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India's ageing population faces unequal future kin-based support

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Abstract

India's ageing population relies heavily on kin, but conventional ageing measures do not capture older adults' kin networks. We use demographic kinship models to estimate biological and selected affinal kin for a woman aged 65 in 17 Indian states covering 92% of the population, for rural and urban areas, from 1950 to 2100. We find between- and within-state inequalities in kin networks, similar to cross-country differences in South Asia. Kin networks become smaller and older, and working-age kin per older person (support ratio) declines faster than total kin. States reach low kin support ratios decades apart. The support ratio in urban Kerala is expected to fall below one by 2035, but Madhya Pradesh does not reach this level until 2050. Urban Madhya Pradesh is expected to have about 22 kin per woman in 2080, similar to urban Kerala in 2026. However, Madhya Pradesh is projected to have a support ratio of 0.64 in 2080, compared with 1.21 in Kerala in 2020. A male-biased sex ratio at birth associated with son preference has created a deficit in working-age daughters, reaching 10% in Punjab and Haryana around 2040 despite an assumed SRB of 1.05 after 2026. Yet having more sons than daughters does not translate proportionately into more daughters-in-law, traditionally expected to provide care. Our data show 0.6-0.7 daughters-in-law per son in urban Punjab and Kerala. These changes reshape the demographic basis of family support and highlight the need to strengthen formal care systems and redistribute support equitably across kin and genders.

Key words: Kinship, Subnational, India, Son preference, Ageing, Projection

Significance

Population ageing is typically measured through national population indicators, yet its consequences are experienced through the family networks on which older adults in India continue to rely. We show that these networks are changing unevenly across and within states. We also find that kin networks are changing not only in size, but also in their age, sex, and relationship composition. States where son preference is stronger are losing female kin faster. These findings show that population ageing can create different support pressures even among populations with similar overall kin counts. Our projections provide a more direct way to assess where family-based support may weaken first and demonstrate why ageing policy must account for subnational and gendered variation in kin networks.

Introduction

In India, the number of people aged 65 and over was 162 million in 2021, and is expected to reach 346 million by 2050 (1). Most of these older people have no or only meagre public or private pensions and no access to formal long-term care (2). Given the limited coverage of formal social protection and long-term care programs, most people in India will continue to depend heavily on kin for support in later life. The implications of population ageing cannot be assessed by examining old-age dependency ratios – i.e., the number of older people per working-age people at the population level – alone, as they also depend on how many kin older adults have, which of their kin are still alive, and whether those kin need support themselves. Having living kin does not necessarily mean that they are in a position to provide support. The potential for support may depend on the family members' ages, sex, and relationship types, which are, in turn, associated with labour force participation, co-residence patterns, and gendered norms regarding support.

Due to gendered expectations, the availability of sons, daughters, and their spouses to provide parents with support in later life is likely to differ. Our estimations based on data from the Longitudinal Ageing Study in India (LASI) 2017-2018 and the National Sample Survey (NSS) 2004-2018 show that across Indian states, around 75% to 90% of adults aged 65 and over are co-residing with a son and/or daughter-in-law, while less than 10% are co-residing with a daughter and/or son-in-law even in the absence of a son or daughter-in-law. We do not observe any decline in this co-residence pattern from 2004 to 2018 (see Appendix, Tables S5 and S6). These contemporary living arrangements indicate the importance of children and their spouses to the lives of older adults in India. Thus, to understand population ageing, we must pay attention not only to the number of surviving kin, but also to the composition of the kin network and how it varies across India.

India's persistent son preference is closely tied to patrilocal family systems in which sons are expected to remain connected to or co-reside with their parents. Daughters-in-law have traditionally played an important role as informal care providers to older adults. These norms have demographic consequences. As captured by Amartya Sen's concept of "missing women", male-biased sex ratios at birth (MBSRBs) and excess female mortality driven by son preference have produced substantial deficits of women across successive cohorts, particularly in northern states such as Punjab and Haryana (3–5). As these cohorts age, the imbalance is carried into kin networks. Fewer girls in one generation means fewer daughters in their natal families and, potentially, fewer women available to become daughters-in-law elsewhere. Thus, son preference reshapes both the sex and relationship composition of the kin networks on which older adults depend. Although we

cannot directly trace these pathways through marriage and co-residence in this study, we can estimate how a historically imbalanced sex ratio at birth (SRB) reshapes the number of working-age daughters, and we can examine whether the number of sons corresponds to the observed number of daughters-in-law.

Formal demographic kinship models make it possible to estimate the expected number and age-sex distribution of different types of biological kin (6,7). Recent global applications show that while kin networks expanded during much of the 20th century, they are now contracting and ageing in many countries (8). These studies have established the broad demographic transformation of kin networks, but their reliance on national averages obscures potentially consequential variation within country like India.

The use of national averages is based on the assumption that a country is demographically coherent enough for one number to describe it. India is not. Thus, when studying the world's most populous country, it is important to move below the national level. India's states differ in terms of fertility, mortality, and SRB by margins comparable to differences between countries. For example, Kerala reached replacement fertility in the late 1980s while Bihar remains above three births per woman today. The SRB also varies substantially across states, with particularly skewed ratios being observed in parts of northern and north-western India. Rural and urban populations within the same state also differ (9,10). Previous research has found evidence of divergence in health inequalities for several indicators across states, even though one average health outcome shows evidence of convergence (11). Fertility and mortality are likewise expected to gradually converge across states. However, because states are at different stages of the demographic transition, they are expected to experience the implications of population ageing at different times and speeds in the future (9). India is also ageing rapidly at comparatively lower levels of socioeconomic development, while substantial differences in health and socioeconomic conditions persist across states. A single national estimate can therefore mask important differences between states that are directly relevant for state-level policy planning.

Therefore, the objective of this study is to examine how demographic change is expected to reshape kin count and the demographic potential for kin-based support among older adults across Indian states over time. We estimate kin count and composition from 1950 to 2100 for a hypothetical woman we call "Focal" of a given age in 17 major Indian states, which include more than 92% of the Indian population in 2021. Focal represents an average woman of a given age in each state and the rural or urban population around whom the expected kin network is constructed.

Rural and urban areas are included separately within each state. This gives us 34 distinct subnational units for each year. In the main text we show the results for a Focal aged 65. We have chosen age 65 because it is a widely used threshold for old age in existing studies, and thus allows our results to be situated within the broader ageing literature. It is also an age at which people tend to retire from formal employment, and at which multimorbidity or associated functional limitations become increasingly prevalent in India (12). Moreover, 65 is the age at which the Focal's descending kin are likely to be entering working age. For the study of daughters-in-law, we have selected a Focal aged 75 as well to capture the completed marriage experience of sons, as a 75-year-old woman is likely to have adult children who have mostly completed the transition to marriage. The results for a Focal aged 65 to 100 are given in supplementary file A.

We use demographic kinship models that combine age-specific fertility, mortality, and SRB schedules to estimate the expected number and age-sex distribution of living kin of each kin type. The models use fertility histories to connect generations, SRB to determine their sex composition, and mortality to determine how many kin survive to each age. Together, these processes reconstruct the expected kin network of a Focal across her life course. The types of kin include mothers, grandmothers, great-grandmothers, daughters, granddaughters, great-granddaughters, siblings, cousins, uncles, aunts, nephews, and nieces. Given the uncertainty inherent in long-term demographic projections, we also assess the robustness of our results to alternative assumptions about fertility, sex ratio at birth, and internal migration. The number of daughters-in-law is estimated using the spousal co-residence rate (see the Materials & Method section). We summarize the resulting kinship structure using two measures. The “kin count” is the expected number of living kin of a given type. The “kin support ratio” is the expected number of working-age kin (aged 15 to 64) per elderly kin (aged 65+), including the Focal (aged 65). Thus, the kin count measures the size of the kin network, while the kin support ratio measures its capacity to provide support.

Materials and Methods

We have constructed demographic schedules for 17 major Indian states covering more than 92% of the Indian population in 2021, separately for rural and urban areas, from 1950 to 2100. Age-specific fertility rates, age-sex-specific survival probabilities, and the sex ratio at birth (SRB) for each state and for rural-urban areas are obtained from the Sample Registration System, while age- and sex-specific population counts are derived from the Indian censuses from 1980 to 2020. The fertility, survival, SRB, and population schedules for 2021 to 2100 have been updated and projected using the approach described in (9). For historical periods without consistent subnational data, we have reconstructed historical schedules by preserving the state-specific demographic pattern observed in 1980. For each state, rural-urban areas, age, and sex, we have calculated the ratio of the subnational value to the corresponding national value in 1980 and have applied that ratio to the national historical series from 1950 to 1979 provided by World Population Prospects 2024 (1).

Kinship model and kin support ratio measure

Study population and demographic inputs

We estimate kin count and age-sex-relationship composition for a hypothetical woman (“Focal”) of a given age in 17 major Indian states. Each state is analysed separately for rural and urban populations, yielding 34 subnational populations. Together, these states accounted for more than 92% of India’s population in 2020. Table S1 lists each state’s full name and abbreviation and its broader regional classification, following the Government of India’s Zonal Council classification (13).

We constructed annual demographic schedules for 1950-2100 for each state and rural-urban population (Table S2). Age-specific fertility rates, age- and sex-specific survival probabilities, and sex ratios at birth (SRBs) for 1980-2020 were obtained from the Sample Registration System (SRS); age- and sex-specific population counts were obtained from the Indian Population Census. For 1950-1980, we reconstructed state-specific schedules by applying the demographic pattern observed in 1980 to the corresponding national historical series from the United Nations World Population Prospects 2024 (1). For 2020-2100, schedules were updated and projected using the approach described in this paper (9). Potential daughters-in-law were estimated only for 1990-2020 because projections would require additional assumptions about marriage formation, partner matching, migration, and future marriage-market conditions.

All demographic inputs were initially available in five-year time intervals and five-year age groups. Before using the kinship model, we converted them to annual, single-age schedules. For fertility, survival, population, and SRB, values between five-year observations were linearly interpolated. Age-specific fertility rates and SRBs were assumed constant across the five single ages within each age group. Five-year survival ratios were converted to annual survival probabilities by taking the fifth root. Population counts were distributed equally across the five single ages within each age group.

Two-sex time-varying kinship model

We estimated kin counting using a two-sex, time-varying matrix kinship model that combines the formal demographic kinship framework with its extensions to two-sex and time-varying demographic rates (6,7,14). The model treats each type of kin as an age-structured population linked to the life course of a hypothetical individual, whom we call “Focal.” In this study, Focal is a woman. We focus on women because they constitute a larger share of the Indian population at older ages because of their higher survival and are an especially relevant population for examining dependence on family support in later life in India.

For each state and rural-urban area, the model estimates the expected number and age-sex distribution of Focal’s biological kin. We considered parents, grandparents, great-grandparents, children, grandchildren, great-grandchildren, older and younger siblings, nieces and nephews, older and younger aunts and uncles, and cousins. The resulting estimates are demographic expectations implied by the underlying fertility, SRB and survival schedules and should not be interpreted as observed individual family histories.

Let g index the state–area population, t calendar year, x the age of Focal, a the age of kin, and j the kin type. For each kin type, $K_{\{j,g\}(x,t)}$ represents the age-sex distribution of that kin when Focal is age x in year t . As Focal ages, existing kin can die or survive and age, while new kin may enter the network through reproduction. The general projection equation for kin of Focal can be written as:

$$K_{\{j,g\}(x+1,t+1)} = U_{\{g,t\}} K_{\{j,g\}(x,t)} + B_{\{j,g\}(x,t)}$$

Where $U_{\{g,t\}}$ is the age- and sex-specific survival matrix for population (g) in year (t), and $B_{\{j,g\}(x,t)}$ is the recruitment vector representing new kin of type (j) added during the interval.

Thus, the kin population at the next age and calendar year consists of kin who survive from the previous interval plus newly generated kin. The exact recruitment process differs by kin type. For example, children added through reproduction of Focal, grandchildren through reproduction of Focal’s children, and nieces and nephews through reproduction of Focal’s siblings. Full relationship-specific matrix equations and their derivations are described in previous work (8,14).

The model traces female and male kin through both maternal and paternal lines. Fertility, survival, and the sex ratio at birth (SRB) are allowed to vary annually by state and rural-urban area. The starting kin distributions in 1950 are initialized using demographic schedules at the beginning of the series under a stable-population assumption. From 1950 onward, demographic schedules change annually. The influence of this initialization is therefore concentrated in the earliest part of the study period and diminishes as successive cohorts experience the observed time-varying demographic schedules.

Incorporating the time varying sex ratio at birth

An important extension in our application is the explicit incorporation of time-varying and state-specific SRBs into the two-sex kinship model. Earlier national-level applications generally

assumed a constant biological SRB(8,15,16) . This assumption is less appropriate for India, where the SRB has varied substantially across calendar years, states, and rural-urban areas.

