SSM - Population Health 11 (2020) 100572

Contents lists available at ScienceDirect

SSM - Population Health

journal homepage: http://www.elsevier.com/locate/ssmph

Article

Changing family structures and self-rated health of India's older population (1995-96 to 2014)

Judith Lieber [a,*], Lynda Clarke [a], Ian M. Timæus [a,b], Poppy Alice Carson Mallinson [a], Sanjay Kinra [a]

[a] London School of Hygiene and Tropical Medicine, Keppel Street, London, WC1E 7HT, UK
[b] University of Cape Town, Rondebosch, Cape Town, 7700, South Africa

ARTICLE INFO

Keywords:
India
Older adults
Health
Family
Marriage
Social support
Parity

ABSTRACT

A common view within academia and Indian society is that older Indians are cared for by their families less than in the past. Children are a key source of support in later life and alternatives are limited, therefore declining fertility appears to corroborate this. However, the situation may be more complex. Having many children may be physiologically burdensome for women, sons and daughters have distinct care roles, social trends could affect support provision, and spouses also provide support. We assessed whether the changing structure of families has negatively affected health of the older population using three cross-sectional and nationally representative surveys of India's 60-plus population (1995–96, 2004 and 2014). We described changes in self-rated health and family structure (number of children, sons, and daughters, and marital status) and, using ordinal regression modelling, determined the association between family structure and self-rated health, stratified by survey year and gender. Our results indicate that family structure changes that occurred between 1995-96 and 2014 were largely associated with better health. Though family sizes declined, there were no health gains from having more than two children. In fact, having many children (particularly daughters) was associated with worse health for both men and women. There was some evidence that being sonless or childless was associated with worse health, but it remained rare to not have a son or child. Being currently married was associated with better health and became more common over the inter-survey period. Although our results suggest that demographic trends have not adversely affected health of the older population thus far, we propose that the largest changes in family structure are yet to come. The support available in coming years (and potential health impact) will rely on flexibility of the current system.

Introduction

The Indian 60-plus population is growing rapidly and is predicted to triple to 300 million by 2050 (Dey, 2016). A common perception within academia and Indian society is that older people are cared for by their relatives less than in previous years, due to social (e.g. perceived rise in individualistic attitudes) and demographic (e.g. household nuclearisation) changes (Cohen, 1998; Kumari Bhat & Dhruvarajan, 2002; Lamb, 2000). This cannot be assessed directly due to a lack of longitudinal data on support provision to older people. Nevertheless, fertility trends appear to corroborate this. Children (primarily sons and daughters-in-law) are the normative and primary source of support for older Indians (Lamb, 2000; UNFPA, 2012), and fertility has been declining since the mid-20th century (Rele, 1987). The Total Fertility Rate (TFR) dropped from 5.2 in 1971 to 2.3 in 2016 (Registrar General & Census Commissioner of India, 2016).

Formal sources of care are scarce. Only one-fifth of the population work in the formal sector and are thus eligible for private pensions (International Labour Office, 2018), and public pensions are nominal and difficult to obtain (Dey, 2016; Rajan & Mishra, 2011). Formal care is availabl2e only to the urban middle-classes (Kalavar & Jamuna, 2011), yet three-quarters of people aged 60-plus live rurally (Jeyalakshmi, Chakrabarti, & Gupta, 2011, pp. 1–63) and over one-third live below the poverty-line (UNFPA, 2012). Care homes remain highly stigmatised (Brijnath, 2012). Shrinking family sizes and support declines may have consequences for health of the older population, for instance evidence

* Corresponding author. Department of Population Health, London School of Hygiene and Tropical Medicine, Keppel Street, London, WC1E 7HT, UK.
E-mail addresses: judith.lieber1@lshtm.ac.uk (J. Lieber), Lynda.clarke@lshtm.ac.uk (L. Clarke), ian.timaeus@lshtm.ac.uk (I.M. Timæus), poppy.mallinson@lshtm.ac.uk (P.A.C. Mallinson), Sanjay.kinra@lshtm.ac.ukAffiliations (S. Kinra).

https://doi.org/10.1016/j.ssmph.2020.100572
Received 20 August 2019; Received in revised form 17 March 2020; Accepted 19 March 2020
Available online 25 March 2020

from outside India indicates that a lack of assistance with daily tasks (e.g. bathing) is associated with poor health outcomes (Hass et al., 2017; He et al., 2015; Momtaz, Hamid, & Ibrahim, 2012). Declines in support may be compounded by high (and potentially rising (Dandona et al., 2017)) support needs; one-fifth of the older population are estimated to have a functional disability (Parmar & Saikia, 2018).

On the other hand, family structure changes may have a more complex relationship with health. Fertility decline could be beneficial for Indian women as there is evidence that women experience a health penalty at high parity (Högnäs et al., 2017). Sons and daughters play different roles in later life care, so changes in both the number and composition of children could influence support availability. The relationship between children and parental health might vary as Indian society changes. Finally, spouses are also key sources of support and gender-specific trends in mortality and ages at marriage have led to small declines in widowhood (Registrar General & Census Commissioner, 2010; Jeyalakshmi et al., 2011, pp. 1–63; Das & Das, 2013; MOSPI, 2016). To assess whether changing family structures have had an adverse effect on older Indians' health, we have the following objectives:

Objectives

1. Describe trends in family structure (number of children, sons, daughters, and marital status) for India's older population (aged 60-plus) (1995-96 to 2014)
2. Determine the relationship between older people's family structure and their health
3. Assess the relationship between family structure and health by survey year and gender

Background and hypotheses

The influence of children on parental health in India

To our knowledge, no studies have examined the combined effect of sons and daughters on parents' later life health in India. Evidence from other settings indicates the shape of the relationship between children and parents' health is dependent on the population. Contemporary populations tend to demonstrate U or J-shaped relationships, whereby having both few (0–2) and many (4- or 5-plus) children is associated with poor health in comparison to having 3 or 4 children (Barclay et al., 2016; Högnäs et al., 2017; Zeng et al., 2016). On the other hand, a meta-analysis of historical populations (and populations of less economically developed countries) demonstrates declining mortality for women with increasing numbers of births (Hurt, Ronsmans, & Thomas, 2006). Children can both positively and negatively influence their parents' health over the lifecourse, and these influences vary by context, thereby underscoring these differing relationships. For instance, it has been theorised that having multiple children provided parents with survival benefits in historical populations as children were necessary for support at older ages, while large family sizes in contemporary populations are more likely to result in financial strain and stress (Hurt et al., 2006).

One consistent trend is that childless older people tend to have worse health outcomes (Barclay et al., 2016; Högnäs et al., 2017; Zeng et al., 2016). This is proposed to result from both social (e.g. effects on psychosocial outcomes such as self-esteem or lack of social support) and biomedical (e.g. higher rates of certain cancers in childless women) pathways (Berkman et al., 2000; Carr & Utz, 2020; Högnäs et al., 2017). Given the dependence of much of the older population in India on their children, we hypothesise:

H1. Having no children will be associated with worse health for both men and women.

The study population were born in the first half of the 20th century and had children during the early stages of the demographic transition. As such, it is not immediately evident whether having multiple children would have been beneficial (as indicated in historical populations) or detrimental (as indicated in contemporary populations) for health at older ages. However, we propose that older women in this population would have experienced a physiological penalty on their health due to their fertility histories. Fertility had started to decline but remained relatively high (average completed family size of 4.7 for a woman born in the 1940s (Mari Bhat & Zavier, 1999)). Early first births (which are associated with negative health outcomes (Barclay et al., 2016)) would have been common (Bloom & Reddy, 1986). Evidence from Bangladesh and a recent meta-analysis indicates that women experience more negative effects from having multiple children than men, with the meta-analysis indicating divergence between men and women at parity 7 (Högnäs et al., 2017; Hurt et al., 2004). Evolutionary theory proposes that this results from women's energy being channelled into reproduction rather than somatic maintenance (Kirkwood & Rose, 1991). Given the fertility histories of women of this population, we hypothesise that:

H2. Having many children will be associated with worse health for women, but not men.

Only two studies have assessed the distinct relationships between sons and daughters, and older parents' health in India, with contrasting results. A nationwide survey in the 1980s revealed a positive effect of sons on functional health, but no effect of daughters (Sengupta & Agree, 2003). This may be underscored by the distinct roles of sons and daughters, which stem from the largely patriarchal, patrilocal, and patrilineal structure of Indian society.

Adult sons are more likely to co-reside with their parents than their sisters and thus contribute financially to the household. Daughters are expected to move to their husband's household on marriage (Cain, 1986). The marriage of a son brings dowry into the household, while the opposite is true for daughters. Dowry costs can be steep, for instance 15% of all household loans in 2004-05 were to fund dowry (Desai, 2005). At older ages, norms dictate that sons co-reside with their parents and provide financially; two-thirds of economically dependent older Indians rely on their sons for financial support versus 4% who rely on daughters (UNFPA, 2012)). Women's filial responsibilities largely lie with their in-laws as daughters-in-law play a crucial role as primary caregivers (Gupta, 2009; Prince et al., 2004).

In contrast, the second study indicated a positive effect of having 1-plus daughters on father's (but not mother's) self-rated health. Sons were not associated with either parents' health (Sudha et al., 2006). Though daughters are not expected to be primary carers for their parents, they are typically perceived as reliable sources of emotional support, and can provide care during illness (Bailey, Hallad, & James, 2014; Cain, 1986; Diamond-Smith, Luke, & McGarvey, 2008; Gupta, Pillai, & Levy, 2012). Daughters (and sons-in-law) can also take on the primary support role when sons are unavailable. Given the varied roles of sons and daughters in old-age support, we have the following hypotheses:

H3. Having sons will be associated with better health for both men and women, while the effect of daughters will be smaller or negative.

India is undergoing rapid social changes, therefore the influence of children on their parents' health may be also changing with time. Some trends could increase support availability, for instance there is qualitative evidence that the stigma around daughters providing support is lessening (Allendorf, 2012). Nevertheless, common perception (including in the academic literature) offers a pessimistic view, due to the perceived effects of migration, household nuclearisation, labour market participation of women, ideational changes, and rising dowry practice (Kumari Bhat & Dhruvarajan, 2002; Cohen, 1998; Diamond-Smith et al., 2008; Lamb, 2000). As such, we hypothesise that:

H4. The effect of both sons and daughters on health will become increasingly negative over the inter-survey period.

Marriage and health in India

Current evidence demonstrates that having a spouse is associated with better health for older Indians (Sengupta & Agree, 2002); some studies suggest a greater effect for women (Sudha et al., 2006; Perkins et al., 2016; Stewart Williams, Norström, & Ng, 2017) while others show similar effects by gender (Hirve et al., 2012). Gender norms result in qualitative differences in the support and status that husbands and wives provide. Women tend to act as caregivers for dependent husbands, though care can be supplemented by daughters-in-law if wives are unavailable (Prince et al., 2004). On the other hand, older women tend to be economically and socially dependent on their husbands (Dyson & Moore, 1983) and widowhood can result in declines in social status, discrimination, and limitations on access to economic resources (Agarwal, 1998; Chen & Dreze, 1992). We hypothesise that:

H5. Being currently married will be associated with better health for both men and women, though the positive effect will be larger for women.

