4), 1297–1318. https://doi.org/10.1162/REST_a_00129.
- Goldberg, D. P., Gater, R., Sartorius, N., Ustun, T. B., Piccineeli, M., Gureje, O., & Rutter, C. (1997). The validity of two versions of the GHQ in the WHO study of mental illness in general health care. *Psychological Medicine*, 27(1), 191–197. <https://doi.org/10.1017/S0033291796004242>
- Grossman, M. (1972). On the concept of health capital and the demand for health. *Journal of Political Economy*, 80(2), 223–255.
- Gureje, O., & Obikoya, B. (1990). The GHQ-12 as a screening tool in a primary care setting. *Social Psychiatry and Psychiatric Epidemiology*, 25(5), 276–280. <https://doi.org/10.1007/BF00788650>
- Hacihasanoglu, R., Yildirim, A., & Karakurt, P. (2012). Loneliness in elderly individuals, level of dependence in activities of daily living (ADL) and influential factors. *Archives of Gerontology and Geriatrics*, 54(1), 61–66. <https://doi.org/10.1016/j.archger.2011.03.011>
- Hankins, M. (2008). The reliability of the twelve-item general health questionnaire (GHQ-12) under realistic assumptions. *BMC Public Health*, 8, 355. <https://doi.org/10.1186/1471-2458-8-355>
- Heckman, J. J. (1979). Sample Selection Bias as a Specification Error. *Econometrica*, 47(1), 153–161.
- Hermalin, A. I., & Myers, L. G. (2002). Aging in Asia: Facing the crossroads. In A. I. Hermalin (Ed.), *The well-being of the elderly in Asia: A four-country comparative study* (pp. 1–23). The University of Michigan Press.
- Joshi, K., Kumar, R., & Avasthi, A. (2003). Morbidity profile and its relationship with disability and psychological distress among elderly people in Northern India. *International Journal of Epidemiology*, 32(6), 978–987. <https://doi.org/10.1093/ije/dyg204>
- Kanaiaupuni, S. M. (2000). Leaving Parents Behind: Migration and Elderly Living Arrangements in Mexico (No. 99–16). <https://www.ssc.wisc.edu/cde/cdewp/99-16.pdf>
- Kastor, A., & Mohanty, S. K. (2016). Associated covariates of functional limitation among older adults in india: an exploration. *Ageing International*, 41(2), 178–192. <https://doi.org/10.1007/s12126-016-9241-y>.

- Knodel, J., & Saengtienchai, C. (2007). Rural parents with urban children: Social and economic implications of migration for the rural elderly in Thailand. *Population, Space and Place*, 13(3), 193–210. <https://doi.org/10.1002/psp.436>
- Kuhn, R., Everett, B., & Silvey, R. (2011). The effects of children's migration on Elderly Kin's health: A counterfactual approach. *Demography*, 48(1), 183–209. <https://doi.org/10.1007/s13524-010-0002-3>
- Kuhn, R. S. (2005). A longitudinal analysis of health and mortality in a migrantsending region of Bangladesh. In S. Jatrana, M. Toyota, & B. S. A. Yeoh (Eds.), *Migration and Health in Asia* (1st ed., pp. 177–208). Routledge. <https://doi.org/10.4324/9780203013564>
- Kumar, K., Shukla, A., Singh, A., Ram, F., & Kowal, P. (2016). Association between wealth and health among older adults in rural China and India. *Journal of the Economics of Ageing*, 7, 43–52. <https://doi.org/10.1016/j.jeoa.2016.02.002>
- Kumar, S., & Pradhan, M. R. (2019). Self-rated health status and its correlates among the elderly in India. *Journal of Public Health*, 27(3), 291–299. <https://doi.org/10.1007/s10389-018-0960-2>
- Lee, Y., & Shinkai, S. (2005). Correlates of cognitive impairment and depressive symptoms among older adults in Korea and Japan. *International Journal of Geriatric Psychiatry*, 20(6), 576–586. <https://doi.org/10.1002/gps.1313>
- Lloyd-Sherlock, P., McKee, M., Ebrahim, S., Gorman, M., Greengross, S., Prince, M., Pruchno, R., Gutman, G., Kirkwood, T., O'Neill, D., Ferrucci, L., Kritchevsky, S. B., & Vellas, B. (2012). Population ageing and health. *The Lancet*, 379(9823), 1295–1296. [https://doi.org/10.1016/S0140-6736\(12\)60519-4](https://doi.org/10.1016/S0140-6736(12)60519-4)
- Lu, Y., Hu, P., & Treiman, D. J. (2012). Migration and depressive symptoms in migrant-sending areas: Findings from the survey of internal migration and health in China. *International Journal of Public Health*, 57(4), 691–698. <https://doi.org/10.1007/s00038-011-0314-0>
- Miltiades, H. (2002). The social and psychological effect of an adult child's emigration on non-immigrant Asian Indian elderly parents. *Journal of Cross-Cultural Gerontology*, 17(1), 35–55. <https://doi.org/10.1023/A:1014868118739>
- Nguyen, C. V. (2016). Does parental migration really benefit left-behind children? Comparative evidence from Ethiopia, India, Peru and Vietnam. *Social Science and Medicine*, 153, 230–239. <https://doi.org/10.1016/j.socscimed.2016.02.021>
- Perkins, J. M., Lee, H., & young, James, K. S., Oh, J., Krishna, A., Heo, J., Lee, J. koo, & Subramanian, S. V. (2016). Marital status, widowhood duration, gender and health outcomes: A cross-sectional study among older adults in India. *BMC Public Health*, 16, 1032. <https://doi.org/10.1186/s12889-016-3682-9>
- Qin, M., Vlachantoni, A., Evandrou, M., & Falkingham, J. C. (2018). General Health Questionnaire-12 reliability, factor structure, and external validity among older adults in India. *Indian Journal of Psychiatry*, 60(1), 56–59. <https://doi.org/10.4103/psychiatry.IndianJPsychiatry>
- Rajan, S. I., Sarma, P. S., & Mishra, U. S. (2003). Demography of Indian Aging, 2001–2051. *Journal of Aging & Social Policy*, 15(2–3), 11–30. https://doi.org/10.1300/J031v15n02_02
- Razzaque, A., Nahar, L., Akter Khanam, M., & Kim Streatfield, P. (2010). Socio-demographic differentials of adult health indicators in Matlab, Bangladesh: Self-rated health, health state, quality of life and disability level. *Global Health Action*, 3(1), 4618. <https://doi.org/10.3402/gha.v3i0.4618>
- Rossi, A. S., & Rossi, P. H. (2017). *Parent-Child Relations Across the Life Course*. Routledge.
- Samanta, T. (2018). The family context, social capital, and older adult well-being: how are they related? In M. C. P. Alejandria-Gonzalez, S. Ghosh, & N. Sacco (Eds.), *Aging in the Global South: Challenges and Opportunities*. Lexington Books.
- Samanta, T., Chen, F., & Vanneman, R. (2015). Living Arrangements and Health of Older Adults in India. *Journals of Gerontology: Series B, Psychological Sciences and Social Sciences*, 70(6), 937–947. <https://doi.org/10.1093/geronb/gbu164>
- Sathyanarayana, K. M., Kumar, S., & James, K. S. (2014). Living Arrangements of Elderly in India: Policy and Programmatic Implications. In G. Giridhar, K. M. Sathyanarayana, S. Kumar, K. S. James, & M. Alam (Eds.), *Population Ageing in India* (pp. 74–95). Cambridge University Press. <https://doi.org/10.1017/CBO9781139683456.005>
- Singh, L., Arokiasamy, P., Singh, P. K., & Rai, R. K. (2013). Determinants of gender differences in self-rated health among older population: Evidence from India. *SAGE Open*. <https://doi.org/10.1177/2158244013487914>
- Song, Q. (2017). Aging and separation from children: The health implications of adult migration for elderly parents in rural China. *Demographic Research*, 37(1), 1761–1792. <https://doi.org/10.4054/DemRes.2017.37.55>