Let $SRB_{g,t}$ denote the SRB in subnational unit g and year t , expressed as the number of male births per female birth. The corresponding proportions of all births that are female and male are:

$$q_{g,t}^f = \frac{1}{1 + SRB_{g,t}}$$

$$q_{g,t}^m = \frac{SRB_{g,t}}{1 + SRB_{g,t}}$$

Where $q_{g,t}^f$ and $q_{g,t}^m$ are the proportions of births allocated to females and males, respectively.

At each step in which new kin are generated through reproduction, the total number of newborn kin implied by the relevant fertility schedule is divided into female and male newborns using these proportions. Thus, the SRB prevailing in a particular state, rural-urban area, and calendar year directly determines the sex composition of newly generated kin. These kin subsequently survive, reproduce, and generate additional kin.

Approximation of male fertility

The two-sex model requires fertility schedules for both women and men. Consistent age-specific male fertility rates are not available by state, rural-urban area, and calendar year for the full study period. We therefore derive male fertility schedules from female age-specific fertility rates.

We assume the same overall fertility level for men and women but shift the female age-specific fertility schedule five years toward older ages for men:

$$f_{(g,t)(a)}^m = f_{(g,t)(a-5)}^f$$

Where $f_{(g,t)(a)}^f$ and $f_{(g,t)(a)}^m$ denote female and male age-specific fertility rates, respectively. This procedure preserves the overall fertility level while shifting the timing of male fertility toward older ages.

The five-year shift approximates the difference in the timing of motherhood and fatherhood in India. We examined state-level spousal age differences using NFHS-5, conducted in 2020-2021. These differences generally ranged from approximately three to seven years, with most states concentrated between four and six years. Because consistent information on historical and future changes in these age differences is unavailable, we apply a uniform five-year shift across all states and rural-urban areas and hold it constant over the study period. The resulting male fertility schedules should therefore be interpreted as an approximation of the age pattern of male fertility rather than directly observed male fertility rates. This approach has been commonly used in existing literature (15,17).

Kin composition and kin support ratio

We summarize the resulting kin networks using two main measures. Kin count is the expected number of living kin of a given relationship type. It is obtained by summing the expected number of kin across ages and, where appropriate, across sex.

Our second measure captures the age composition of the kin network. We define the potential kin support ratio (KSR) as the expected number of working-age kin aged 15-64 per older kin aged 65 or above.

$$KSR_{s(x,t)} = \frac{W_{s(x,t)}}{O(x,t)}$$

where $W_{s(x,t)}$ is the expected number of working-age kin of sex s in Focal's kin network and $O(x,t)$ is the expected number of older kin aged 65 or above. Focal's spouse is not included in the measure. In India, husbands are typically older than their wives. Therefore, the spouse of a 65-year-old female Focal would also often be aged 65 or older. Including the spouse would therefore be unlikely to increase the support ratio and could lower it by adding another older person to the denominator.

We calculate the ratio separately for female and male working-age kin while using the same total number of older kin in the denominator. The potential kin support ratio is a demographic measure of the age composition of the kin network. It should not be interpreted as the number of actual caregivers, the amount of care received, or unmet care need.

Gendered and affinal kin measures

Counterfactual scenario

To quantify the demographic legacy of historically male-biased SRBs, we compare the expected number of working-age daughters under observed and counterfactual SRB schedules.

In the observed scenario, reconstructed and observed state- and residence-specific SRBs are applied from 1950 to 2026. From 2026 onward, the SRB is assumed to be 1.05 male births per female birth in all states and rural-urban areas. In the counterfactual scenario, the SRB is fixed at 1.05 throughout the entire period from 1950 to 2100. Fertility and survival schedules are identical in the two scenarios; only the SRB differs.

Let $D^{(OBS)}(x,t)$ and $D^{(CF)}(x,t)$ denote the expected numbers of working-age daughters aged 15-64 under the baseline and counterfactual scenarios, respectively. We calculate the percentage daughter deficit as:

$$D_{deficit}(x,t) = \left(\frac{D^{(CF)}(x,t) - D^{(OBS)}(x,t)}{D^{(CF)}(x,t)} \right) \times 100$$

A value of zero indicates that the baseline SRB produces the same number of working-age daughters as the counterfactual biological SRB. A positive value indicates the percentage of working-age daughters absent from Focal's kin network because of historical deviations from the biological SRB.

This counterfactual isolates the pathway operating through the SRB. It does not capture additional female deficits that may have resulted from excess female mortality associated with son preference. Moreover, the observed scenario assumes that the SRB returns to 1.05 after 2026. The estimated daughter deficit should therefore be interpreted as a conservative measure of the demographic legacy of son preference operating through male-biased SRBs.

Estimation of daughters-in-law

The formal kinship model generates biological kin but does not directly generate affinal kin. Since daughters-in-law have historically been an important relationship within patrilocal family systems in India, we estimate their number separately for the period from 1990 to 2020.

For each state, rural-urban area, calendar year, and age of Focal, we combine the model-estimated age distribution of Focal's surviving sons with the observed age-specific prevalence of co-residing spouses among men derived from the National Family Health Surveys (NFHS) from 1990 to 2020. The expected number of daughters-in-law is calculated as:

$$DIL_{g(x,t)} = \sum_a S_g(a|x, t) c_{g(a,t)}$$

where $S_g(a|x, t)$ is the expected number of Focal's surviving sons aged a , and $c_{g(a,t)}$ is the observed prevalence of a co-residing spouse among men of age a in the corresponding population and period. Thus, sons at each age are weighted by the observed probability that a man of that age has a co-residing spouse.

This measure should not be interpreted as a direct measure of the proportion of sons who marry. The absence of a co-residing spouse may reflect non-marriage, widowhood, separation, migration, or separate residence, which cannot be distinguished with our measure. We therefore interpret it as an estimate of the demographic availability of daughters-in-law under observed residence patterns.

We restrict the daughters-in-law analysis to 1990-2020 and do not project this measure into the future. Projecting affinal kin would require additional assumptions regarding future marriage formation, age at marriage, widowhood, partner matching, marriage migration, and residential arrangements.

Scenarios for sensitivity analysis

To assess the uncertainty of the projection model we conducted sensitivity analysis with the use of alternative demographic assumptions and constructed a set of scenarios in which one component of the baseline projection was modified at a time, while all other demographic inputs and model specifications were held constant as in baseline. We considered alternative assumptions for fertility, sex ratio at birth (SRB), and internal migration.

Fertility scenarios

We examined two alternative trajectories for the pace of fertility decline. In the Higher fertility scenario, fertility declines 20% slower than in the baseline projection. In the Lower fertility scenario, fertility declines 20% faster than in the baseline projection. These scenarios therefore generate, respectively, lower and higher future fertility relative to the baseline. If, under the Lower fertility scenario, a state reaches its baseline projected fertility level for 2100 before 2100, fertility is allowed to continue declining at the same scenario-specific pace through 2100.

Sex ratio at birth scenarios

Sex ratio at birth in baseline scenario is assumed to have immediate-convergence. State-specific SRBs are retained through 2026 and are set to 1.05 male births per female birth from 2027 onward. Under the Gradual-SRB scenario, state-specific SRBs are retained through 2026 and then converge progressively to 1.05 between 2026 and 2040, remaining at 1.05 thereafter. The two scenarios therefore differ only in the timing of convergence to the assumed long-run SRB.

Internal migration scenario

To assess the contribution of internal migration, we constructed a zero-migration scenario in which internal migration is set to zero throughout the projection period.

Results

We report four main findings. First, the kin count varies significantly across Indian states, and the rural-urban gap within each state is large (Figure 1). Second, many kin fall outside the working ages commonly associated with support provision, and the share of working-age kin per older adult declines over time and unevenly across states and male and female kin (Figure 2). Third, part of this decline reflects the historical son preference, which persists for decades even if we assume that the SRB converges to a “natural” value of 1.05 sons per daughter from 2026 onwards (Figure 3). Fourth, having more sons does not necessarily imply a correspondingly larger pool of daughters-in-law (Figure 4). Thus, changes in both the number and composition of close kin (sons, daughters, daughters-in-law) reduce the pool of kin who could potentially provide day-to-day support. The magnitude of this reduction differs across states and between rural and urban areas of same state, and produces largely unequal kin-based support capacity across India.

1. Kinship structures differ as much across Indian states as across countries

Figure 1 shows the average number of kin available to a Focal at age 65 in each state from 1950 to 2100. The solid black line is the total kin for an urban Focal. The red dashed line is the total kin of a rural Focal. The stacked areas show the age and sex composition of the kin of an urban Focal. The most striking finding is the inequality between states. In 2026, an urban Focal has about 17 kin in West Bengal and about 20 kin in Kerala, but about 55 kin in Bihar. Rural differences are similar in size. Thus, a woman residing in one state may have three times as many living kin as a woman of the same age who is residing in the same country with the same legal and pension systems but in another state. The magnitude of the subnational variation within India is comparable to the national-level variation across South Asia, and the rural-urban differences within the same state are of a similar magnitude (Appendix, Fig. S2). India alone spans a large part of the global range in kin counts. National averages for India therefore represent none of its states well.

Within this inequality, the shape of the trend is common to all states. Kin networks grew through the second half of the 20th century, peaked in the early 21st century, and are projected to contract thereafter. What differs is the timing and the level of the trend. Southern states like Kerala and Tamil Nadu entered the decline earliest and had some of the smallest networks by 2026. Bihar, Uttar Pradesh, Haryana and Rajasthan had larger networks for longer. Peak kin count for an urban Focal reached about 62 in Bihar around early 2000, but was only about 18 in West Bengal in the same year. By 2080, the total kin is projected to decline in every state. The gap between states with early and late transitions narrows but does not close.

An urban Focal has fewer living kin than a rural Focal in every state, but the size of this gap varies greatly. Around 2026, it is largest in West Bengal, Haryana, and Jharkhand, where a rural Focal has about 29, 23, and 21 more kin, respectively, than an urban Focal, while it is relatively small in Kerala, Punjab, and Bihar, at about 3.5 kin. The gap narrows over time as rural kin networks also contract. By 2080, the largest remaining gaps are in Jharkhand and Uttar Pradesh, at around 11 kin, while in Punjab the gap declines to only about one kin (Appendix, Fig. S3). The rural-urban gap within a state is therefore often larger than the gap between two states.