Method

We used individual-level data from three cross-sectional (1995–96, 2004 and 2014) and nationally-representative household surveys, collected by the Indian National Sample Survey Office. Each survey included a module for persons aged 60-plus that collected data on sociodemographic and health outcomes, and used a stratified multi-stage design, sampling 33,991, 34,808 and 27,245 older individuals respectively (total sample size of 96,044).

The primary outcome is the respondent's own perception about their current state of health (self-rated health), which was categorised as excellent/very good (1), good/fair (2), and poor (3) (hereon referred to as excellent, good and poor). There is strong evidence that self-rated health is a reliable and holistic measure of health in India; self-rated health is associated with different components of health, including mental, physical, and functional health, and with objective measures such as chronic disease diagnosis (Cullati et al., 2018; Hirve et al., 2012). We cross-checked our findings with the outcome of functional health, which was categorised as physically mobile (1), confined to home (2), and confined to bed (3).

The survey collected data on the number of sons and daughters alive at the time of the survey (biological rather than children-in-law), which we categorised as 0, 1, 2, 3, 4, and 5-plus, due to small sub-samples at higher parity. As marriage is almost universal, having an adult son will typically correspond to having a daughter-in-law, and vice-versa. Nevertheless, we did not have information on children's characteristics (e.g. marital status) so were unable to confirm or investigate this. Sons and daughters were summed to total number of children alive, which was categorised as 0, 1, 2, 3, 4, 5, 6, 7, and 8-plus. This was guided by a meta-analysis of parity and mortality, which demonstrated a divergence in mortality risk between men and women at parity 7 (Högnäs et al., 2017). We treated each child variable as categorical given the mixed evidence for the shape of the relationship between children and parents' health outcomes (Barclay et al., 2016; Högnäs et al., 2017; Hurt et al., 2006; Zeng et al., 2016), though we also conducted linear tests for trend, excluding 0 children/sons/daughters with the rationale that the relationship would differ between 0 and 1, and 1-plus. Finally, we coded marital status as being currently married versus not. Divorce and remarriage remain rare in India (less than 2% of the sample were divorced or never married), therefore individuals who were not currently married were mostly widowed.

To address the first objective, we estimated descriptive statistics age-standardised to the 1995-96 survey age distribution, weighting for sampling design. We calculated predicted probabilities using the STATA margins command (StataCorp, 2017). We presented the descriptive statistics by gender for self-rated health and marital status due to large gender differences. To address the second and third objectives, we used ordinal regression. Ordinal regression assumes that the association between each exposure and poor/good versus excellent is the same as for good/excellent versus poor. We tested this assumption on the full model with the autofit option of the gologit2 command (Williams, 2016), which we set at a significance level of 0.01 to limit trivial assumption violations resulting from the large sample size. The assumption was not violated for any of the exposures and results of the unconstrained model were similar to the ordinal model, therefore we used ordinal regression.

Due to collinearity, we modelled total number of children separately to sons and daughters (which were always modelled together). We controlled for age (five-year intervals, 60–64 to 80-plus), gender, education (below primary, primary, middle to secondary, above secondary), socioeconomic status (quintiles of household consumption), living arrangements (alone, with spouse only, with children and grandchildren, with children, with others), region (south, west, north, central, east/north-east), and survey year. We were unable to investigate living arrangements in detail due to the response categories available. We developed the socioeconomic status variable from household consumption data using an equivalence scale, selecting parameters on the basis of estimates summarised by (Deaton, 2018). We adjusted for inflation using the consumer price index of each survey year (World Bank, no date)and finally split the adjusted consumption data into quintiles separately by urban and rural residence.

We used Wald tests to determine strength of evidence for interactions, firstly with survey year, secondly with gender, and thirdly between exposure variables. Conceptually, this population corresponds to the Indian population aged 60-plus living between 1995-96 and 2014, therefore we adjusted the survey weights of the later surveys to account for the larger older populations in India at these time-points (Korn & Graubard, 1999; United Nations, 2013).

We used multiple imputation to account for missing data, which was greatest in the children variables, 14%, 11% and 7% missing in total children, daughters, and sons respectively. All other variables were <3% missing. While the complete case sample was large (N = 76,639), other factors might have influenced whether the data were missing, which could have biased the effect estimates. To address this, we fitted an imputation model, which included the analysis model variables plus auxiliary variables (caste category, functional health, change in self-rated health, economic dependence, household size, urban residence, self-reported illness and hospitalisation in the past year). We assumed that data were missing at random conditional on these variables. We used the chained equations method and imputed 10 datasets. Results from analysis of the complete case and the imputed data (N = 96,044) were very similar and we used the imputed data for the final analyses. All analyses were conducted using STATA 15, and we used the mi estimate and svy prefixes to account for the imputed data and sampling design throughout (StataCorp, 2017).

Results

Table 1 summarises the sociodemographic characteristics of the Indian population aged 60-plus between 1995-96 and 2014. The average age was 67.6, with little difference between men and women. Levels of education were low although men were more educated (38% had primary schooling or above in comparison to 14% of women). Most older people lived with their children (80%) and living alone was rare, but more common for women (6% versus 2% of men), while living with only one's spouse was more common for men (16% versus 9% of women). More people lived in the south versus the rest of the country, and women tended to live in households of slightly lower socioeconomic status than men. Table 3 (appendix) describes changes in background characteristics over the survey years.

Fig. 1 reveals that the self-rated health of India's older population worsened between 1995-96 and 2004; prevalence of poor reported health rose by approximately 6%, while excellent health declined by

Table 1
Percent distribution of the older Indian population according to their background characteristics, by gender (1995-96 - 2014).

%	Women	Men	Total
Age (years)			
60–64	36.0	34.2	35.1
65–69	29.2	29.2	29.2
70–74	18.4	19.3	18.9
75–79	7.8	8.8	8.3
80+	8.6	8.4	8.5
Female	50.5	49.5	100
Education			
Below primary	85.9	61.9	74.0
Primary	6.1	11.9	9.0
Middle to secondary	6.3	19.8	13.0
Above secondary	1.7	6.4	4.0
Quintile of socioeconomic status			
1 - lowest	24.6	22.9	23.8
2	18.2	17.9	18.1
3	17.7	17.5	17.6
4	17.9	18.9	18.4
5 - highest	21.5	22.8	22.1
Living arrangements			
Alone	6.3	1.8	4.1
Spouse only	9.1	16.3	12.7
Children and grandchildren	63.5	53.4	58.5
Children	15.0	23.5	19.2
Others	6.1	4.9	5.5
Region			
South	27.8	25.7	26.8
West	15.7	14.7	15.2
Central	22.3	22.6	22.4
East/North east	21.2	24.4	22.7
North	13.1	12.6	12.9

2–3% for women and men ($p < 0.001$). In the second inter-survey period, self-rated health improved slightly, with poor reported health declining by 2% for women and men ($p = 0.04$ and 0.01 respectively), and excellent health showing no further changes. Fig. 6 (appendix) demonstrates that functional health improved slightly for men (3% rise in physically mobile across the inter-survey period, $p < 0.001$) but did not change for women. By 2014, less than 10% of the population were confined either to their house or bed).

Fig. 2 demonstrates that the average number of children alive to older Indians has declined. By 2014, older Indians had on average 3.7 children in comparison to 4.5 in 1995-96 (not shown). Having 5-plus children has become less common, while having none or 1 child remains unusual (<5% and <10% respectively). By 2014, the majority of India's older population had 3 children and having many children (6-plus) had become uncommon.

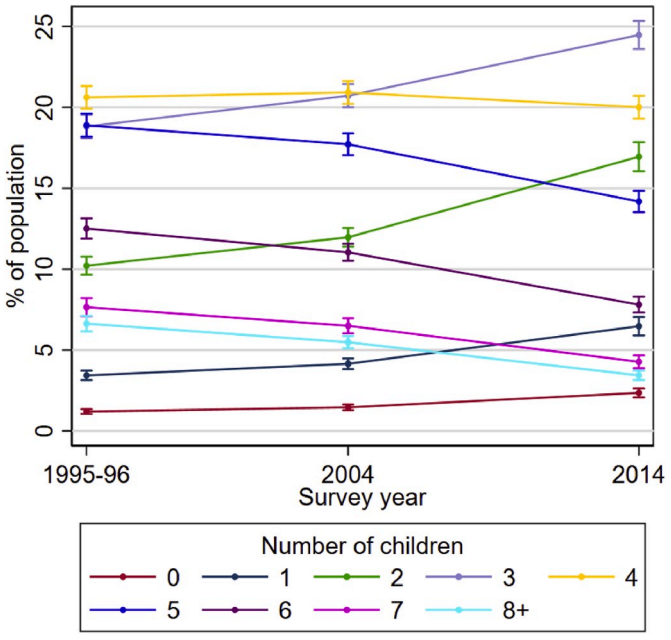

Fig. 2. Trends in number of children alive to India's older population (1995-96 to 2014) (standardised to 1995-96 age structure).

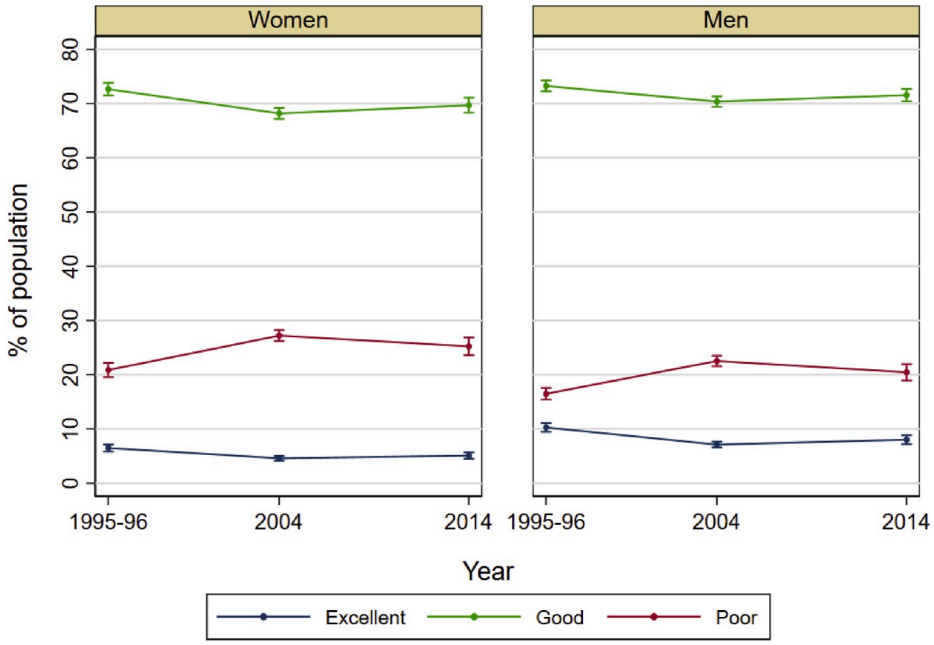

Fig. 1. Trends in self-rated health of India's older population, by gender (1995-96 to 2014) (standardised to 1995-96 age structure).