- Thapa, D. K., Visentin, D., Kornhaber, R., & Cleary, M. (2018). Migration of adult children and mental health of older parents “left behind”: An integrative review. *PLoS ONE*, *13*(10), e0205665. <https://doi.org/10.1371/journal.pone.0205665>
- Ugargol, A. P., Hutter, I., James, K. S., & Bailey, A. (2016). Care Needs and Caregivers: Associations and Effects of Living Arrangements on Caregiving to Older Adults in India. *Ageing International*, *41*(2), 193–213. <https://doi.org/10.1007/s12126-016-9243-9>
- UNFPA. (2012). Building a Knowledge Base on Population Ageing (BKPAL): Report on the Status of Elderly in Selected States of India, 2011. <https://india.unfpa.org/en/publications/report-status-elderly-select-states-india-2011>
- Van de Ven, W. P. M. M., & Van Praag, B. M. S. (1981). The demand for deductibles in private health insurance. *Journal of Econometrics*, *17*(2), 229–252. [https://doi.org/10.1016/0304-4076\(81\)90028-2](https://doi.org/10.1016/0304-4076(81)90028-2)
- Vullnetari, J., & King, R. (2008). “Does your granny eat grass?” on mass migration, care drain and the fate of older people in rural Albania. *Global Networks*, *8*(2), 139–171. <https://doi.org/10.1111/j.1471-0374.2008.00189.x>
- Wahba, J., & Wang, C. (2019). Sons or Daughters? The Impact of Children’s Migration on the Health and Well-Being of Parents Left Behind. In IZA Discussion Paper Series (IZA DP No.12370). <http://ftp.iza.org/dp12370.pdf>
- Waidler, J., Vanore, M., Gassmann, F., & Siegel, M. (2018). Migration and the multi-dimensional well-being of elderly persons in Georgia. *Journal of Population Ageing*, *11*(3), 217–238. <https://doi.org/10.1007/s12062-017-9176-4>
- Yi, F., Liu, C., & Xu, Z. (2019). Identifying the effects of migration on parental health: Evidence from left-behind elders in China. *China Economic Review*, *54*(1), 218–236. <https://doi.org/10.1016/j.chieco.2018.11.005>

Publisher’s Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Authors and Affiliations

Pravat Bhandari¹  · Shinjini Ray¹ · R. Nagarajan²

Shinjini Ray
shinjiniiray24@gmail.com

R. Nagarajan
nagarajan@iips.net

¹ International Institute for Population Sciences, Mumbai 400088, India

² Department of Development Studies, International Institute for Population Sciences, Mumbai 400088, India