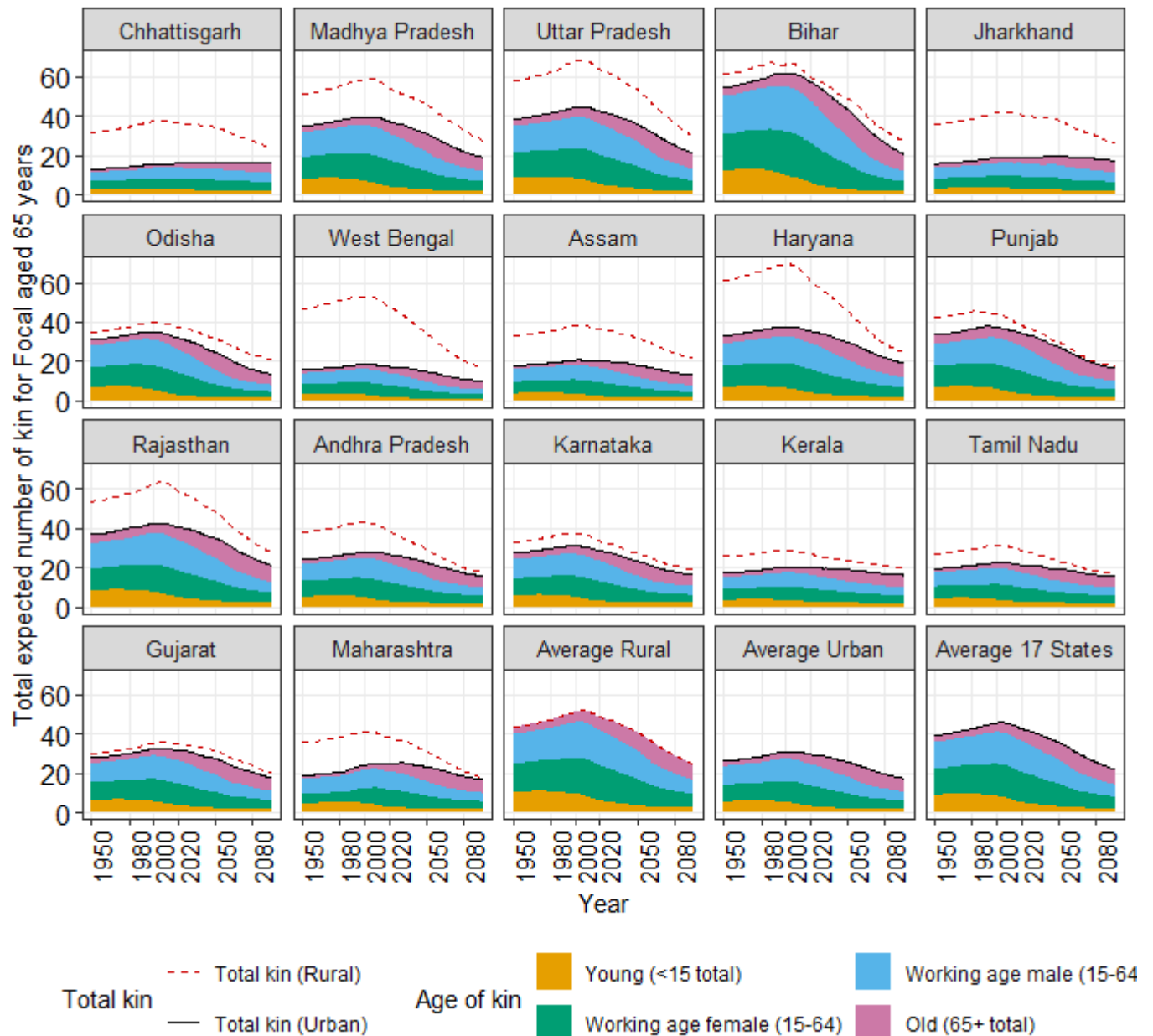


Figure 1: Total number of kin available for a Focal aged 65 in rural (shown by red dotted line) and urban (shown by dark solid line) states in India. The stacked areas show the kin composition by age and sex of kin in urban states from 1950 to 2100. States are ordered by broader region: Central (Chhattisgarh–Uttar Pradesh), Eastern (Bihar–Assam), Northern (Haryana–Rajasthan), Southern (Andhra Pradesh–Tamil Nadu), and Western (Gujarat–Maharashtra). Average Rural, Average Urban, and Average 17 States show the population-weighted mean kin counts across rural areas, urban areas, and all 17 states combined, respectively. For states affected by state reorganization, historical schedules prior to the reorganization are based on the corresponding undivided (parent) states, as separate historical schedules for the present-day state boundaries are unavailable.

2. The number of working-age kin declines faster and more unevenly by sex than the total number of kin

Figure 1 shows the total number of surviving kin available to a Focal, regardless of her age. Figure 2 adds this age dimension by showing the number of working-age kin (aged 15-64) per older person (aged 65+) in the kin network, including the Focal. The ratios are shown separately for female (red line) and male (blue line) working-age kin. A horizontal dashed line shows the value of one working-age kin per older person. A value of one means that there is, on average, one working-age kin of that sex for every older person in the kin network. We use one as a descriptive reference point rather than a threshold for adequate support, as the number of kin required to provide support depends on the Focal's care needs, the intensity and organization of care, and how the support provision is shared within the kin network. We show results for an urban Focal aged 65 in four states that illustrate the different trajectories among the 34 subnational units.

The support ratio declines substantially across all states, but the timing and pace of the decline differ. In 2026, the ratio ranges from about 1.2 working-age kin of each sex per older person in Kerala to about 1.6-1.7 in Madhya Pradesh. By 2080, the four states converge towards much lower levels, at about 0.5-0.7 working-age kin of each sex per older person. This broader convergence is also visible across the 34 subnational units. By 2080, every unit has fewer than one working-age female kin and one working-age male kin per older person (Appendix, Fig. S5). Thus, the states follow different demographic paths but increasingly converge towards a lower kin support ratio.

The timing of this transition is heterogeneous. In Kerala, which entered the fertility transition earlier, the number of working-age kin of each sex falls below one by 2035, compared with by 2040 in Haryana and by 2050 in Madhya Pradesh. Odisha also crosses this threshold by 2040, despite starting at a level similar to that in Madhya Pradesh and substantially higher than that in Haryana. The results therefore show convergence in the eventual level of the support ratio alongside substantial differences across states in when that level is reached.

The results also indicate that the number of surviving kin and their potential for providing support do not change in parallel. States may have similar numbers of kin at different points in time, but the future kin networks contain substantially lower kin support ratios. For example, in Haryana and Madhya Pradesh, an urban Focal is projected to have about 22 kin of all ages in 2080, close to the number observed in urban Kerala in 2026. Yet the support ratios in Haryana and Madhya Pradesh are projected to be only about 0.64-0.65 in 2080, compared with 1.21 in Kerala in 2026 (Appendix, Fig. S6).

The sex-specific trajectories show larger female-male gaps early in the period, which mainly reflect historically higher female mortality, together with the model's stable population assumption for the pre-1950 period. As female survival improves, these differences narrow. States with a history of stronger son preference, particularly Haryana, continue to have fewer female than male working-age kin, even though the projected SRB is the same across all states from 2026 onwards. The effect of past sex imbalances therefore persists even after the SRB is assumed to normalize. By the end of the projection period, the female and male support ratios converge, but do so at substantially lower levels.

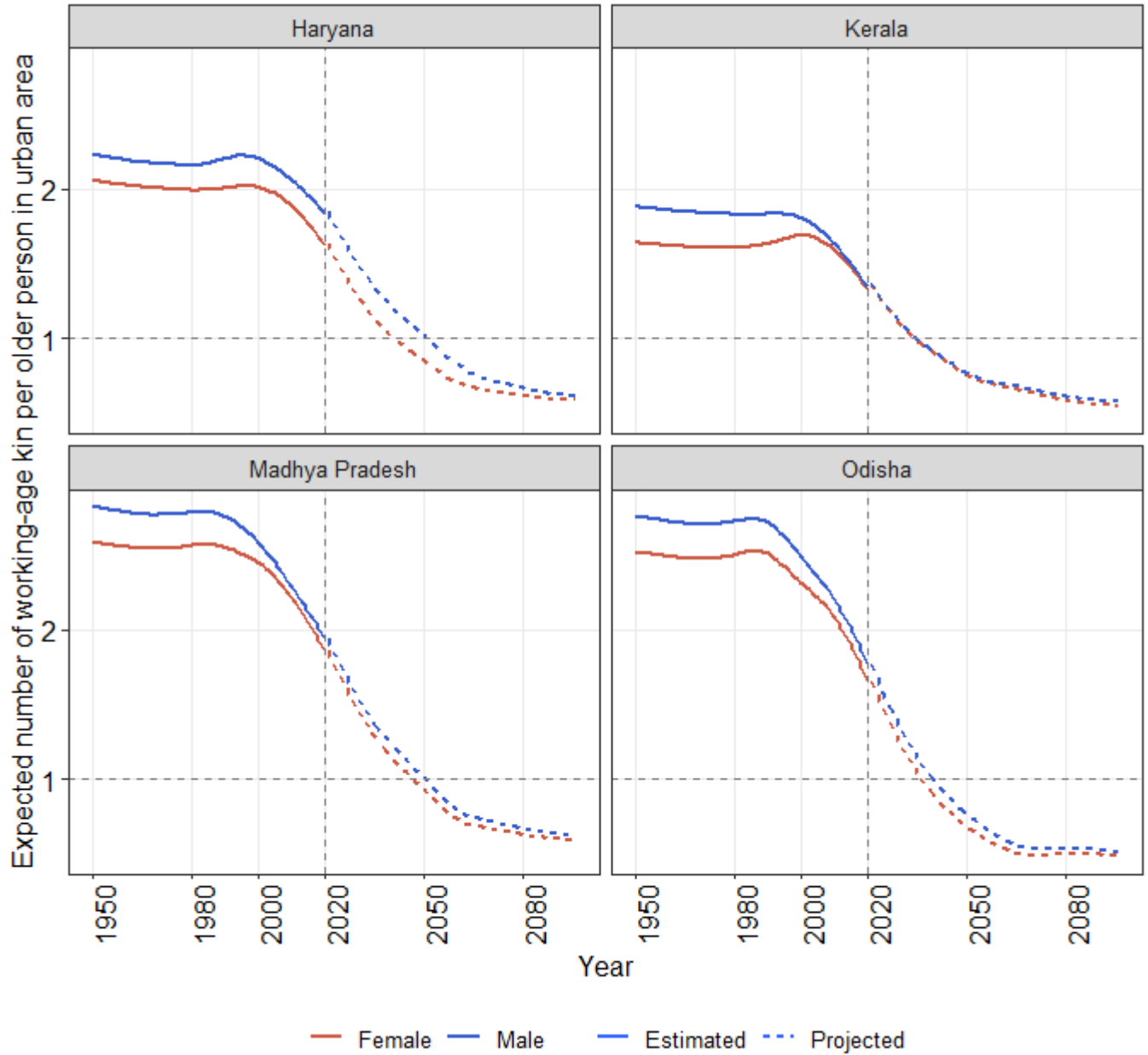


Figure 2: Expected number of working-age kin (aged 15 to 64) per elderly kin (aged 65+), by sex, in urban areas of Haryana, Kerala, Madhya Pradesh, and Odisha, 1950 to 2100. Elderly kin also include the Focal aged 65. Colour of the line indicate the sex of kin. The vertical dashed line marks 2020, the start of the projection period. The horizontal dashed line marks one working-age kin per older person.

3. Son preference accelerates the decline in working-age kin for older persons

Figure 3 examines whether the female shortfall shown in Figure 2 could reflect male-biased SRBs. It compares the observed number of working-age daughters under state-specific SRBs with a counterfactual scenario in which every state maintains a sex ratio of 1.05 male births per female birth from 1950 to 2100 to represent the absence of son preference. The difference is the percentage

of working-age daughters missing because of a MBSRB. We show urban states here as urban areas have higher MBSRBs than rural areas. The results for rural states are displayed in SI, Fig. S7.

We capture only the effect of sex selection at birth and exclude excess female child mortality driven by son preference. Thus, this is a partial measure and may underestimate the daughter deficit driven by son preference. Our “baseline” scenario assumes that the SRB returns to 1.05 after 2026. Both choices make our estimates conservative. Under a scenario with no immediate normalization the deficit would be even larger.

The deficit varies widely across states. In 2026, around 8.5% of working-age daughters are missing in Punjab and Haryana due to son preference. States across northern and western India show intermediate deficits of around 3% to 5%. Almost no missing daughters are found in eastern and southern states. The geography of the deficit follows the historical geography of son preference rather than the geography of fertility decline. The deficit does not fall once the SRB normalizes. Instead, it continues to rise. It peaks at around 2040, which is 14 years after normalization, and only then starts to decline. Punjab and Haryana have a deficit close to 10% in 2040. The deficit also rises substantially in Gujarat (7%) and Rajasthan (5%). The deficit is not expected to fall below 2% in the most affected states of Haryana and Punjab until 2065, almost two decades after the SRB normalizes (Appendix, Fig. S7). Therefore, in our scenario-based analysis, a reduction of the male-biased SRB has no immediate effect on the supply of adult daughters for two decades, and no full effect for four decades. The declining support ratio in Figure 2 is thus a consequence not only of fertility decline and ageing, but also of historical trends of son preference.

Figures 1 to 3 show the surviving biological kin, representing a potential pool of support who may be mobilized when needed, rather than the kin available for everyday support. In India, later-life support is organized primarily by adult children, particularly sons, the wives of sons, and daughters. Within patrilocal households, daughters-in-law often perform much of the routine and personal care of older parents, thereby enabling sons to fulfil culturally prescribed filial obligations (13,14). One of the reasons for son preference is this expectation of receiving care from daughters-in-law. We therefore examine in Figure 4 whether having more sons translates into having a greater number of daughters-in-law.