Fig. 3 demonstrates that, by 2014, the majority of older individuals had 1 daughter in comparison to 2 in 1995-96. Having no daughters has risen by 75% since 1995–96; over 10% of older people did not have a daughter in 2014, similar or higher than the number with 3 or 4-plus daughters. Having 1 or 2 sons was most common by 2014 due to the decline in the number of older people having 3 or more, while having no sons has increased by 50% but remains rare (7% in 2014).

Finally, almost twice as many older men than women were currently married, 83% in 2014 versus 43% of women. The percentage rose by 5% and 4% for women and men respectively between 2004 and 2014 ($p < 0.001$), with no change between 1995-96 and 2004.

We interacted survey year with each of the family structure variables to determine whether the relationships with self-rated health changed over time. There is no evidence that the relationship between family structure and health varied across the survey rounds ($p > 0.05$) (Table 2 and 3; appendix), so we combined the surveys for the regression models. We also tested for an interaction with gender. As is evident from the overlapping confidence intervals in Figs. 4 and 5, there is also no evidence for differences in the relationship between family structure (including total number of children and marital status, as hypothesised) and self-rated health by gender ($p > 0.10$ for each variable) (Table 4 and 5; appendix). The estimates of the fully-adjusted models are very similar to those of model 1 (Table 4 and 5; appendix), indicating little confounding by the socioeconomic variables included in the model, and are presented in Figs. 4 and 5.

Fig. 4 demonstrates that, in comparison to having 2 children, having 0 or 1 children is associated with worse self-rated health (0 children: OR = 1.20, p = 0.16; 1 child: OR = 1.16, p = 0.13), though confidence intervals are wide and cross 1, potentially due to small sub-samples. Having more than 2 children (in comparison to 2) is also associated with worse self-rated health; the largest effect size for the total population is for 8-plus children (OR = 1.38, $p < 0.001$).

Fig. 5 demonstrates that having none versus 1 son is associated with 15% higher odds of having worse self-rated health, though again the confidence interval crosses 1 (p = 0.10). There is no evidence that this effect varies by co-residence with a daughter (p = 0.30) or the older person's marital status (p = 0.73). There are no further gains from having more than 1 son for self-rated health, and potential negative effects of having many sons (5+ sons: OR = 1.13, p = 0.14). There is no evidence for a relationship between having none versus 1 daughter and self-rated health (OR = 1.02, p = 0.80), but for individuals with a daughter, having an additional daughter is associated with 5% higher odds of worse health (p = 0.01) (Table 5table 5; appendix). This relationship between number of daughters and parents' self-rated health is the same in those with and without sons (p = 0.78) and irrespective of marital status (p = 0.28). We interacted number of sons and daughters to assess the effect of child composition on health. The results (Table 6table 6; appendix) mirror the individual effects of sons and daughters; in comparison to having 1 son 1 daughter, most other compositions are associated with worse health.

Having a spouse is associated with better self-rated health for older people, with 18% lower odds of worse self-rated health ($p < 0.001$). The effect of marriage is largest in those without children (OR = 0.69 p = 0.11).

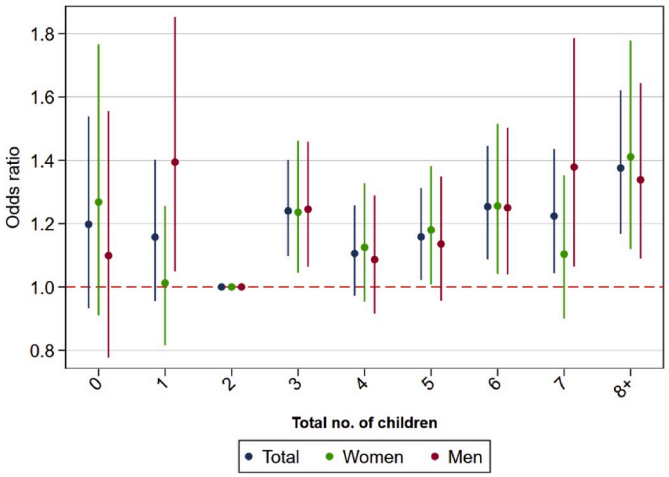

Fig. 4. Relationship between total number of children and self-rated health for the older Indian population, by gender (1995-96 to 2014). Ordinal model controlling for age, gender, marital status, education, socioeconomic status, living arrangement, region and survey year.

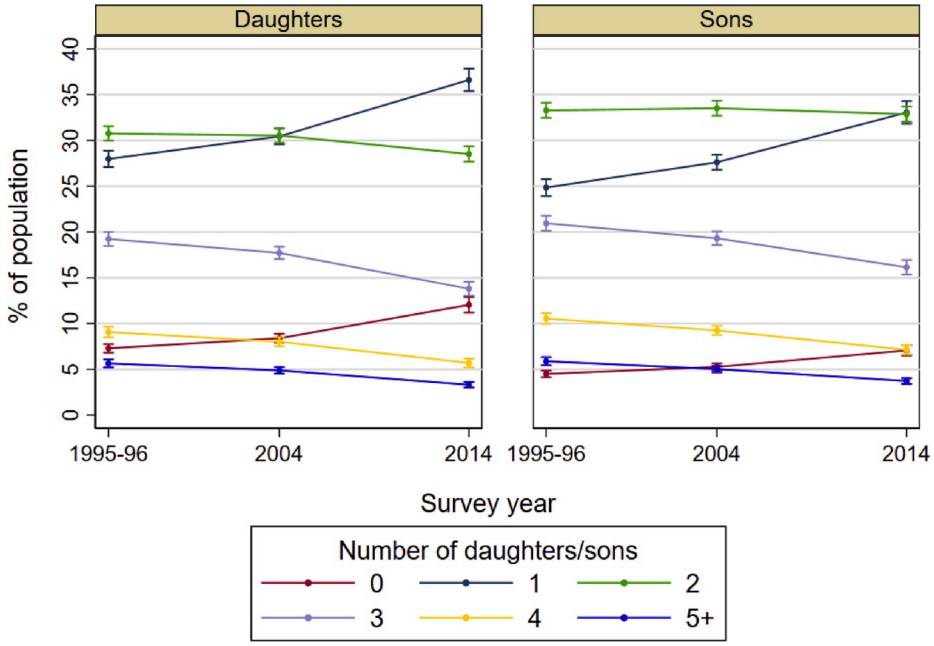

Fig. 3. Trends in number of sons and daughters alive to India's older population (1995-96 to 2014) (standardised to 1995-96 age structure).

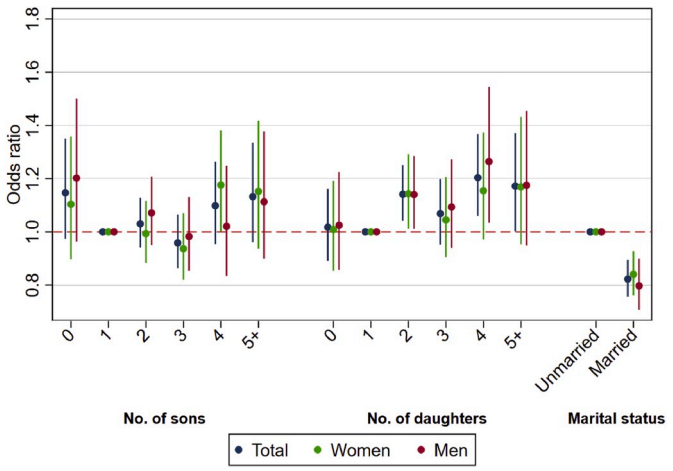

Fig. 5. Relationship between number of sons and daughters, marital status, and self-rated health for the older Indian population, by gender (1995-96 to 2014). Ordinal model controlling for age, gender, education, socioeconomic status, living arrangement, region and survey year.

We repeated the models with functional health to cross-check our results. Marital status is similarly associated with functional health (OR = 0.73, $p < 0.001$; Table 7; appendix) while the association between total number of children, sons, daughters, and functional health is less clear (all the confidence intervals cross 1). In comparison with having 1 son, being sonless may be associated with worse functional health (OR = 1.24 p = 0.09; Table 7; appendix), while being daughterless (in comparison to having 1 daughter) may be associated with better functional health (OR = 0.84 p = 0.09; Table 7; appendix).

Discussion

In an effort to understand whether demographic trends have adversely impacted health of the older Indian population, this paper described how family structures have changed, and examined the link between family structure and health. In contrast to the typically pessimistic view of changing families and population ageing in India, our results indicate that changes in family structure that have occurred thus far have been largely associated with better health.

We initially proposed that fertility decline has the potential to negatively affect the older population's health by limiting the support available from children. Following this, hypothesis 1 proposed that having no children would be associated with worse health. No previous studies have assessed this proposition in India and our results provide some support. Being childless is associated with worse health in comparison to having 2 children (as is having 1 child), though the evidence is inconclusive. The impact for older people in India is likely to be minimal as it remains rare to have none or 1 child (3% and 7% respectively in 2014).

We then proposed that reductions in high parity births could benefit Indian women due to the direct physiological impact of having children. Hypothesis 2 proposed that having many children would be associated with worse health for women but not men. Our results do not support this, as having 3-plus children was associated with worse health for both women and men. This is in line with several studies that have demonstrated an association between parity and negative health outcomes for men, though it contrasts with a meta-analysis which indicates higher mortality for women at parity 7 (Barclay et al., 2016; Högnäs et al., 2017). The study population raised their children in the latter half of the 20th century when almost half of the Indian population were living below the poverty line (World Bank, 2019). Raising children, for instance financing their living costs, education, and marriages, corresponds to a heavy socioeconomic burden for parents (Diamond--Smith et al., 2008). Having limited resources may have resulted in parents adapting their own behaviours, for instance there is evidence that children are more likely to be associated with negative health outcomes in parents of low socioeconomic groups (Dribe, 2006).

A woman-specific physiological burden of children could have been masked if social mechanisms act differently for men and women. A study in Egypt revealed a larger negative effect of parity on functional health for older men, which was hypothesised to be due to their role as economic provider (Engelman et al., 2010). This could also be underscored by the fact that women in better health are more able to have one or several children (the "healthy pregnant woman effect"), which is particularly strong in populations not consciously restricting their fertility (similar to the study population) (Beeton, Yule, & Pearson, 1900). This effect was likely exacerbated as we used numbers of surviving children in our analyses, rather than children born. Less healthy women are likely to have fewer children who survive to adulthood, amplifying the positive association between children and better health. Given the lack of a clear physiological penalty of having many children in Indian women, it appears that so far, fertility decline has been beneficial for the total population.

Hypothesis 3 proposed that sons (and correspondingly daughters-in-laws) would be associated with better health, while the effect of daughters would be either smaller or negative due to the varying roles in later life care. Our results largely support this and are in line with the results of the 1980s nationwide survey of children and parents' functional health (Sengupta & Agree, 2003). We found that having no sons versus 1 was associated with worse health but having no daughters had no effect. The negative effect of being sonless remained in individuals living with, and assumedly being supported by, their daughter. Thus, this effect could result from a loss of social standing (rather than support) that a son provides (Vlassoff, 1990). Despite the preference granted to sons in Indian society, there is no evidence for health gains from having more than 1 son. This corresponds to older Indians' perceptions of 1 son being optimal for support in later years (UNFPA, 2012; Vlassoff & Vlassoff, 1980). On the other hand, having more than 1 daughter was associated with worse health, and this effect was similar in individuals with and without sons. This perhaps conflicts with evidence of daughters supporting their parents when sons are unavailable (Bailey et al., 2014; Cain, 1986; Gupta et al., 2012) and may indicate that the negative relationship between daughters and parents' health is determined at an earlier life-stage, for instance from the financial impact of dowry. As fertility has declined to a level where most older people have 1 daughter and 1 or 2 sons, past fertility trends appear to have been beneficial for the current older population.

Hypothesis 4 proposed that the effect of sons and daughters would be increasingly negative over time due to social changes (e.g. perceived rise in individualistic attitudes). Our results do not support this. Rather than social trends not affecting the relationship between children and parents' health in India, it may be that changes are balancing each other out. To give a straightforward example, the rise of schooling in India will increase the financial costs of raising children (which appears to be corroborated in our data as number of children was not associated with household consumption in 1995-96, but negatively associated in 2014 (not shown)). This could impact economic wellbeing of the household and subsequently, parents' health over the lifecourse. On the other hand, education would increase children's earning potential and thus their ability to financially support their parents in later life (as evidence from populations with old-age support systems similar to India demonstrates (Zimmer, Hermalin, & Lin, 2002; Yang, Martikainen, & Silventoinen, 2016)). So, similar relationships between children and parents' health at different periods could be underscored by different mechanisms.

Finally, hypothesis 5 proposed that declines in widowhood would benefit health of the older population, particularly women if they experience a larger positive effect of marriage due to the socioeconomic support a husband provides in Indian society. Our results reveal declines

in widowhood, but indicate a similarly positive effect of marriage on both men and women's health. This contradicts some evidence of larger effects for women in India (Sudha et al., 2006; Perkins et al., 2016; Stewart Williams et al., 2017), but is in line with other studies from India and Bangladesh (Hirve et al., 2012; Rahman, 2000), and is very similar to the relationship in western populations (Manzoli et al., 2007). It is likely that marriage benefits older men and women via different pathways, although the distress from losing a spouse and the loss of emotional support may be significant for both.

On the whole, as it remains uncommon for older Indians to be sonless (or childless), but is increasingly common for older Indians to have a spouse, our results suggest that family structure changes have not led to declines in family-based support and thus their health has not been adversely affected. Looking forward, we make two propositions; first, that the greatest changes in family structure are yet to come, and second, that support availability will rely on flexibility of the support system.

Fertility has dropped considerably since that of the current older population, reaching below replacement in some states (e.g. TFR = 1.6 in Tamil Nadu) (Registrar General & Census Commissioner of India, 2016). While declines in widowhood could offset a loss of support from children, it is unclear whether this will continue as old-age mortality is projected to fall faster in women (Dhillon & Ladusingh, 2013). Though it will likely remain rare to be childless for the foreseeable future, fertility decline coupled with the use of sex-selective abortions since the 1970s (Chao et al., 2019) means it is increasingly common to have children of one gender (mostly sons). By assessing child composition of the Indian population aged 40–49 in 2005, we can estimate that roughly one-quarter of those in their 60s will not have a daughter by 2025, while over 10% will not have a son (IIPS, 2007).

Changes in child composition will affect support provision if roles remain distinct and inflexible; only 24% of Indians surveyed in 2004-05 stated they would consider living with a daughter if their son was unavailable (Desai, 2005). Our results reveal some flexibility, for instance, while living alone was more common for childless individuals, almost 50% lived with others. Population dynamics may limit this. As numbers of older people increase in relation to younger generations, daughters/extended family may become less able to support sonless/childless individuals. Further, if roles adapt to sociodemographic changes but norms do not, we may observe some negative effects on older people's wellbeing. There is evidence that older Indians living with a daughter can feel indebted and unable to ask for help (Lamb, 2000; Vera-Sanso, 2004; Vlassoff, 1990).

A key study limitation is that we described past trends and associations to infer how sociodemographic trends have affected health of India's older population, without formally assessing the potential impact on the future population. Nonetheless, we propose that the socially driven nature of these relationships make projections unsuitable. Instead, research should focus on quantifying trends and elucidating the (potentially changing) relationships between family, social support and older people's health.

A second limitation is that the cross-sectional nature of the data and the variables available make it difficult to examine potential causal mechanisms. For instance, numbers of children are not strongly linked with receipt of support (Grundy & Read, 2012). Thus, data on children's characteristics (e.g. proximity, marital and employment status), and amounts, type, and sources of support would be preferable, as would data on fertility histories. Thus, while we can establish the relationships and broadly estimate which mechanisms are at play, we are unable to clarify further. There is also potential for residual confounding by socioeconomic status, though we propose this will be more pertinent to future generations.

Third, there is evidence that individuals with similar objective measures of health rate their health differently, for instance educated people with higher levels of health awareness tend to be more critical (Bago d'Uva, O'Donnell, & van Doorslaer, 2008; Sen, 2002). Nevertheless, adjusting the descriptive statistics of self-rated health for education resulted in very similar estimates (not shown). We cross-checked our results with functional health, which led to broadly similar conclusions (for instance on the relationship between marriage and health, and the varying relationship between sons, daughters and parental health). However, the results did not mirror self-rated health exactly, for instance having more than 1 son or daughter was similarly associated with health as having 1. This may be because the functional health question only captured more extreme forms of functional limitations (i.e. restricted to household or bed), which were rare (<15% of the population with either limitation).

Finally, the regression sample corresponds to a very broad population - Indians aged 60-plus living between 1995-96 and 2014 - and although we did not find evidence that relationships varied over time or by gender, this grouping may have hidden other variation. Future research could assess the relationship between family structure and health in different regional, socioeconomic or religious groups.

This leads on to a key issue in understanding the implications of changing family structures for India's older population. Beyond basic descriptions of sons providing financially and daughters-in-law caregiving, there is very little evidence to how dependent older people are supported (Bailey et al., 2014; HelpAge, 2014; Ugargol & Bailey, 2018; UNFPA, 2012). We need to understand this to predict how sociodemographic trends will affect both the older population and their families, and thus prepare strategies to mitigate this. For instance, how is support allocated between children, how are extended relatives involved, and how do families, particularly women, manage support provision around employment? India's system of old-age support, and thus wellbeing of the older population, is reliant on the motivation and the ability of families to care. Going forward, it is key that the wellbeing of family caregivers is also considered, as this will be beneficial for both them and the older population.

Declaration of competing interest

None.

CRediT authorship contribution statement

Judith Lieber: Conceptualization, Methodology, Formal analysis, Writing - original draft, Funding acquisition. **Lynda Clarke:** Conceptualization, Supervision, Writing - review & editing. **Ian M. Timæus:** Methodology, Supervision, Writing - review & editing. **Poppy Alice Carson Mallinson:** Writing - review & editing. **Sanjay Kinra:** Conceptualization, Supervision, Writing - review & editing.

Acknowledgement

We would like to thank the National Sample Survey Office, India, for granting us access to the data used in this study. This work was supported by the Economic and Social Research Council, UK, as part of Judith's PhD. We would also like to thank the reviewers for their comments and suggestions.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ssmph.2020.100572.

Appendix

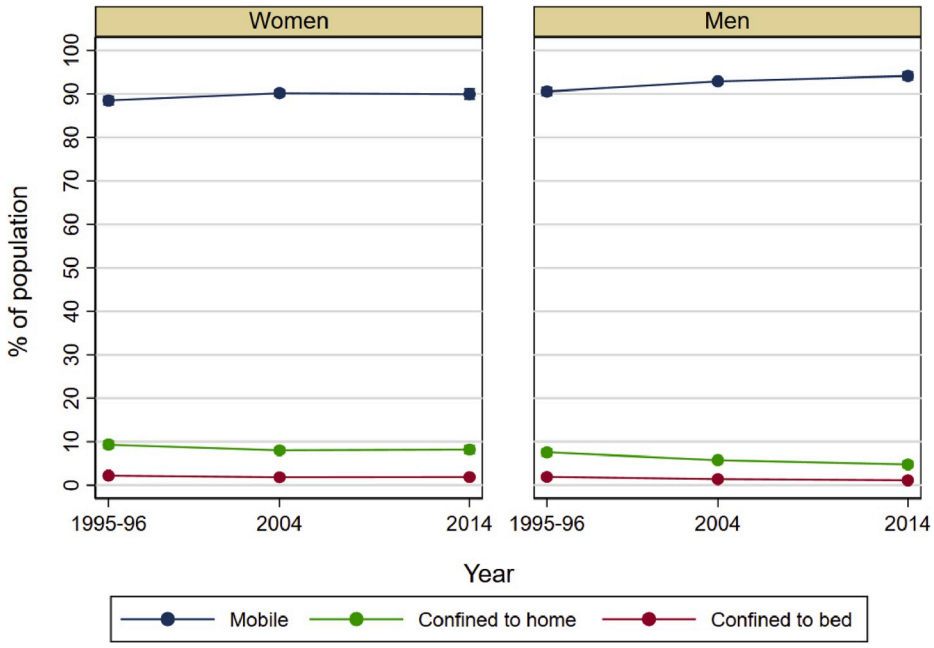

Fig. 6. Trends in functional health of the India's older population, by gender (1995-96-2014) (standardised to 1995-96 age structure)

Table 2
Ordinal regression of self-rated health and family structure in India's older population, by survey year