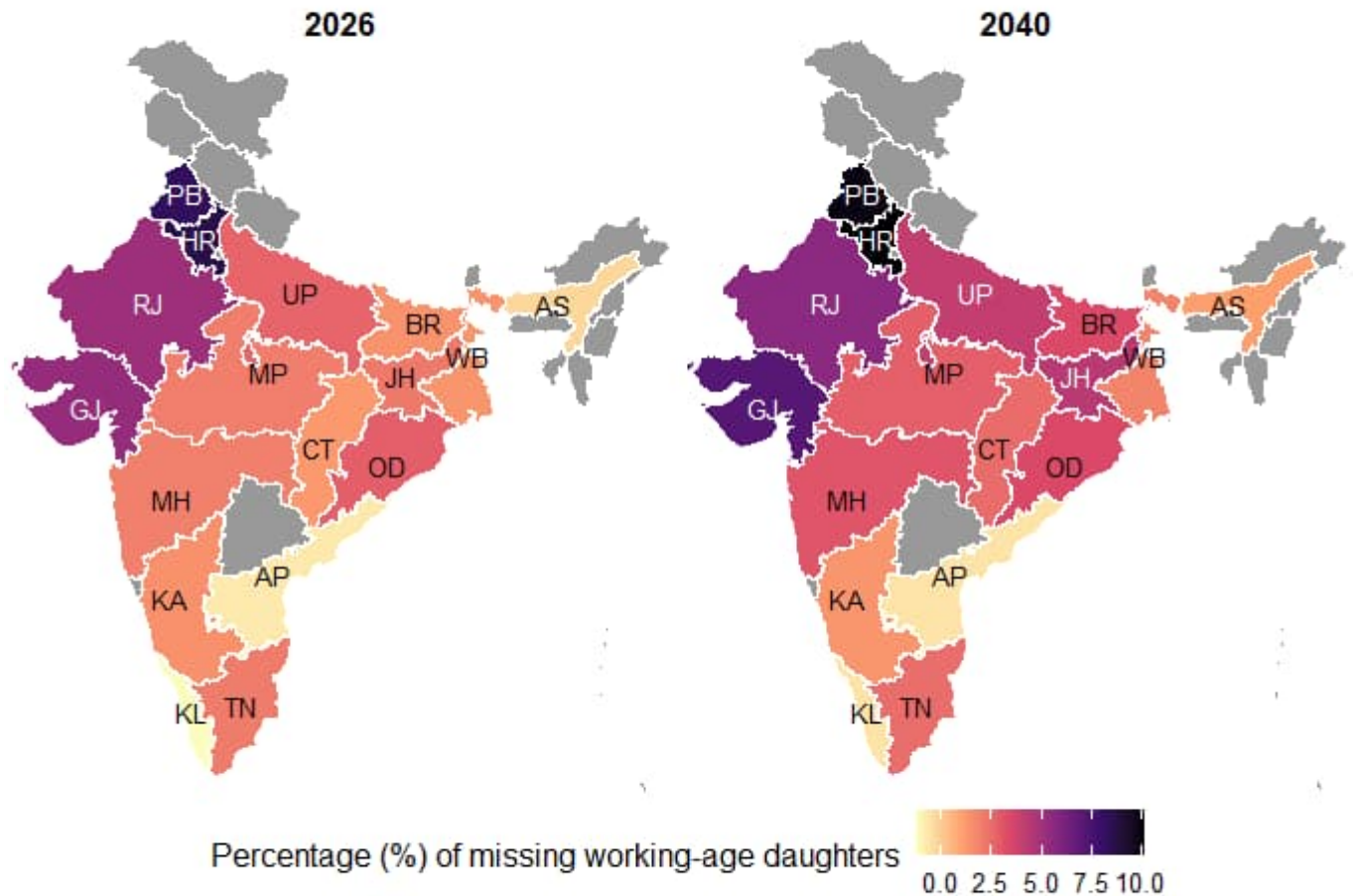


Figure 3: Percentage of working-age daughters of an urban Focal aged 65 missing under the baseline sex ratio at birth relative to the counterfactual scenario, in 2026 and 2040. The baseline scenario applies state-specific sex ratios at birth from 1950 to 2026 and assumes a SRB of 1.05 male births per female birth thereafter. The counterfactual holds the SRB at 1.05 throughout 1950–2100. The estimated daughter deficit therefore captures the effect of male-biased SRBs alone and excludes any additional deficit associated with excess female child mortality; it should therefore be interpreted as a lower-bound estimate of the demographic effects of son preference. States shown in grey are excluded because data are unavailable. For states affected by state reorganization, historical schedules prior to the reorganization are based on the corresponding undivided (parent) states, as separate historical schedules for the present-day state boundaries are unavailable.

4. Having more sons does not necessarily translate into having a greater number of daughters-in-law for old-age support

Figure 4 extends the analysis of daughter deficits by examining whether the number of surviving sons translates into a corresponding number of daughters-in-law in urban Kerala and Punjab. The two states lie at opposite ends of the SRB-attributable daughter deficit shown in Figure 3: Punjab has a pronounced deficit, whereas Kerala has a much smaller or no deficit. Comparing these states therefore demonstrates whether historical differences in son preference are reflected in the relationship between the number of sons and the estimated number of daughters-in-law – an affinal relationship that may be important for later-life support in patrilocal family settings.

For a Focal aged 65 and aged 75, Figure 4 shows the expected numbers of sons, daughters, and daughters-in-law from 1990 to 2020. Here we show the results for an urban Focal aged 65 and aged 75 to capture the completed marriage experience of sons, as a Focal aged 75 is likely to have adult children who have mostly completed the transition to marriage. We estimate the number of sons and daughters using state-specific fertility, mortality, and SRB schedules in the kinship model. Since kinship models do not generate affinal kin directly, we estimate the number of daughters-in-law by applying survey-derived, age-specific spousal co-residence rates among men to the age distribution of a Focal's sons. We restrict this measure to the observed period, as projecting it would require additional assumptions about future marriage formation, partner matching, migration, and household residence. Projections of the numbers of sons and daughters are given in SI, Fig. S8.

The resulting estimates reveal that the sex composition of children differs across states in ways consistent with the states' contrasting histories of son preference. In 1990, a Focal aged 65 in Punjab has more sons (1.75) than daughters (1.63), whereas her counterpart in Kerala has around the same number of sons (1.20) and daughters (1.10). At the start of the period, the number of daughters-in-law is also higher in Punjab (1.42) than in Kerala (0.85), reflecting the larger number of sons in Punjab.

In neither state does the number of sons correspond one-to-one to the number daughters-in-law. For a Focal aged 75 – whose sons are generally aged 40 years or older, and for whom incomplete marriage timing is less likely to explain the difference – the ratio of daughters-in-law to sons in 2020 is about 0.79 in Punjab and 0.81 in Kerala. The ratio is even lower for a Focal aged 65 (0.66 in Punjab and 0.76 in Kerala). Even though Punjab and Kerala have very different histories of son preference and sex imbalance, the gap between the number of sons and daughters-in-law is similar.

The Punjab-Kerala comparison therefore highlights that even though Kerala has only a small SRB-related imbalance in the number of sons and daughters, the shortfall of daughters-in-law relative to sons in Kerala is similar to that in Punjab. By 2080, declining fertility is projected to reduce the number of both sons and daughters in both states to roughly 0.75 of each per Focal (Appendix, Fig. S8). Thus, even as the sex composition of children becomes more balanced, the pool of daughters-in-law does not necessarily increase accordingly.

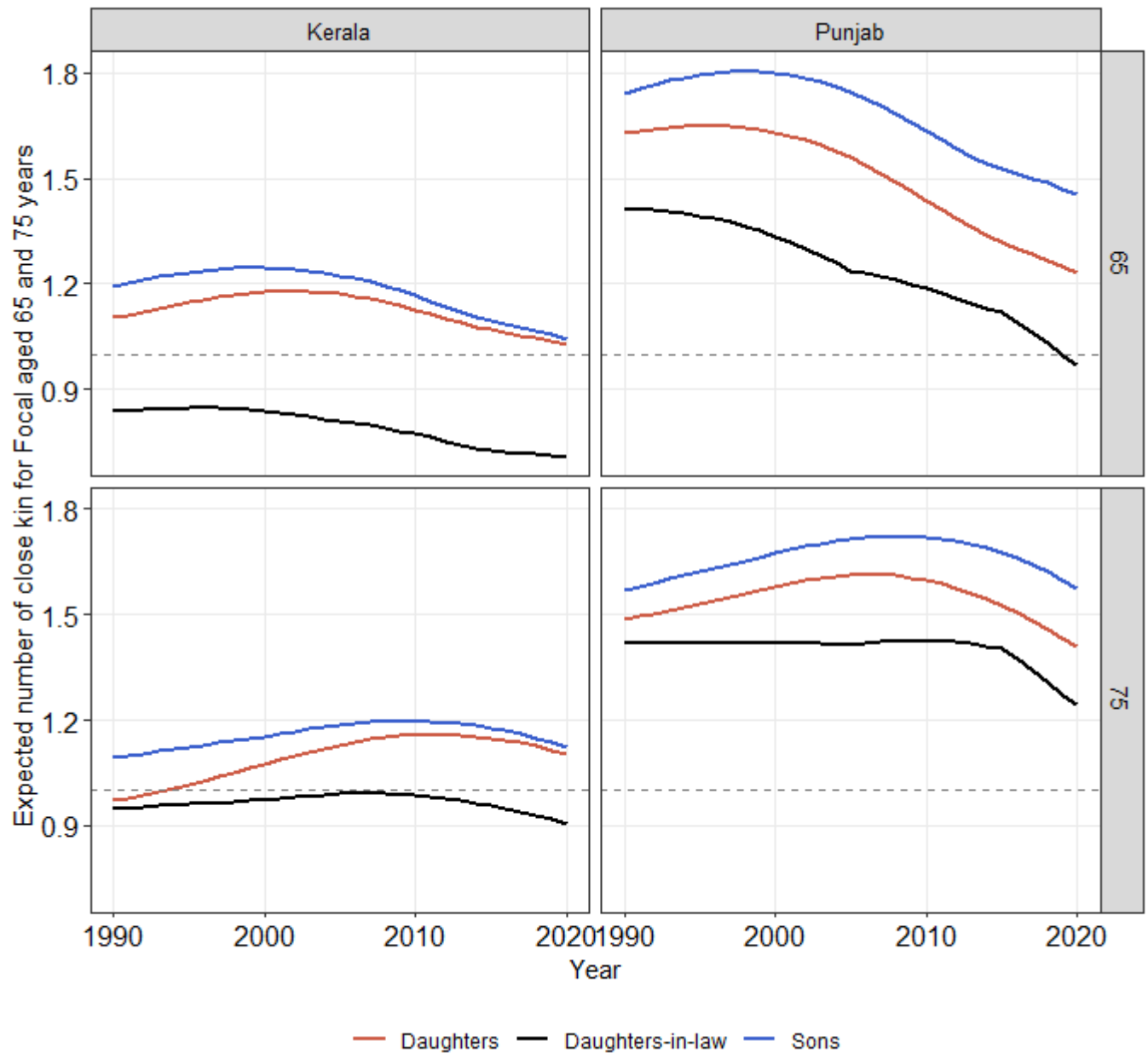


Figure 4: Expected numbers of sons, daughters, and daughters-in-law of an urban Focal aged 65 (top row) and aged 75 (bottom row) in Kerala and Punjab, 1990 to 2020. The numbers of sons and daughters are estimated from the state-specific fertility, mortality, and SRB. The numbers of daughters-in-law are estimated from the age-specific prevalence of men living with a spouse in each state. The dashed horizontal line marks one kin per Focal.

Discussion

Population ageing is commonly assessed using population-level dependency ratios, which treat working-age adults as an undifferentiated pool of potential providers of support. This approach is inadequate in India, where the formal welfare system is limited and later-life support continues to be provided mainly through family networks. The demographic potential for kin-based support is shaped by whether working-age people are related to an older person, whether those relatives are themselves of working age, how they are distributed by sex and kin type, and whether biological kin are accompanied by the affinal relationships embedded in prevailing family systems. These conditions vary substantially across Indian states and between rural and urban areas within states.

Our study shows that India's well-documented regional demographic divergence is reproduced within the kin networks of older adults. Extending previous state-level population projections that documented significantly different demographic trajectories across Indian states (9), we demonstrate that these trajectories translate into substantially different family environments in later life. Differences in kin count across Indian states are comparable to, and in some cases greater than, the cross-country differences previously documented within South Asia (8). These differences are also pronounced within states. A rural older woman has more living kin than her urban counterparts in every state, and in some cases the rural-urban gap within the state is as large as the differences between states and between countries. National averages therefore conceal fundamentally different demographic contexts of family support within India.

The age composition of kin networks shows a decline in the kin support ratio – i.e., the number of working-age kin (aged 15-64) per older kin (aged 65+) – that changes in ways that the total kin count alone cannot capture. As kin networks age, a similar number of surviving kin corresponds to fewer working-age kin relative to older kin. Even if an older woman in the future is expected to have as many living kin as an older woman has today, she is likely to have a substantially lower support ratio. However, this decline in the support ratio does not occur uniformly across India. States and rural–urban areas reach similarly low kin support ratios at different times and at different paces. Thus, while support ratios are expected to converge towards similarly low levels, substantial inequalities persist in the timing of this decline. Our findings provide similar evidence of convergence to lower kin support ratios alongside persistent heterogeneity in the timing of convergence, as has been observed in other dimensions of India's demographic and health transition (11).

The changes in kin networks are also gendered in ways that extend beyond the numerical imbalance between sons and daughters. The legacy of past son preference remains embedded in the kin networks of future older adults. Cohorts born under a male-biased SRB continue to produce deficits of working-age female kin decades after the SRB improves. The consequences of India's "missing women" therefore extend across generations and across the life course, reappearing later as fewer adult daughters and other female kin within family networks. Our findings extend (3) from population-level sex imbalances to their consequences within kin networks. Women who are missing from the population are also absent from the pool of potential daughters, sisters, and other female kin available to families. The same population-level deficit also reduces the pool of women

available to become daughters-in-law. A daughter missing from one family is also a potential daughter-in-law unavailable elsewhere in the kinship system. Thus, the demographic legacy of son preference can affect both natal and affinal sources of female kin, although the eventual number of daughters-in-law also depends on marriage, survival, and migration patterns.