		Model 1			Model 2		
OR 95% CI		**1995–96**	**2004**	**2014**	**1995–96**	**2004**	**2014**
No. of children	0	1.30	0.99	1.34	1.40	1.06	1.21
		0.89–1.91	0.73–1.35	0.89–2.01	0.95–2.07	0.76–1.47	0.79–1.85
	1	1.39	1.04	1.23	1.38	1.06	1.16
		0.96–2.00	0.83–1.30	0.92–1.65	0.95–2.00	0.84–1.32	0.87–1.56
	2	1	1	1	1	1	1
	3	1.26	1.09	1.37**	1.26	1.07	1.34**
		0.98–1.62	0.96–1.25	1.12–1.69	0.98–1.62	0.94–1.23	1.09–1.65
	4	1.21	1.09	1.12	1.21	1.08	1.06
		0.96–1.52	0.95–1.25	0.89–1.42	0.96–1.53	0.94–1.23	0.84–1.35
	5	1.22	1.16*	1.27*	1.21	1.12	1.14
		0.97–1.53	1.01–1.33	1.01–1.60	0.97–1.52	0.97–1.29	0.90–1.44
	6	1.33*	1.23*	1.39*	1.31*	1.18*	1.26
		1.03–1.72	1.05–1.44	1.04–1.87	1.01–1.70	1.01–1.38	0.94–1.69
	7	1.13	1.10	1.78**	1.13	1.06	1.51*
		0.86–1.49	0.93–1.30	1.29–2.47	0.86–1.48	0.89–1.26	1.10–2.08
	8+	1.21	1.06	2.47**	1.24	1.03	2.13**
		0.95–1.56	0.88–1.28	1.72–3.56	0.96–1.60	0.85–1.25	1.49–3.06
	Linear test for trend §	1.01	1.02*	1.07**	1.01	1.01	1.05*
		0.98–1.04	1.00–1.04	1.04–1.11	0.98–1.04	0.99–1.04	1.01–1.09
No. of sons	0	0.99	0.93	1.32*	1.04	0.98	1.30
		0.74–1.34	0.79–1.11	1.02–1.72	0.77–1.41	0.82–1.17	0.99–1.70
	1	1	1	1	1	1	1
	2	1.00	0.98	1.09	1.00	0.98	1.08
		0.85–1.17	0.89–1.08	0.92–1.29	0.85–1.17	0.89–1.08	0.91–1.27
	3	1.05	0.94	1.01	1.03	0.94	0.92
		0.90–1.23	0.84–1.05	0.82–1.25	0.88–1.20	0.84–1.05	0.75–1.14
	4	1.05	1.07	1.33	1.05	1.06	1.16
		0.85–1.31	0.93–1.23	0.98–1.79	0.84–1.31	0.92–1.22	0.86–1.57
	5+	1.02	1.07	1.51	1.03	1.05	1.36
		0.82–1.27	0.92–1.26	0.98–2.35	0.82–1.28	0.89–1.23	0.88–2.10
	Linear test for trend §	1.01	1.01	1.08*	1.01	1.00	1.03
		0.97–1.06	0.98–1.05	1.00–1.16	0.97–1.06	0.97–1.04	0.96–1.11

(*continued on next page*)

Table 2 (*continued*)

		Model 1			Model 2		
OR 95% CI		**1995–96**	**2004**	**2014**	**1995–96**	**2004**	**2014**
No. of daughters	0	1.16	1.00	1.02	1.16	1.06	0.99
		0.90–1.51	0.86–1.16	0.83–1.25	0.89–1.51	0.91–1.23	0.80–1.21
	1	1	1	1	1	1	1
	2	1.04	1.16**	1.25*	1.04	1.12*	1.21*
		0.90–1.21	1.05–1.27	1.04–1.49	0.90–1.20	1.02–1.23	1.02–1.45
	3	1.09	1.07	1.10	1.07	1.04	1.08
		0.92–1.28	0.95–1.20	0.87–1.38	0.91–1.27	0.93–1.17	0.85–1.36
	4	1.25*	1.08	1.38**	1.24*	1.08	1.29
		1.03–1.52	0.93–1.26	1.05–1.81	1.02–1.51	0.92–1.25	1.00–1.68
	5+	0.88	1.04	1.78**	0.92	1.04	1.61**
		0.70–1.11	0.87–1.24	1.25–2.53	0.72–1.16	0.87–1.24	1.13–2.30
	Linear test for trend §	1.02	1.02	1.11**	1.02	1.01	1.09*
		0.97–1.07	0.98–1.05	1.04–1.18	0.97–1.07	0.98–1.05	1.02–1.16
Married		0.77**	0.88**	0.79**	0.76**	0.89*	0.81**
		0.69–0.87	0.81–0.96	0.69–0.91	0.68–0.86	0.82–0.98	0.70–0.94

Number of children modelled separately to number of sons and daughters; model 1 controls for age, gender and marital status, model 2 additionally controls for education, socioeconomic status, living arrangement, region; *p < 0.05, **p < 0.01; OR odds ratio; CI confidence interval; § restricted to population with 1-plus children/sons/daughters.

Table 3
Percent distribution of the older Indian population according to their background characteristics, by survey year

%	1995–96	2004	2014
Age (years)			
60–64	31.8	36.3	36.0
65–69	30.7	29.1	28.5
70–74	19.7	18.7	18.6
75–79	8.6	7.6	8.7
80+	9.2	8.4	8.2
Female	50.6	50.0	50.8
Education			
Below primary	80.9	76.4	68.6
Primary	8.1	9.1	9.4
Middle to secondary	9.2	11.5	16.1
Above secondary	1.8	3.0	6.0
Quintile of socioeconomic status			
1 - lowest	21.5	29.4	20.7
2	22.1	19.1	15.1
3	19.6	17.1	16.9
4	19.4	16.0	19.6
5 - highest	17.4	18.3	27.6
Living arrangements			
Alone	3.5	4.8	3.8
Spouse only	9.7	11.7	15.0
Children and grandchildren	60.5	57.7	58.0
Children	19.3	19.7	18.8
Others	6.9	6.0	4.4
Region			
South	24.9	25.4	28.8
West	15.7	16.1	14.2
Central	25.9	23.1	20.1
East/North east	21.6	22.7	23.4
North	11.9	12.8	13.4

Table 4
Ordinal regression of self-rated health and family structure (number of children and marital status) in India's older population 1995-96 - 2014, by gender

OR 95% CI		Model 1			Model 2		
		Women	**Men**	**Total**	**Women**	**Men**	**Total**
Age (years)	**60–64**	1	1	1	1	1	1
	65–69	1.39**	1.39**	1.39**	1.41**	1.41**	1.41**
		1.28–1.50	1.28–1.50	1.28–1.51	1.30–1.53	1.30–1.53	1.30–1.53
	70–74	2.23**	2.23**	2.23**	2.28**	2.28**	2.27**
		2.03–2.45	2.03–2.45	2.03–2.45	2.07–2.50	2.07–2.50	2.07–2.50
	75–79	2.91**	2.91**	2.91**	3.05**	3.05**	3.04**
		2.56–3.31	2.56–3.31	2.55–3.31	2.68–3.46	2.68–3.46	2.68–3.46
	80+	4.70**	4.70**	4.70**	5.00**	5.00**	5.00**
		4.18–5.28	4.18–5.28	4.18–5.27	4.44–5.63	4.44–5.63	4.44–5.62
Male				0.77**			0.82**
				0.72–0.82			0.77–0.88
Education	**Below primary**				1	1	1
	Primary				0.81**	0.81**	0.81**
					0.71–0.92	0.71–0.92	0.71–0.92
	Middle to secondary				0.67**	0.67**	0.66**
					0.60–0.74	0.60–0.74	0.60–0.74
	Above secondary				0.49**	0.49**	0.49**
					0.40–0.60	0.40–0.60	0.40–0.60
Quintile of socioeconomic status	**1 - lowest**				1	1	1
	2				0.91	0.91	0.91
					0.82–1.01	0.82–1.01	0.82–1.01
	3				0.83**	0.83**	0.83**
					0.74–0.93	0.74–0.93	0.75–0.93
	4				0.81**	0.81**	0.81**
					0.73–0.91	0.73–0.91	0.72–0.91
	5 - highest				0.78**	0.78**	0.78**
					0.69–0.87	0.69–0.87	0.69–0.87
Living arrangements	**Alone**				0.82*	0.82*	0.82*
					0.69–0.98	0.69–0.98	0.69–0.98
	Spouse only				1.14*	1.14*	1.14*
					1.01–1.29	1.01–1.29	1.01–1.29
	Children and grandchildren				1	1	1
	Children				0.89*	0.89*	0.89*
					0.81–0.98	0.81–0.98	0.81–0.98
	Others				0.89	0.89	0.89
					0.77–1.02	0.77–1.02	0.77–1.02
Year	**1995–96**				1	1	1
	2004				1.51**	1.51**	1.51**
					1.40–1.63	1.40–1.63	1.39–1.63
	2014				1.42**	1.42**	1.42**
					1.29–1.57	1.29–1.57	1.29–1.57
Region	**South**				1	1	1
	West				0.57**	0.57**	0.57**
					0.51–0.65	0.51–0.65	0.51–0.65
	Central				1.03	1.03	1.03
					0.92–1.15	0.92–1.15	0.92–1.15
	East/North east				1.34**	1.34**	1.34**
					1.20–1.50	1.20–1.50	1.20–1.50
	North				0.76**	0.76**	0.76**
					0.67–0.86	0.67–0.86	0.67–0.86
No. of children	**0**	1.19	1.23	1.21	1.27	1.10	1.20
		0.88–1.62	0.88–1.73	0.96–1.53	0.91–1.76	0.78–1.56	0.93–1.54
	1	1.03	1.47**	1.20	1.01	1.40*	1.16
		0.84–1.28	1.11–1.95	0.99–1.45	0.82–1.25	1.05–1.85	0.96–1.40
	2	1	1	1	1	1	1
	3	1.23*	1.27**	1.25**	1.24*	1.24**	1.24**
		1.04–1.46	1.08–1.49	1.11–1.41	1.05–1.46	1.06–1.46	1.10–1.40
	4	1.12	1.13	1.13	1.13	1.09	1.11
		0.96–1.32	0.96–1.34	0.99–1.28	0.95–1.33	0.92–1.29	0.97–1.26
	5	1.20*	1.22*	1.21*	1.18*	1.14	1.16*
		1.03–1.41	1.03–1.44	1.07–1.36	1.01–1.38	0.96–1.35	1.02–1.31
	6	1.26*	1.35**	1.30**	1.26*	1.25*	1.25**
		1.05–1.52	1.12–1.61	1.13–1.50	1.04–1.52	1.04–1.50	1.09–1.45
	7	1.13	1.51**	1.29*	1.11	1.38*	1.22*
		0.93–1.37	1.15–1.97	1.10–1.52	0.90–1.35	1.06–1.78	1.04–1.44

(*continued on next page*)

Table 4 (*continued*)

OR 95% CI		Model 1			Model 2		
		Women	**Men**	**Total**	**Women**	**Men**	**Total**
	8+	1.40**	1.39**	1.40**	1.41**	1.34**	1.38**
		1.11–1.76	1.14–1.70	1.19–1.64	1.12–1.78	1.09–1.64	1.17–1.62
	Linear test for trend §	1.03**	1.03*	1.03**	1.03*	1.02	1.03**
		1.01–1.06	1.01–1.06	1.01–1.05	1.01–1.06	1.00–1.05	1.01–1.05
Marital status	**Married**	0.82**	0.82**	0.82**	0.82**	0.82**	0.82**
		0.76–0.88	0.76–0.88	0.76–0.88	0.75–0.89	0.75–0.89	0.75–0.89

$p < 0.05$, $^{**}p < 0.01$; OR odds ratio; CI confidence interval; § restricted to population with 1-plus children/sons/daughters.

Table 5
Ordinal regression of self-rated health and family structure (number of sons, daughters and marital status) in India's older population 1995-96 - 2014, by gender

OR 95% CI		Model 1			Model 2		
		Women	**Men**	**Total**	**Women**	**Men**	**Total**
Age (years)	**60–64**	1	1	1	1	1	1
	65–69	1.39**	1.39**	1.39**	1.41**	1.41**	1.41**
		1.28–1.51	1.28–1.51	1.28–1.51	1.30–1.53	1.30–1.53	1.30–1.53
	70–74	2.23**	2.23**	2.23**	2.27**	2.27**	2.27**
		2.03–2.45	2.03–2.45	2.03–2.44	2.07–2.50	2.07–2.50	2.07–2.49
	75–79	2.92**	2.92**	2.92**	3.05**	3.05**	3.05**
		2.57–3.32	2.57–3.32	2.56–3.32	2.69–3.47	2.69–3.47	2.68–3.47
	80+	4.69**	4.69**	4.70**	4.99**	4.99**	4.99**
		4.18–5.27	4.18–5.27	4.18–5.28	4.44–5.62	4.44–5.62	4.44–5.62
Male				0.77**			0.82**
				0.73–0.82			0.77–0.88
Education	**Below primary**				1	1	1
	Primary				0.81**	0.81**	0.81**
					0.71–0.93	0.71–0.93	0.71–0.93
	Middle to secondary				0.67**	0.67**	0.67**
					0.60–0.74	0.60–0.74	0.60–0.74
	Above secondary				0.49**	0.49**	0.49**
					0.40–0.60	0.40–0.60	0.40–0.60
Quintile of socioeconomic status	**1 - lowest**				1	1	1
	2				0.91	0.91	0.91
					0.83–1.01	0.83–1.01	0.83–1.01
	3				0.83**	0.83**	0.83**
					0.74–0.93	0.74–0.93	0.74–0.93
	4				0.81**	0.81**	0.81**
					0.73–0.91	0.73–0.91	0.73–0.91
	5 - highest				0.78**	0.78**	0.78**
					0.69–0.87	0.69–0.87	0.69–0.87
Living arrangements	**Alone**				0.81*	0.81*	0.81*
					0.68–0.97	0.67–0.96	0.67–0.96
	Spouse only				1.12	1.13	1.13
					0.99–1.28	1.00–1.28	1.00–1.28
	Children and grandchildren				1	1	1
	Children				0.90*	0.90*	0.90*
					0.82–0.98	0.82–0.98	0.82–0.98
	Others				0.86*	0.86*	0.86*
					0.75–1.00	0.75–1.00	0.75–1.00
Year	**1995–96**				1	1	1
	2004				1.51**	1.51**	1.51**
					1.39–1.63	1.39–1.63	1.39–1.63
	2014				1.42**	1.42**	1.42**
					1.29–1.57	1.29–1.57	1.29–1.57
Region	**South**				1	1	1
	West				0.58**	0.58**	0.58**
					0.51–0.65	0.51–0.65	0.51–0.65
	Central				1.03	1.03	1.03
					0.92–1.15	0.93–1.15	0.93–1.15
	East/North east				1.35**	1.35**	1.35**
					1.20–1.50	1.21–1.51	1.21–1.51
	North				0.76**	0.76**	0.76**
					0.67–0.87	0.67–0.87	0.67–0.87

(*continued on next page*)

Table 5 (*continued*)

OR 95% CI		Model 1			Model 2		
		Women	**Men**	**Total**	**Women**	**Men**	**Total**
No. of sons	**0**	1.05	1.25*	1.13	1.10	1.20	1.15
		0.86–1.28	1.01–1.54	0.97–1.32	0.90–1.36	0.96–1.50	0.97–1.35
	1	1	1	1	1	1	1
	2	0.98	1.09	1.03	0.99	1.07	1.03
		0.87–1.10	0.97–1.23	0.94–1.13	0.88–1.12	0.95–1.21	0.94–1.13
	3	0.96	1.03	0.99	0.94	0.98	0.96
		0.84–1.09	0.90–1.19	0.89–1.10	0.82–1.07	0.85–1.13	0.86–1.07
	4	1.19*	1.09	1.14	1.18*	1.02	1.10
		1.01–1.40	0.90–1.33	0.99–1.31	1.00–1.38	0.83–1.25	0.95–1.26
	5+	1.14	1.17	1.15	1.15	1.11	1.13
		0.92–1.40	0.95–1.44	0.98–1.35	0.94–1.42	0.90–1.38	0.96–1.34
	Linear test for trend §	1.03	1.03	1.03	1.03	1.01	1.02
		0.99–1.08	0.98–1.07	1.00–1.06	0.99–1.08	0.96–1.05	0.99–1.06
No. of daughters	**0**	1.02	1.04	1.03	1.01	1.03	1.02
		0.87–1.20	0.88–1.24	0.91–1.18	0.85–1.19	0.86–1.22	0.89–1.16
	1	1	1	1	1	1	1
	2	1.14*	1.16**	1.15**	1.14*	1.14*	1.14**
		1.01–1.29	1.03–1.31	1.05–1.26	1.01–1.29	1.01–1.28	1.04–1.25
	3	1.04	1.12	1.08	1.05	1.09	1.07
		0.90–1.20	0.96–1.30	0.96–1.20	0.91–1.21	0.94–1.27	0.95–1.20
	4	1.16	1.30	1.22**	1.16	1.26*	1.20**
		0.98–1.37	1.05–1.61	1.07–1.39	0.97–1.37	1.03–1.55	1.06–1.37
	5+	1.15	1.21	1.18*	1.17	1.18	1.17*
		0.94–1.41	0.98–1.49	1.01–1.38	0.95–1.43	0.95–1.46	1.00–1.37
	Linear test for trend §	1.03	1.06**	1.05**	1.04	1.06*	1.05*
		0.99–1.07	1.02–1.11	1.02–1.08	1.00–1.08	1.01–1.11	1.02–1.08
Marital status	**Married**	0.84**	0.79**	0.82**	0.84**	0.80**	0.82**
		0.77–0.92	0.70–0.89	0.76–0.89	0.76–0.93	0.71–0.90	0.76–0.90

$p < 0.05$, $^{**}p < 0.01$; OR odds ratio; CI confidence interval; § restricted to population with 1-plus children/sons/daughters.

Table 6
Ordinal regression of self-rated health and child composition in India's older population 1995-96-2014, by gender

OR 95% CI		Model 1			Model 2		
		Women	**Men**	**Total**	**Women**	**Men**	**Total**
Child composition	0 children	1.22	1.24	1.23	1.31	1.12	1.23
		0.89–1.67	0.87–1.75	0.96–1.56	0.93–1.85	0.78–1.59	0.95–1.59
	1 S 0 D	1.04	1.37	1.17	1.00	1.29	1.12
		0.78–1.39	0.98–1.92	0.92–1.49	0.75–1.33	0.92–1.80	0.88–1.42
	1 S 1 D	1	1	1	1	1	1
	1 S 2 D	1.35*	1.23	1.30**	1.34*	1.20	1.28**
		1.07–1.72	1.00–1.53	1.09–1.54	1.06–1.69	0.98–1.49	1.08–1.51
	1 S 3 D	1.16	1.11	1.14	1.17	1.08	1.12
		0.86–1.57	0.82–1.52	0.90–1.45	0.86–1.58	0.79–1.47	0.88–1.43
	1 S 4 D	1.47*	1.29	1.38**	1.50*	1.24	1.37**
		1.08–1.99	0.94–1.77	1.10–1.74	1.10–2.03	0.90–1.71	1.09–1.73
	1 S 5 D	1.48	1.32	1.40*	1.46	1.25	1.36
		0.95–2.30	0.90–1.92	1.02–1.92	0.93–2.31	0.86–1.82	0.99–1.87
	2 S 0 D	1.03	0.94	0.98	1.02	0.93	0.97
		0.73–1.46	0.69–1.28	0.76–1.26	0.72–1.45	0.68–1.27	0.75–1.26
	2 S 1 D	1.18	1.31*	1.25**	1.19	1.28*	1.24**
		0.96–1.46	1.06–1.62	1.06–1.46	0.96–1.47	1.04–1.57	1.05–1.45
	2 S 2 D	1.15	1.26*	1.20*	1.17	1.20	1.19*
		0.94–1.41	1.04–1.54	1.03–1.40	0.95–1.44	0.98–1.47	1.02–1.38
	2 S 3 D	1.13	1.20	1.16	1.13	1.14	1.13
		0.91–1.41	0.95–1.52	0.98–1.39	0.90–1.40	0.89–1.44	0.95–1.35
	2 S 4 D	1.17	1.39	1.27	1.16	1.30	1.22
		0.83–1.65	1.00–1.93	0.98–1.63	0.83–1.63	0.93–1.80	0.95–1.58
	3 S 0 D	1.23	1.13	1.17	1.23	1.10	1.16
		0.84–1.80	0.81–1.58	0.88–1.56	0.83–1.83	0.78–1.54	0.86–1.56
	3 S 1 D	1.06	0.90	0.97	1.03	0.85	0.93
		0.82–1.36	0.69–1.17	0.79–1.20	0.79–1.33	0.65–1.10	0.75–1.15
	3 S 2 D	1.24	1.32*	1.28**	1.19	1.21	1.20*
		1.00–1.54	1.05–1.66	1.08–1.51	0.96–1.47	0.96–1.52	1.01–1.42
	3 S 3 D	1.07	1.37*	1.21	1.07	1.28	1.17
		0.81–1.41	1.06–1.77	0.99–1.47	0.81–1.43	0.99–1.66	0.95–1.44
	4 S 0 D	2.09**	1.29	1.67	1.98*	1.26	1.61
		1.20–3.62	0.46–3.57	0.90–3.10	1.14–3.45	0.49–3.26	0.89–2.91
	4 S 1 D	1.27	0.94	1.09	1.23	0.83	1.02
		0.91–1.75	0.64–1.39	0.83–1.43	0.89–1.70	0.56–1.25	0.77–1.34
	4 S 2 D	1.58**	1.47**	1.52**	1.56**	1.33	1.44**
		1.18–2.12	1.11–1.95	1.21–1.93	1.16–2.10	1.00–1.77	1.14–1.83
	5 S 0 D						