Our results expose a deeper tension in the traditional logic linking son preference to old-age security. In patrilocal family systems, sons have historically been valued partly because they co-reside with or live close to their parents after marriage, and daughters-in-law have often been expected to provide their parents-in-law with routine and instrumental care. However, we show that having more sons does not translate proportionately into having more daughters-in-law. Declining support ratios indicate that the pool of working-age kin relative to older kin is shrinking. At the same time, the pool of kin traditionally relied upon for family care in India is declining even faster, making these traditional care arrangements increasingly difficult to sustain. In future, India is expected to have fewer working-age kin overall, fewer female working-age kin in states shaped by past son preference, and no demographic guarantee that sons will bring a corresponding number of daughters-in-law into older parents' kin networks. Thus, it should not be assumed that old-age support will remain sustainable through continued reliance only on sons and gendered expectations of care from their spouses.

The changes in kin size and composition imply that later-life support systems must adapt alongside the restructuring of kin networks. Formal long-term care, community-based services, and social protection are needed to complement family support. Our study identifies the states where declines in kin count and support ratios are expected to occur earlier and more rapidly, and thus provides a basis for anticipating where pressures on family-based support are likely to emerge first. Policymakers should therefore account for these subnational inequalities when planning for the provision of long-term care, social protection, and other ageing-related services, rather than relying on national demographic averages or assuming that families will be able to absorb growing support needs. At the same time, the organization of care within families itself needs to change. Where prevailing gender norms continue to assign a disproportionate share of unpaid care to women, a shrinking kin network could intensify pressures on daughters, daughters-in-law, and other female relatives, particularly as they often have to combine caregiving with paid work. These demographic changes show that a broader redistribution of care responsibilities is needed, including greater involvement of sons and other male kin. Therefore, support for older adults in the future cannot depend on the continuation of gendered family care arrangements alone.

We identify several limitations of the study. First, we do not include the Focal's spouse because spouses are affinal kin. Since husbands in India are typically older than their wives, a spouse of a 65-year-old female Focal would also often be aged 65 or older. Including the spouse would therefore lower the kin support ratio by adding another older person to the denominator. Second, our estimates capture the demographic availability and composition of kin rather than their geographic accessibility, resources, or caregiving behaviour, or the support actually received. Sensitivity analysis using LASI and NSS data shows that more than 80% of older adults live with their children, and that this share increases with the older adult's age, which indicates that kin are a source of support in later life. Third, the kinship model does not explicitly follow individual kin as they move across states or rural-urban areas. As a sensitivity analysis, we therefore follow synthetic cohorts from age 15 and cumulatively apply age-, sex-, state-, and residence-specific

internal out-migration rates to working-age kin, which leads to only modest changes in support ratios (Appendix Fig. S4). Since return migration and kinship links among in-migrants are not observed, in-migration is not added, and migration among kin aged 65 or above is not applied. This sensitivity analysis therefore represents an upper-bound effect of internal out-migration on support ratios. International migration is assumed to be zero and may lead to some overestimation of working-age kin in high-emigration populations. Fourth, male fertility schedules are derived from female fertility assuming a constant spousal age gap over time, following the approach used in (15,17). This assumption does not capture temporal changes in the age difference between partners, and may affect the estimated age structure of kin. Fifth, the results are conditional on reconstructed historical schedules and projected fertility, mortality, SRB, and migration. Their exact levels and timing should therefore be interpreted as scenario-based projections. The sensitivity analyses for different scenarios also indicate that the broad patterns are robust to alternative demographic assumptions, although differences across scenarios become more visible later in the projection period. Alternative fertility trajectories produce the largest divergence, with slower fertility decline resulting in larger kin networks and higher support ratios, and faster decline producing the opposite. Gradual SRB convergence to 1.05 by 2040 has little effect on overall kin count, while removing internal migration produces modest differences across states and rural-urban areas. None of these scenarios alters the overall decline in kin count and working-age kin relative to older kin (Appendix, Figs. S11-S12).

Future work should integrate migration directly into kinship models, incorporate within-state socioeconomic heterogeneity, and improve estimates of male fertility as marriage patterns change. It should also link projected kin counts to observed geographic proximity, living arrangements, caregiving, and unmet support needs, and examine how education, migration, changing marriage patterns, and other socioeconomic factors reshape both kin networks and their support patterns.

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Appendix

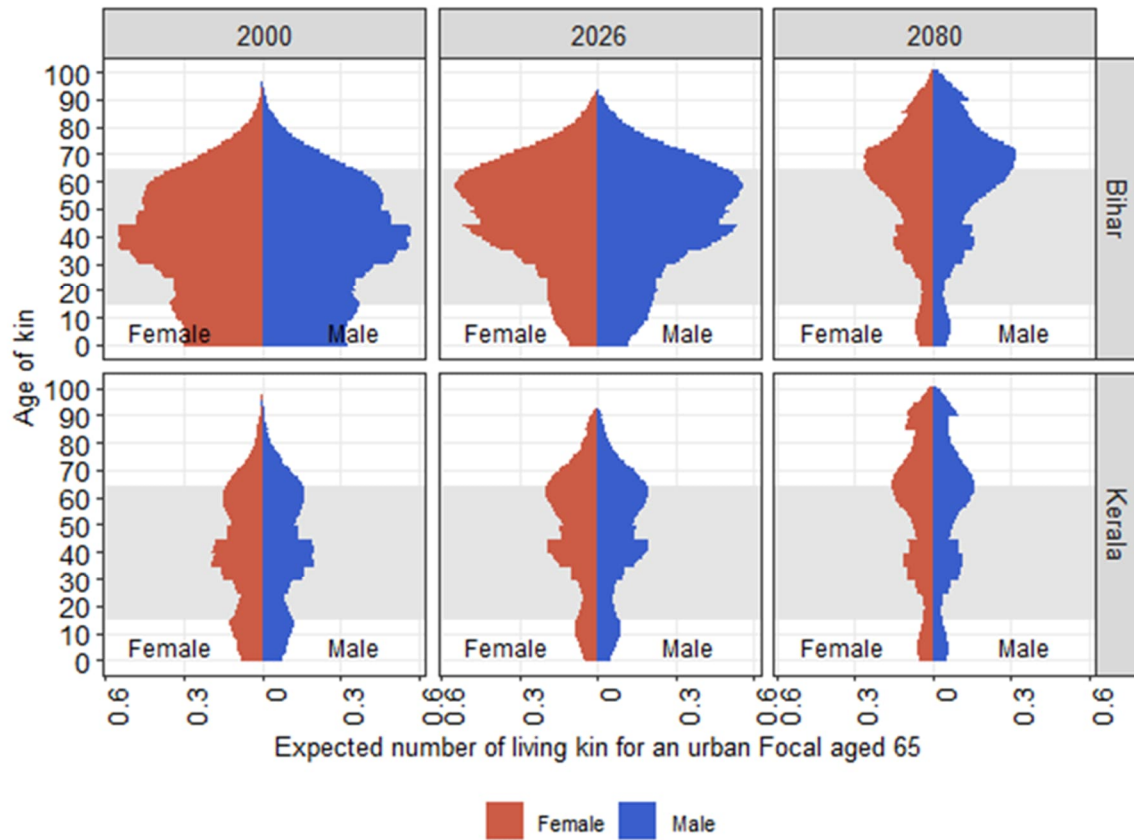


Fig. S1. Number of kin by age and sex of kin for an urban Focal of aged 65 in Bihar and Kerala in 2000, 2026 and 2080. Gray shaded part shows the working age kin of age 15-64 years. Bihar has the highest number of kin and Kerala has the lowest number of kin for an urban Focal aged 65 in 2026 in India.

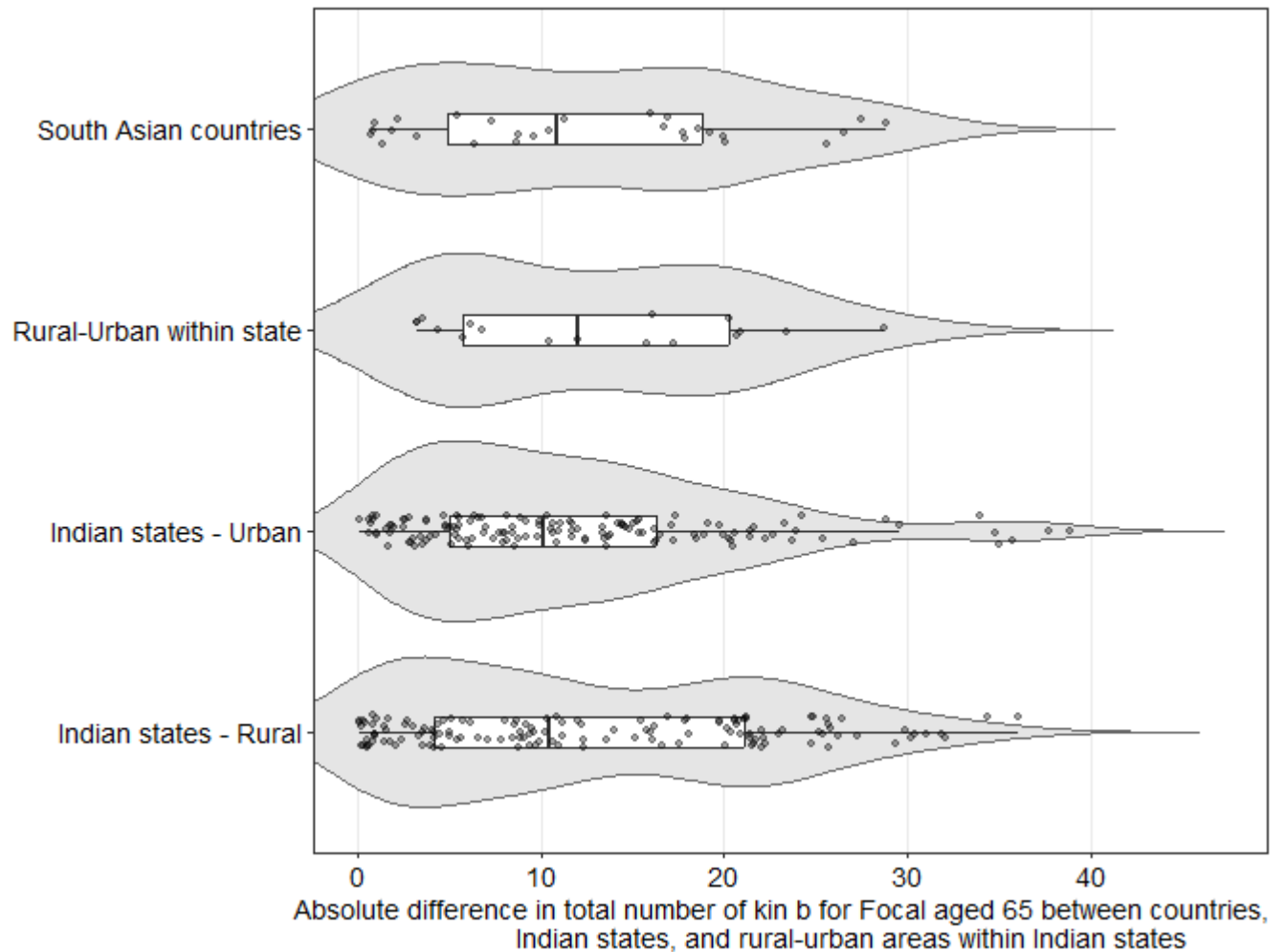


Fig. S2. Pairwise differences in expected total number of kin among Indian states, rural-urban areas, and South Asian countries for a Focal aged 65 years in 2026. Absolute differences in the expected total number of living kin are shown for all pairwise comparisons between Indian states separately for rural and urban areas, between rural and urban areas within the same state, and between South Asian countries. Each point represents one pairwise comparison, boxplots show the median and interquartile range, and shaded distributions show the overall distribution of pairwise differences. Larger values indicate greater inequality in kin-network size. The overlap in the distributions shows that variation in the number of kin across Indian states, between rural and urban areas within states, is comparable to differences observed between South Asian countries. For total number of kin for South Asian countries, see (8).



Fig. S3. Absolute difference in the total number of kin between rural and urban areas within each state for a Focal aged 65 years from 1950 to 2100. The stacked areas show each age-sex group's contribution to the rural-urban difference.

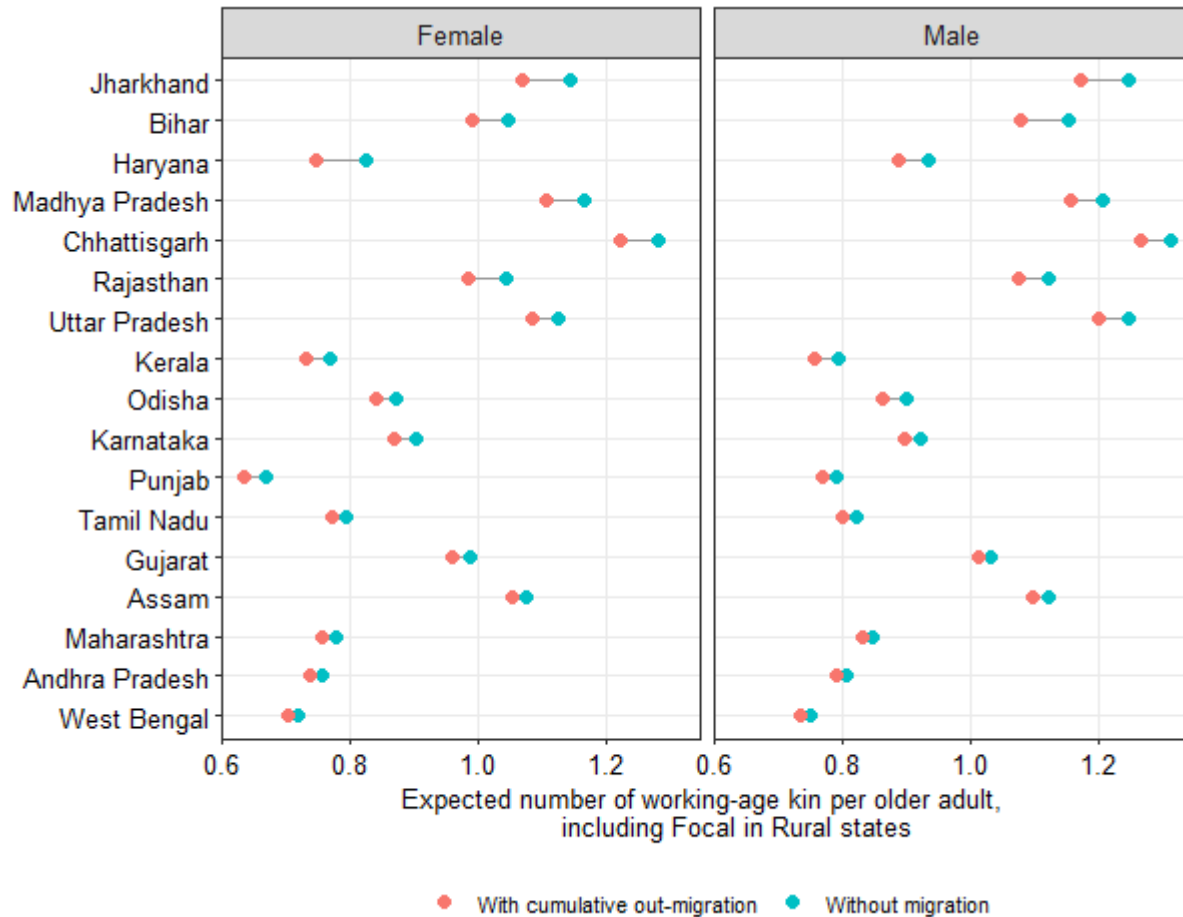


Fig. S4. Effect of cumulative internal out-migration on the expected number of working-age kin per older adult in rural areas, 2060. Expected numbers of female and male working-age kin aged 15-64 per older adult aged 65 or above, including the Focal woman aged 65, are shown for each state. For the migration sensitivity analysis, we followed synthetic birth cohorts from age 15 and cumulatively applied age-, sex-, state-, and residence-specific out-migration rates as cohorts aged. The resulting retention proportions were applied to the corresponding working-age kin estimates, and support ratios were recalculated. Red points show estimates with cumulative out-migration, blue points show estimates without migration and connecting lines indicate the reduction associated with out-migration. Because return migration and in-migration of kin are not incorporated, the estimated reduction represents an upper-bound sensitivity scenario for the effect of internal out-migration on locally available working-age kin. We show result for year 2060 because, we currently have migration data beginning in 2011, so 2060 is the first year in which all working-age cohorts aged 15-64 can be followed from age 15 onward.

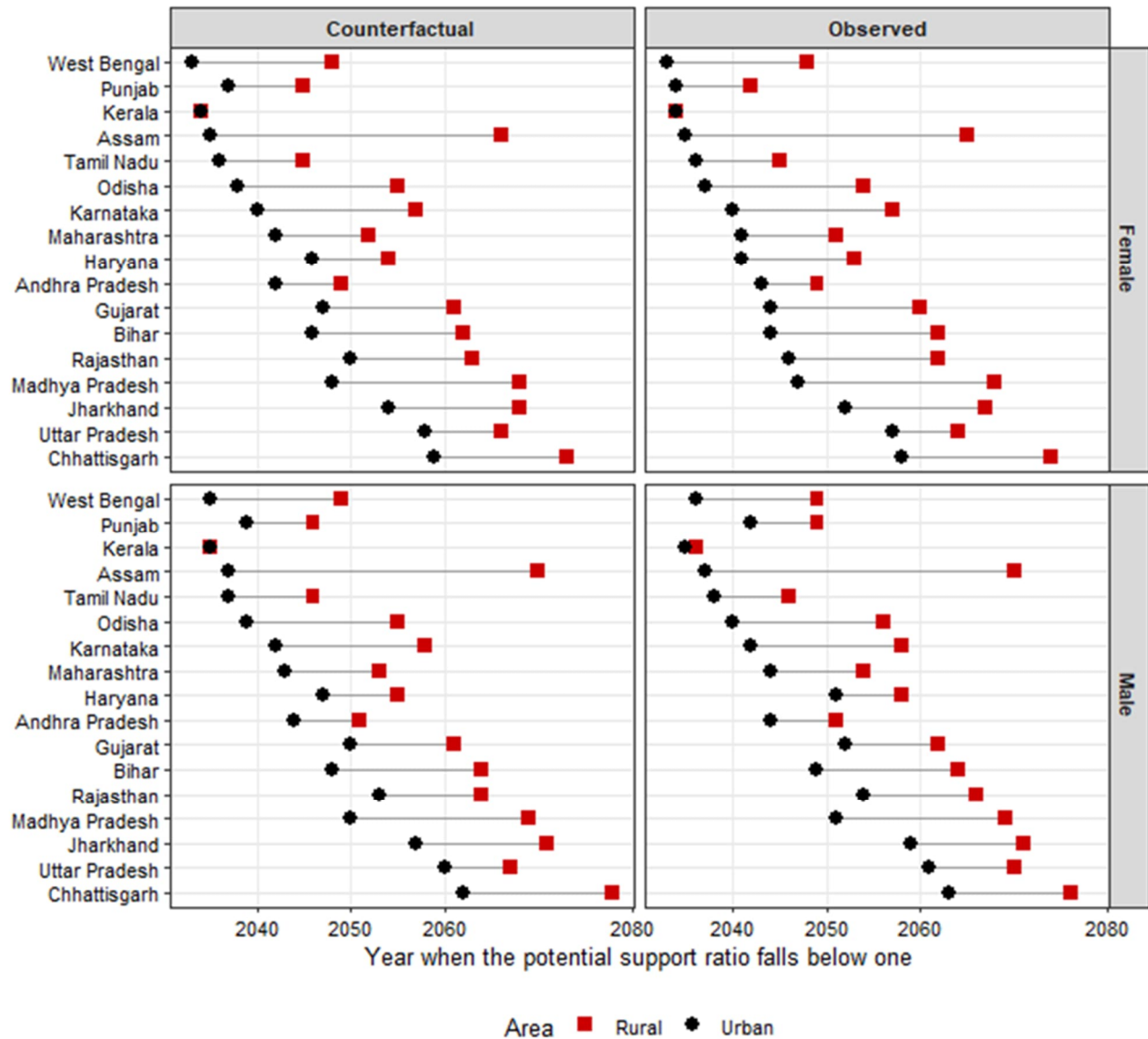


Fig. S5. Year in which the kin support ratio falls below one for a Focal aged 65 years under observed and counterfactual SRB scenarios, by state and rural-urban areas. The observed scenario uses state-specific SRBs from 1950 to 2026 and assumes 1.05 male births per female birth thereafter. The counterfactual assumes an SRB of 1.05 throughout 1950-2100. Black circle shows the year when the kin support ratio for an urban Focal fall below one and red square shows the year when the kin support ratio for a rural Focal fall below one.

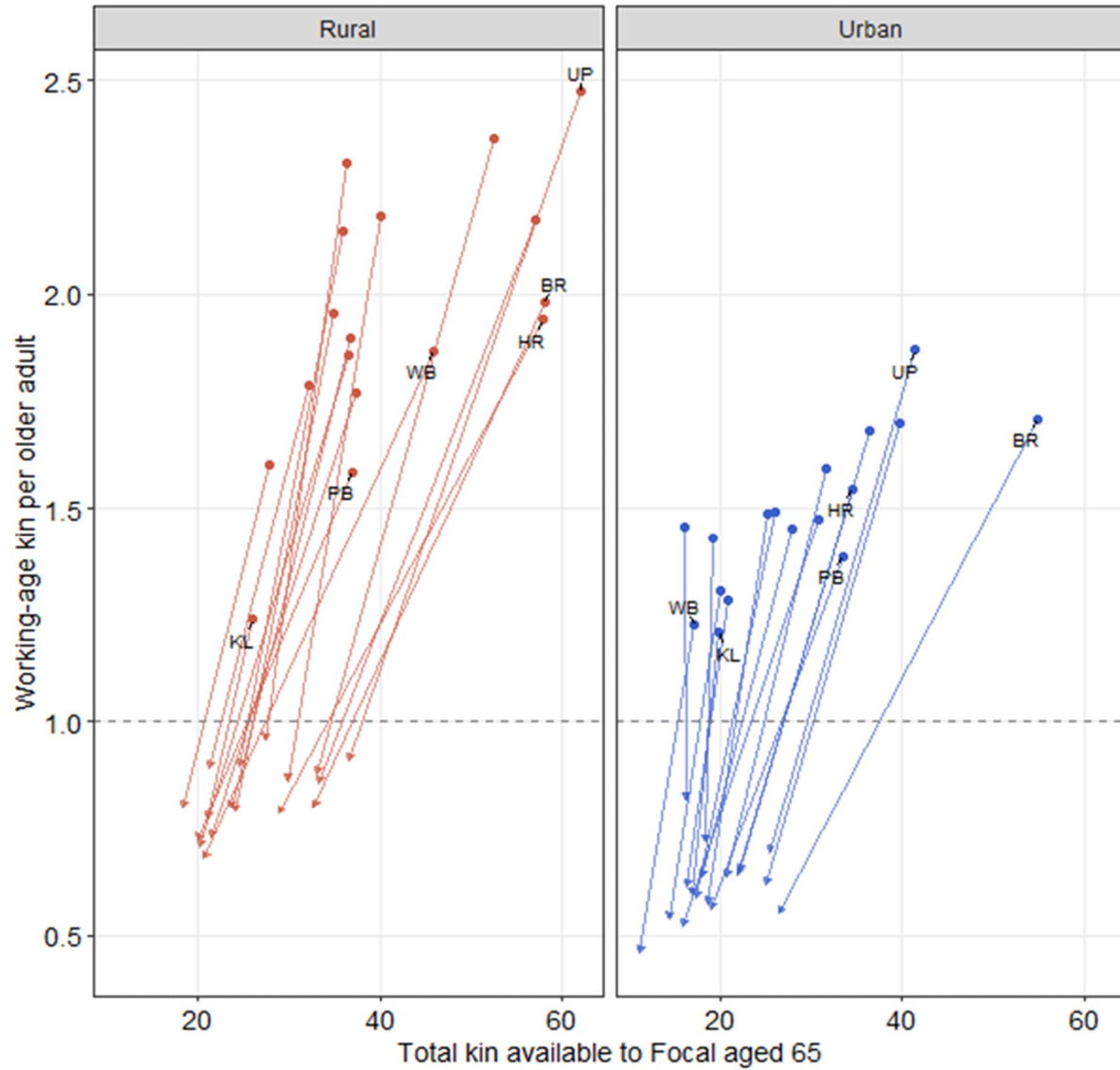


Fig. S6. Total number of kin (x axis) and total working-age kin per older person, including Focal aged 65 (y-axis) between 2020 and 2080, by rural and urban residence across Indian states. Circles indicate 2020 values and arrows indicate projected 2080 values. The horizontal dashed line marks one working-age kin per older person.