(*continued on next page*)

Table 6 (*continued*)

		1.07	1.73*	1.36	1.00	1.40	1.19
		0.61–1.90	1.01–2.97	0.91–2.03	0.54–1.85	0.70–2.80	0.74–1.90
	5 S 1 D	1.44	1.11	1.28	1.43	1.03	1.23
		0.94–2.22	0.71–1.73	0.88–1.86	0.92–2.21	0.65–1.63	0.84–1.80
	6 S 0 D	–	–	–	–	–	–
	0 S 1 D	1.08	1.73*	1.31*	1.10	1.65*	1.29
		0.78–1.51	1.13–2.65	1.00–1.71	0.78–1.55	1.03–2.65	0.97–1.72
	0 S 2 D	1.17	1.18	1.18	1.21	1.16	1.19
		0.76–1.82	0.78–1.79	0.84–1.65	0.77–1.90	0.77–1.76	0.85–1.67
	0 S 3 D	1.47	1.41	1.44	1.54	1.38	1.46
		0.87–2.48	0.77–2.61	0.96–2.17	0.93–2.55	0.75–2.53	0.98–2.18
	0 S 4 D	1.21	2.19	1.69	1.28	2.10	1.70
		0.57–2.57	0.96–4.97	0.93–3.05	0.60–2.74	0.97–4.52	0.97–3.00
	0 S 5 D	1.97	1.56	1.74*	1.87	1.22	1.50
		0.95–4.08	0.84–2.88	1.01–3.01	0.95–3.70	0.66–2.26	0.90–2.49
	0 S 6 D	–	–	–	–	–	–
	7+ children	1.24*	1.46**	1.34**	1.23*	1.35**	1.29**
		1.02–1.50	1.18–1.80	1.15–1.55	1.02–1.50	1.10–1.67	1.11–1.49

Model 1 controls for age, gender and marital status, model 2 additionally controls for education, socioeconomic status, living arrangement, region and survey year; *p $<$ 0.05, **p $<$ 0.01; OR odds ratio; CI confidence interval; S son; D daughter; - no data.

Table 7
Ordinal regression of functional health and family structure in India's older population 1995-96 – 2014, by gender

OR 95% CI		Model 1			Model 2		
		Women	**Men**	**Total**	**Women**	**Men**	**Total**
No. of children	**0**	1.59	0.74	1.30	1.86*	0.77	1.44
		0.91–2.79	0.46–1.19	0.83–2.03	1.06–3.24	0.48–1.25	0.93–2.25
	1	1.00	1.02	1.01	0.98	0.99	0.99
		0.70–1.42	0.61–1.72	0.75–1.37	0.69–1.40	0.59–1.67	0.73–1.34
	2	1	1	1	1	1	1
	3	1.12	1.32	1.19	1.08	1.26	1.15
		0.86–1.46	0.97–1.78	0.97–1.47	0.83–1.41	0.93–1.71	0.93–1.42
	4	1.17	1.23	1.19	1.14	1.15	1.14
		0.91–1.51	0.90–1.68	0.98–1.45	0.88–1.47	0.84–1.57	0.94–1.39
	5	1.13	1.43*	1.24*	1.07	1.29	1.16
		0.87–1.47	1.06–1.91	1.02–1.52	0.81–1.39	0.96–1.74	0.94–1.42
	6	1.33	1.43*	1.36*	1.26	1.29	1.27
		1.00–1.77	1.00–2.04	1.07–1.73	0.94–1.68	0.90–1.83	0.99–1.61
	7	1.09	1.28	1.16	1.01	1.12	1.06
		0.79–1.50	0.90–1.82	0.90–1.49	0.73–1.40	0.80–1.59	0.82–1.36
	8+	1.11	1.56*	1.29	1.04	1.38	1.18
		0.78–1.59	1.09–2.23	0.99–1.67	0.72–1.51	0.96–1.98	0.90–1.54
	Linear test for trend §	1.02	1.06**	1.04*	1.01	1.04*	1.02
		0.98–1.05	1.02–1.11	1.01–1.07	0.97–1.04	1.00–1.09	0.99–1.05
No. of sons	**0**	1.20	1.11	1.17	1.28	1.16	1.24
		0.89–1.61	0.77–1.60	0.92–1.50	0.95–1.73	0.80–1.67	0.97–1.59
	1	1	1	1	1	1	1
	2	1.04	1.18	1.09	1.04	1.16	1.09
		0.88–1.24	0.96–1.45	0.95–1.26	0.87–1.24	0.95–1.43	0.94–1.25
	3	1.12	1.19	1.14	1.09	1.13	1.10
		0.91–1.36	0.96–1.47	0.97–1.33	0.89–1.34	0.91–1.39	0.94–1.28
	4	1.00	1.27	1.10	0.97	1.19	1.06
		0.79–1.27	0.96–1.69	0.90–1.35	0.77–1.24	0.90–1.58	0.86–1.30
	5+	1.22	1.10	1.16	1.18	1.03	1.11
		0.88–1.69	0.83–1.47	0.92–1.47	0.84–1.65	0.77–1.38	0.87–1.41
	Linear test for trend §	1.03	1.05	1.04	1.02	1.03	1.02
		0.97–1.10	0.99–1.11	0.99–1.09	0.96–1.09	0.97–1.09	0.98–1.07
No. of daughters	**0**	0.93	0.63**	0.81*	0.97	0.65*	0.84
		0.71–1.20	0.45–0.88	0.66–0.99	0.74–1.25	0.47–0.91	0.68–1.03
	1	1	1	1	1	1	1
	2	1.05	0.89	0.98	1.03	0.86	0.96
		0.87–1.26	0.74–1.08	0.85–1.13	0.86–1.24	0.71–1.03	0.83–1.10
	3	0.91	1.09	0.99	0.90	1.05	0.96
		0.73–1.14	0.86–1.39	0.83–1.17	0.72–1.12	0.82–1.33	0.81–1.14
	4	1.05	1.13	1.08	1.03	1.07	1.05
		0.80–1.38	0.84–1.53	0.87–1.35	0.78–1.36	0.80–1.44	0.84–1.30
	5+	1.05	1.08	1.06	1.02	1.02	1.02
		0.78–1.40	0.78–1.49	0.84–1.33	0.76–1.37	0.73–1.41	0.81–1.28
	Linear test for trend §	1.00	1.04	1.02	0.99	1.02	1.01
		0.94–1.06	0.97–1.11	0.97–1.07	0.93–1.06	0.96–1.10	0.96–1.05
Marital status	**Married**	0.70**	0.73**	0.71**	0.72**	0.75**	0.73**
		0.60–0.81	0.62–0.86	0.63–0.80	0.61–0.85	0.63–0.89	0.64–0.84

Number of children modelled separately to number of sons and daughters; model 1 controls for age, gender and marital status, model 2 additionally controls for education, socioeconomic status, living arrangement, region and survey year; *p < 0.05, **p < 0.01; OR odds ratio; CI confidence interval; § restricted to population with 1-plus children/sons/daughters.

References

Agarwal, B. (1998). Widows versus daughters or widows as daughters? Property, land, and economic security in rural India. *Modern Asian Studies, 32*(1), 1–48. https://doi.org/10.1017/S0026749X98002935.

Allendorf, K. (2012). Like daughter, like son? Fertility decline and the transformation of gender systems in the family. *Demographic Research, 27*, 429–454. https://doi.org/10.4054/DemRes.2012.27.16.

Bago d'Uva, T, O'Donnell, O, & van Doorslaer, Eddy (2008). Differential health reporting by education level and its impact on the measurement of health inequalities among older Europeans. *International Journal of Epidemiology*.

Bailey, A., Hallad, J. S., & James, K. S. (2014). *Health status, care giving and receiving among elderly with migrant children* (New De).

Barclay, K., et al. (2016). Reproductive history and post-reproductive mortality: A sibling comparison analysis using Swedish register data. *Social Science & Medicine, 155*, 82–92. https://doi.org/10.1016/j.socscimed.2016.02.043.

Beeton, M., Yule, G., & Pearson, K. (1900). Data for the problem of evolution man. V. On the correlation between duration of life and the number of offspring'. *Royal Society Proceedings, 67*, 159–179.

Berkman, L. F., et al. (2000). From social integration to health: Durkheim in the new millennium. *Social Science & Medicine, 51*(6), 843–857. https://doi.org/10.1016/S0277-9536(00)00065-4.

Bloom, D. E., & Reddy, P. H. (1986). Age patterns of women at marriage, cohabitation, and first birth in India. *Demography, 23*(4), 509. https://doi.org/10.2307/2061348.

Brijnath, B. (2012). Why does institutionalised care not appeal to Indian families? Legislative and social answers from urban India. *Ageing and Society, 32*(4), 697–717. https://doi.org/10.1017/S0144686X11000584.

Cain, M. (1986). The consequences of reproductive failure: Dependence, mobility, and mortality among the elderly of rural South Asia. *Population Studies, 40*(3), 375–388. https://doi.org/10.1080/0032472031000142306.

Carr, D., & Utz, R. L. (2020). Families in later life: A decade in review. *Journal of Marriage and Family, 82*(1), 346–363. https://doi.org/10.1111/jomf.12609.

Chao, F., et al. (2019). Systematic assessment of the sex ratio at birth for all countries and estimation of national imbalances and regional reference levels. *Proceedings of the National Academy of Sciences, 116*(19), 201812593. https://doi.org/10.1073/pnas.1812593116.

Chen, M., & Dreze, J. (1992). 'Widows and health in rural north India', *Economic and political weekly. Economic and Political Weekly, 27*(43/44), WS81–WS92. Available at: http://www.jstor.org/stable/4399061.

Cohen, L. (1998). Knowledge, practice, and the bad family. In *No aging in India: Alzheimer's, the bad family, and other modern things*.

Cullati, S., et al. (2018). Is the single self-rated health item reliable in India? A construct validity study. *BMJ Global Health, 3*(6), e000856. https://doi.org/10.1136/bmjgh-2018-000856.

Dandona, L., et al. (2017). *Nations within a nation: Variations in epidemiological transition across the states of India, 1990-2016 in the global burden of disease study', the lancet* (Vol. 390, pp. 2437–2460). United Kingdom: Lancet Publishing Group (E-mail: cususerv@lancet.com). https://doi.org/10.1016/S0140-6736%2817%2932804-0, 10111.

Das, K., & Das, K. C. (2013). *Levels , trends and patterns of age difference among the couples in India*. Busan: IUSSP.

Deaton, A. (2018). *The analysis of household surveys: A microeconometric approach to development policy*. Reissue Edition with a New Preface. https://doi.org/10.1596/0-8018-5254-4.