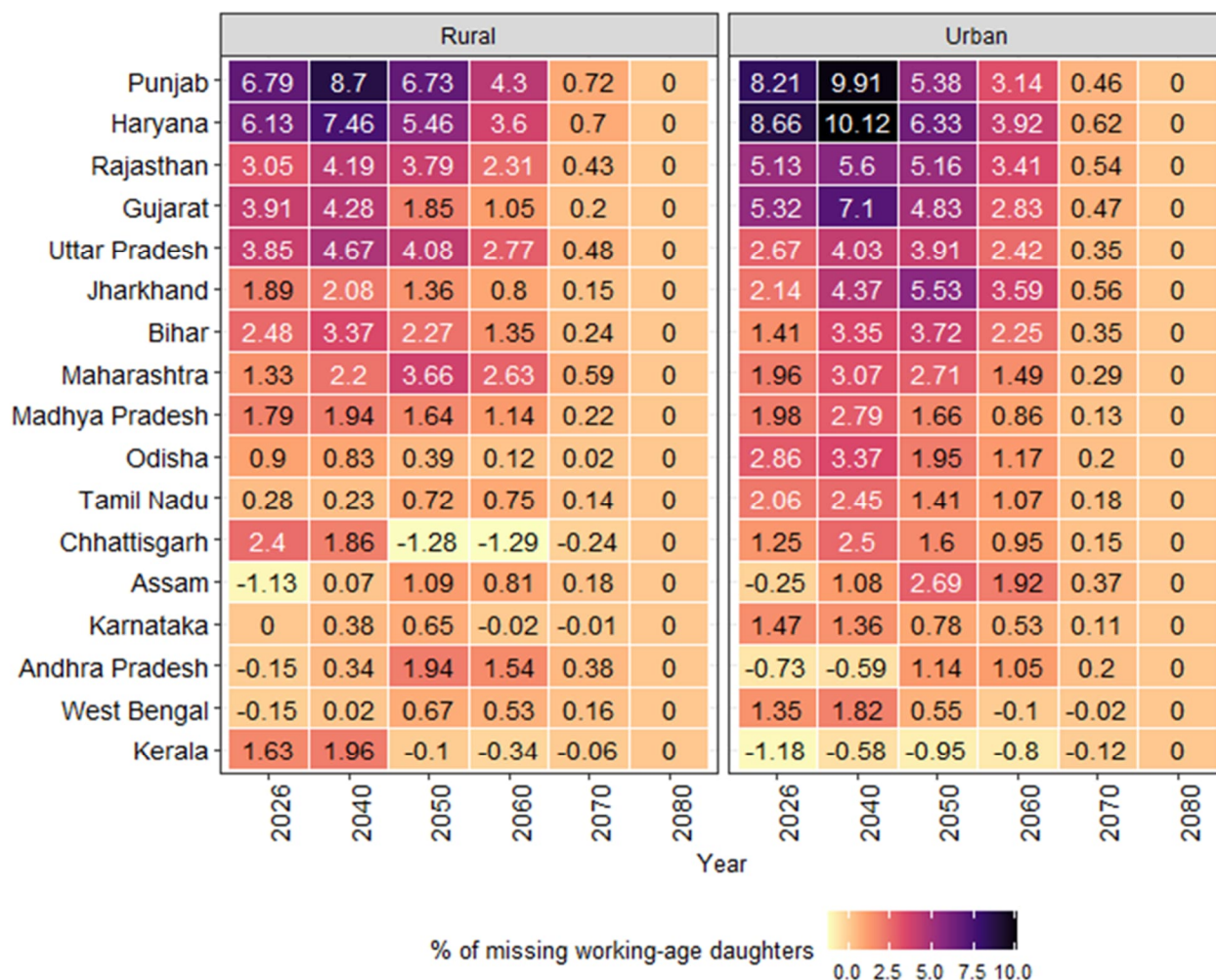


Fig. S7. Percentage of working-age daughters for a Focal aged 65 years absent under the baseline SRB relative to the counterfactual, by rural-urban residence, in 2026, 2040, 2050, 2070, and 2080. The baseline scenario uses state-specific SRBs from 1950 to 2026 and assumes 1.05 male births per female birth thereafter. The counterfactual scenario assumes an SRB of 1.05 throughout 1950-2100 across all states. States are ordered from the highest to the lowest percentage of missing daughters.

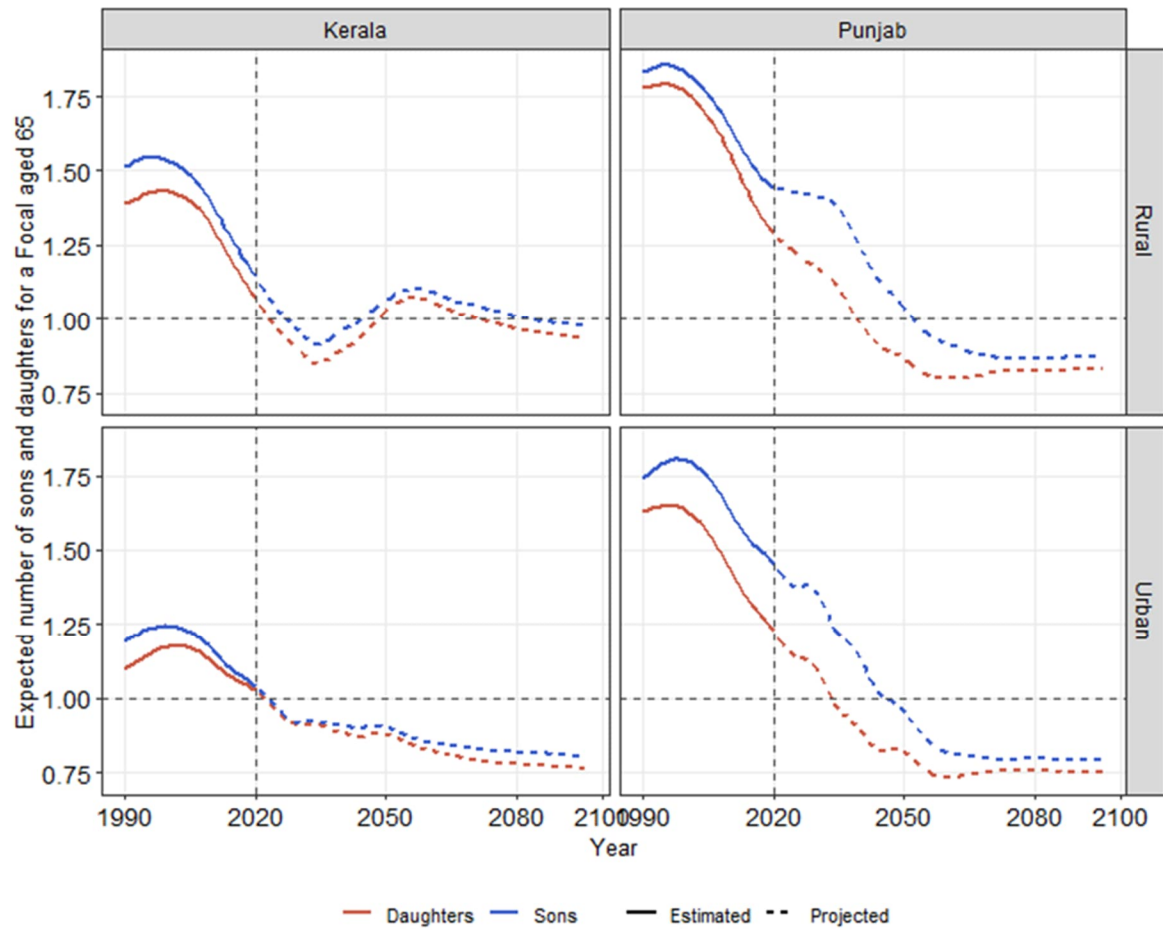


Fig. S8. Expected number of sons and daughters for a Focal aged 65 years in rural and urban Kerala and Punjab under the observed scenario from 1990 to 2100. Sons and daughters are estimated from state-specific fertility, survival, and SRB schedules. The horizontal dotted line marks one children per Focal, and the vertical dotted line marks 2020, the start of the projection period.

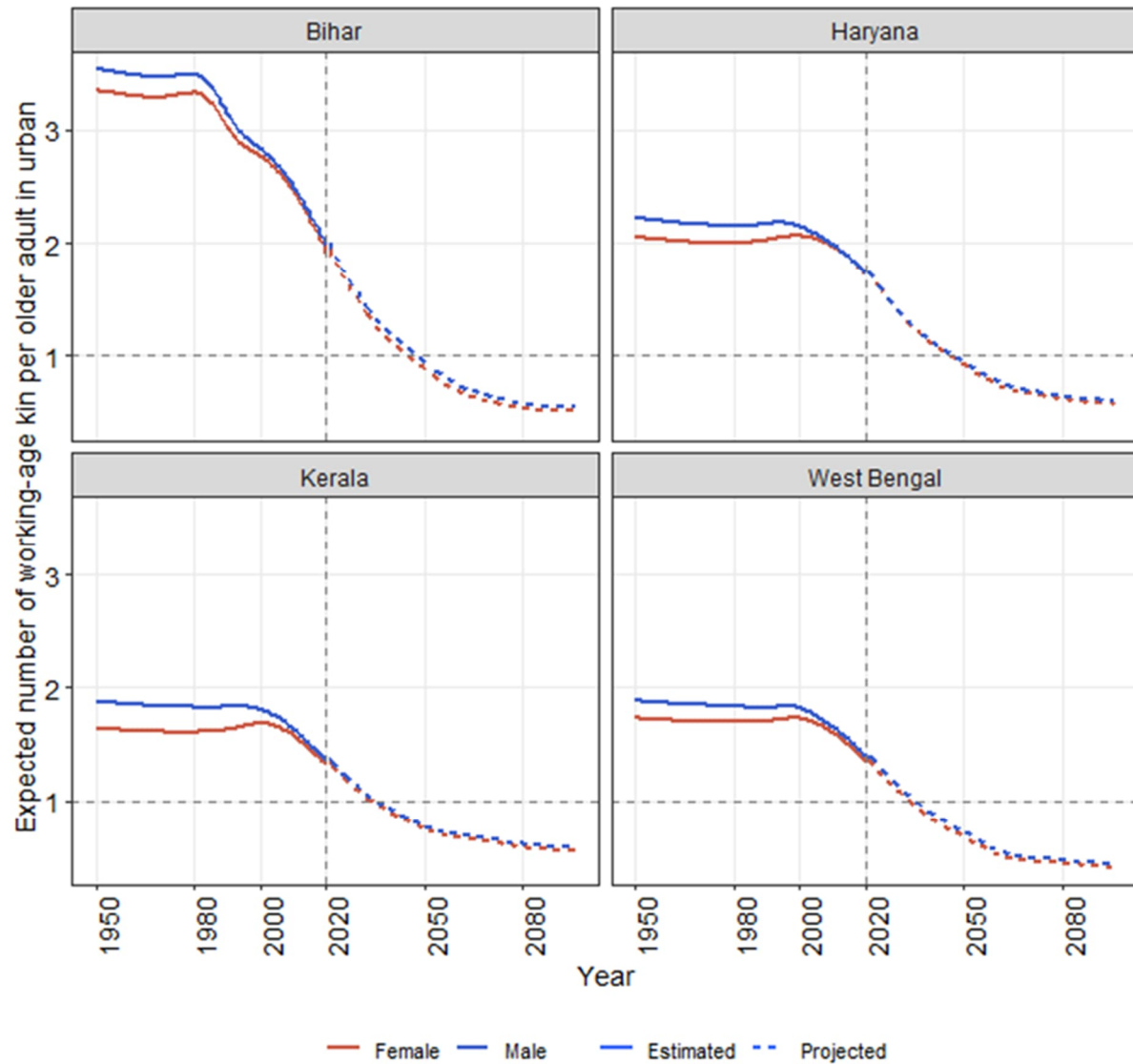


Fig. S9. Expected number of working-age kin (15-64 years) per older adult (65 years or older, including Focal aged 65 years), by sex, in urban Bihar, Haryana, Kerala, and West Bengal under the counterfactual SRB scenario from 1950 to 2100. The counterfactual scenario assumes an SRB of 1.05 throughout 1950-2100 across all states. The vertical dashed line marks 2020, the start of the projection period and the horizontal dashed line marks one working-age kin per older adult.