Desai, S. (2005). *Gender and family dynamics*. IHDS.

Dey, A. B. (2016). Long-term Care for older Persons in India. Bangkok. Available at: http://www.unescap.org/resources/long-term-care-older-persons-china.

Dhillon, P., & Ladusingh, L. (2013). Working life gain from gain in old age life expectancy in India. *Demographic Research, 28*(April), 733–762. https://doi.org/10.4054/DemRes.2013.28.26.

Diamond-Smith, N., Luke, N., & McGarvey, S. (2008). '"Too many girls, too much dowry": Son preference and daughter aversion in rural Tamil Nadu, India'. *Culture, Health and Sexuality, 10*(7), 697–708. https://doi.org/10.1080/13691050802061665.

Dribe, M. (2006). 'Long-term effects of childbearing on mortality : Evidence from pre-industrial Sweden'. *Demography*, 4728. https://doi.org/10.1080/00324720420002723 57.

Dyson, T., & Moore, M. (1983). On kinship structure , female autonomy , and demographic behavior in India. *Population and Development Revie, 9*(1), 35–60. https://doi.org/10.1016/S0140-6736(10)61894-6.Health.

Engelman, M., et al. (2010). *'Parity and parents ' health in later life : The gendered case of Ismailia*. https://doi.org/10.1080/00324721003660511. Egypt', (June 2015).

Grundy, E., & Read, S. (2012). Social contacts and receipt of help among older people in England. *Are There Benefits of Having More Children?, 67*, 742–754. https://doi.org/10.1093/geronb/gbs082.

Gupta, R. (2009). Systems perspective: Understanding care giving of the elderly in India. *Health Care for Women International, 30*(12), 1040–1054. https://doi.org/10.1080/07399330903199334.

Gupta, R., Pillai, V. K., & Levy, E. (2012). Relationship quality and elder caregiver burden in India. *Journal of Social Intervention: Theory and Practice, 21*(2), 39–62. Available at: http://dspace.uta.edu/handle/10106/11001.

Hass, Z., et al. (2017). Unmet need for help with activities of daily living disabilities and emergency department admissions among older medicare recipients. *The Gerontologist, 57*(2), 206–210. https://doi.org/10.1093/geront/gnv142.

He, S., et al. (2015). Unmet need for ADL assistance is associated with mortality among older adults with mild disability. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences, 70*(9), 1128–1132. https://doi.org/10.1093/gerona/glv028.

HelpAge. (2014). *State of the elderly in India. 2014*.

Hirve, S., et al. (2012). Does self-rated health predict death in adults aged 50 years and above in India? Evidence from a rural population under health and demographic surveillance. *International Journal of Epidemiology, 41*(6), 1719–1727. https://doi.org/10.1093/ije/dys163.

Högnäs, R. S., et al. (2017). *J-curve? A meta-analysis and meta-regression of parity and parental mortality', population research and policy review* (Vol. 36, pp. 273–308). Springer Netherlands. https://doi.org/10.1007/s11113-016-9421-1, 2.

Hurt, L. S., et al. (2004). Long-term effects of reproductive history on all-cause mortality among adults in rural Bangladesh. *Studies in Family Planning, 35*(3), 189–196. Available at: http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emed6&NEWS=N&AN=15511062.

Hurt, L. S., Ronsmans, C., & Thomas, S. L. (2006). 'The effect of number of births on women's mortality: Systematic review of the evidence for women who have completed their childbearing'. *Population Studies, 60*(1), 55–71. https://doi.org/10.1080/00324720500436011.

IIPS. (2007). *National family health survey (NFHS-3), 2005–06: India: Volume I. [Dataset] IAIR52FL.DTA'*. Mumbai: International Institute for Population Sciences (IIPS) and Macro International.

International Labour Office. (2018). *Women and men in the informal economy: A statistical picture* (3rd ed.).

Jeyalakshmi, S., Chakrabarti, S., & Gupta, N. (2011). *Situation analysis of the elderly in India* (June). Central Statistics Office Ministry of Statistics & Programme Implementation Government of India. Available at: http://mospi.nic.in/mospi_new/upload/elderly_in_india.pdf.

Kalavar, J. M., & Jamuna, D. (2011). Aging of Indian women in India: The experience of older women in formal care homes. *Journal of Women & Aging, 23*(3), 203–215. https://doi.org/10.1080/08952841.2011.587730.

Kirkwood, T B L, & Rose, M R (1991). Evolution of senescence: late survival sacrificed for reproduction. *Philosophic Transactions of the Royal Society B - Biological Sciences*.

Korn, E. L., & Graubard, B. (1999). Analyses using multiple surveys. In *Analysis of health surveys*. New York: Wiley.

Kumari Bhat, A., & Dhruvarajan, R. A. J. (2002), 02/15. *Ageing in India: Drifting intergenerational relations, challenges and options', ageing and society* (Vol. 21, pp. 621–640). Cambridge University Press. https://doi.org/10.1017/S0144686X0100842X, 5.

Lamb, S. (2000). Conflicting generations: Unreciprocated houseflows in a modern society. In *White saris and sweet mangoes: Aging, gender, and body in north India*.

Manzoli, L., et al. (2007). Marital status and mortality in the elderly: A systematic review and meta-analysis. *Social Science & Medicine, 64*(1), 77–94. https://doi.org/10.1016/j.socscimed.2006.08.031.

Mari Bhat, P. N., & Zavier, F. (1999). Findings of national family health survey regional analysis. *Economic and Political Weekly, 34*(42/43), 3008–3032.

Momtaz, Y. A., Hamid, T. A., & Ibrahim, R. (2012). Unmet needs among disabled elderly Malaysians. *Social Science & Medicine, 75*(5), 859–863. https://doi.org/10.1016/j.socscimed.2012.03.047.

MOSPI. (2016). *Elderly in India*.

Parmar, M. C., & Saikia, N. (2018). 'Chronic morbidity and reported disability among older persons from the India Human Development Survey', *BMC Geriatrics. BMC Geriatrics, 18*(1), 1–12. https://doi.org/10.1186/s12877-018-0979-9.

Perkins, J. M., et al. (2016). Marital status, widowhood duration, gender and health outcomes: A cross-sectional study among older adults in India. *BMC Public Health. United Kingdom, 16*(1), 1032. Available at: http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emexa&NEWS=N&AN=616860184.

Prince, M., et al. (2004). Care arrangements for people with dementia in developing countries. *International Journal of Geriatric Psychiatry, 19*(2), 170–177. https://doi.org/10.1002/gps.1046. Available at: https://search.crossref.org/?q=Care+arrangements+for+people+with+dementia+in+developing+countries.

Rahman, M. O. (2000). The impact of co-resident spouses and sons on elderly mortality in rural Bangladesh. *Journal of Biosocial Science. London School of Hygiene & Tropical Medicine, 32*(1), 89–98. https://doi.org/10.1017/S0021932000000894.

Rajan, I. S., & Mishra, U. S. (2011). *The national policy for older persons: Critical issues in implementation* (New Delhi).

Registrar General, & Census Commissioner. (2010). *Abridged life tables- 2010-14*.

Registrar General, & Census Commissioner of India, G. of I.. (2016). *SRS report 2016*.

Rele, J. R. (1987). Fertility levels and trends in India. *Population and Development Review, 13*(3), 513–530.

Sengupta, M., & Agree, E. M. (2002). Gender and Disability among older adults in North and South India: Difference associated with coresidence and marriage. *Journal of Cross Cultural Gerontology, 17*, 313–336.

Sen, A (2002). Health: perception versus information. *BMJ*.
Sengupta, B. M., & Agree, E. M. (2003). Gender , health , marriage and mobility difficulty among older adults in India. *Asia-Pacific Population Journal, 18*(4), 53–65.
StataCorp. (2017). *Stata statistical software: Release 15*.
Stewart Williams, J., Norström, F., & Ng, N. (2017). 'Disability and ageing in China and India – decomposing the effects of gender and residence. Results from the WHO study on global AGEing and adult health (SAGE)', *BMC Geriatrics*. *BMC Geriatrics, 17* (1), 197. https://doi.org/10.1186/s12877-017-0589-y.
Sudha, S., et al. (2006). Marital status , family ties , and self-rated health among elders in south India. *Journal of Cross-Cultural Gerontology*. https://doi.org/10.1007/s10823-006-9027-x. December.
Ugargol, A. P., & Bailey, A. (2018). *'Family caregiving for older adults: Gendered roles and caregiver burden in emigrant households of Kerala, India', asian population studies* (Vol. 14, pp. 194–210). Taylor & Francis. https://doi.org/10.1080/17441730.2017.1412593, 2.
UNFPA. (2012). Report on the status of elderly in select states of India, 2011. Available at: http://www.isec.ac.in/AgeingReport_28Nov2012_LowRes-1.pdf.
United Nations. (2013). *World population prospects: The 2012 revision*. New York: Department of Economic and Social Affairs, Population Division.
Vera-Sanso, P. (2004). '"They don't need it, and I can't give it": Filial support in South India'. In P. Kreager, & E. Schroder-Butterfill (Eds.), *Ageing without children. European and Asian perspectives*. UK: Berghan Books.
Vlassoff, C. (1990). The value of sons in an Indian village: How widows see it. *Population Studies, 44*(1), 5–20. https://doi.org/10.1080/0032472031000144356.
Vlassoff, M., & Vlassoff, C. (1980). Old age security and the utility of children in rural India old age security and the utility of children in rural India. *Population Studies, 34* (3), 487–499. Available at: http://www.jstor.org/stable/2174805%5Cnhttp://www.jstor.org/stable/2174805.
Williams, R. (2016). Understanding and interpreting generalized ordered logit models. *Journal of Mathematical Sociology, 40*(1), 7–20. https://doi.org/10.1080/0022250X.2015.1112384.
World Bank. No date) *consumer price index*. Available at: https://data.worldbank.org/indicator/FP.CPI.TOTL?end=2017&locations=IN&start=1960&view=chart. (Accessed 21 March 2019).
World Bank. (2019). Poverty data. Available at: http://povertydata.worldbank.org/poverty/country/IND. (Accessed 3 June 2019).
Yang, L., Martikainen, P., & Silventoinen, K. (2016). Effects of individual, spousal, and offspring socioeconomic status on mortality among elderly people in China. *Journal of Epidemiology, 26*(11), 602–609. https://doi.org/10.2188/jea.JE20150252.
Zeng, Y., et al. (2016). Parity and all-cause mortality in women and men: A dose-response meta-analysis of cohort studies. *Scientific Reports, 6*, 1–11. https://doi.org/10.1038/srep19351.
Zimmer, Z., Hermalin, A. I., & Lin, H. S. (2002). Whose education counts? The added impact of adult-child education on physical functioning of older Taiwanese. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences, 57*(1), S23–S32. https://doi.org/10.1093/geronb/57.1.S23.