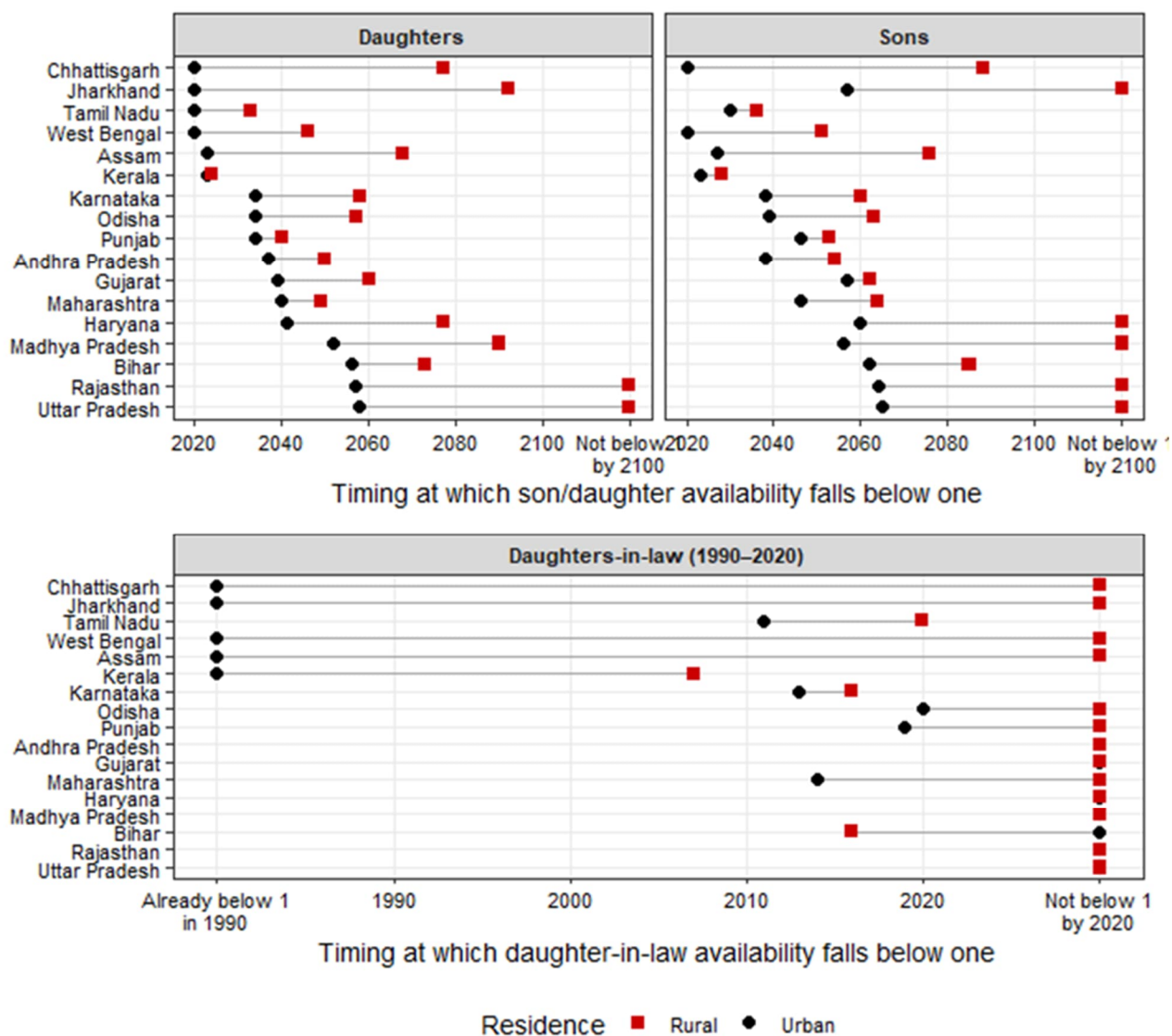


Fig. S10. Year in which the expected number of daughters, sons, and daughters-in-law falls below one for a Focal aged 65 years, by state and rural-urban areas.

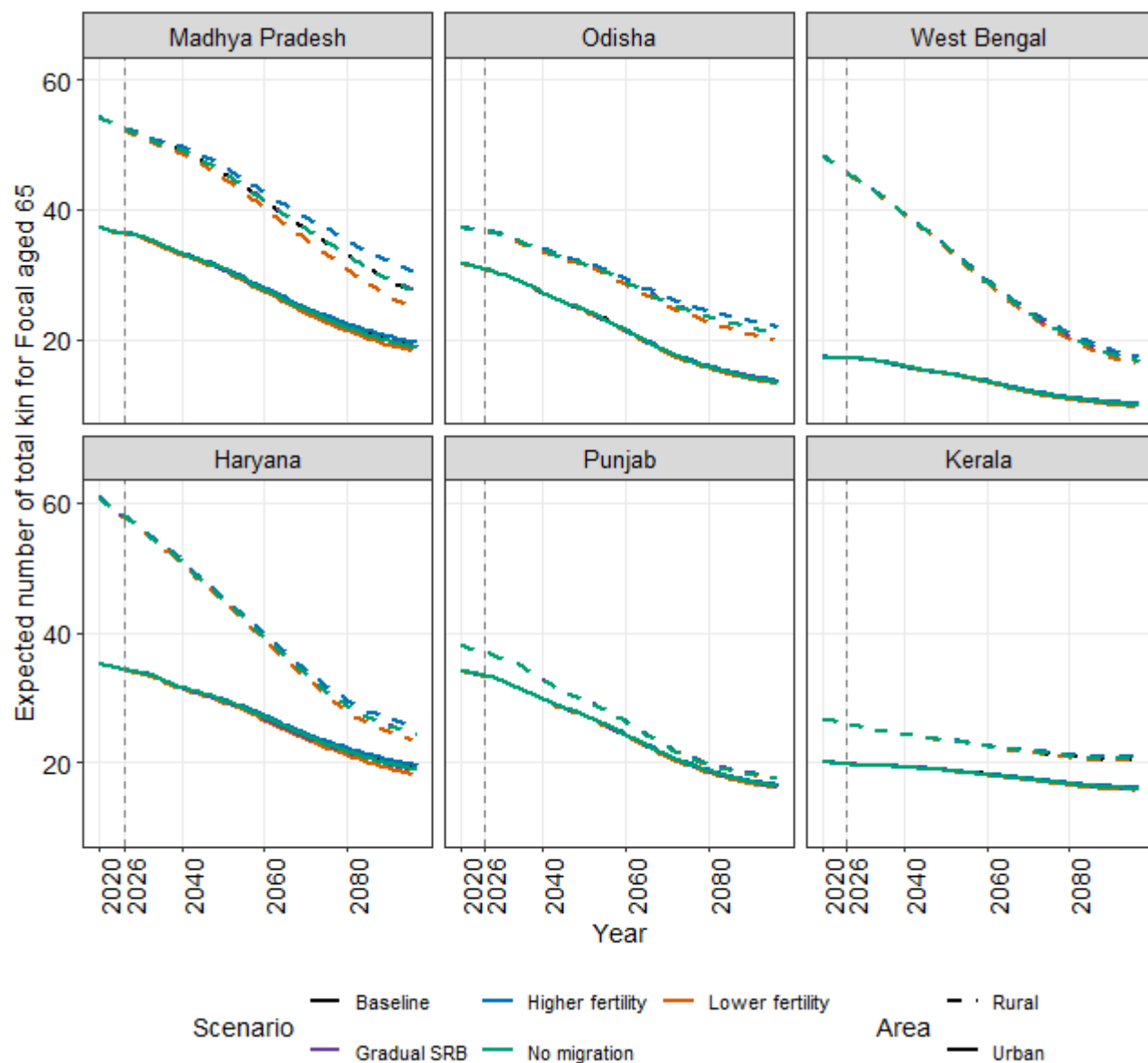


Fig. S11. Total number of kin for the Focal aged 65 in rural (dotted line) and urban (solid line) in some selected states under different scenarios in India.

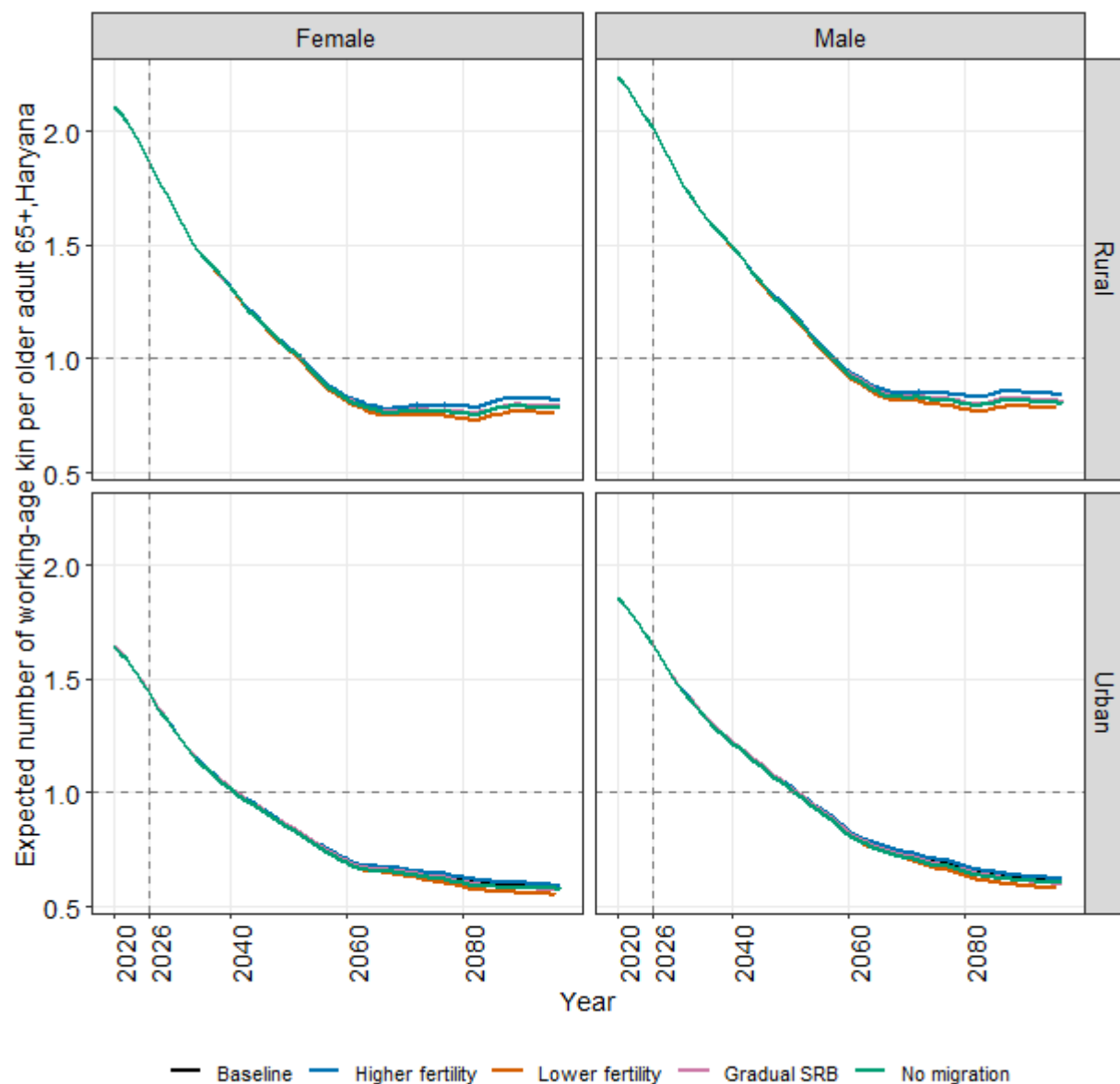


Fig. S12. Expected number of working-age kin (15-64 years) per older adult (65 years or older, including Focal aged 65 years), by sex, in Haryana under different scenarios from 2020 to 2100.

Tables

Table S1. States included in the analysis, their abbreviations, and broader regional classification.

State	Abbreviation	Broader region
Chhattisgarh	CT	Central
Madhya Pradesh	MP	Central
Uttar Pradesh	UP	Central
Bihar	BR	Eastern
Jharkhand	JH	Eastern
Odisha	OR	Eastern
West Bengal	WB	Eastern
Assam	AS	North Eastern
Haryana	HR	Northern
Punjab	PB	Northern
Rajasthan	RJ	Northern
Andhra Pradesh	AD	Southern
Karnataka	KA	Southern
Kerala	KL	Southern
Tamil Nadu	TN	Southern
Gujarat	GJ	Western
Maharashtra	MH	Western

Table S2. Demographic inputs, data sources, and methods used to construct annual state-specific demographic schedules from 1950 to 2100.

Demographic input	1950-1980	1980-2020	2020-2100
Age-specific fertility rates	Backcast from World Population Prospects 2024 national series using state-, age-, and rural-urban-specific ratios observed in 1980.	Sample Registration System	Updated and projected using the approach of (9)
Age- and sex-specific survival probabilities	Backcast from World Population Prospects 2024 national series using state-, age-, and rural-urban-specific ratios observed in 1980.	Sample Registration System	Updated and projected using the approach of (9)
Sex ratio at birth	Backcast from World Population Prospects 2024 national series using state-, age-, and rural-urban-specific ratios observed in 1980.	Sample Registration System	Updated and projected using the approach of (9)
Population by age and sex	Backcast from World Population Prospects 2024 national series using state-, age-, and rural-urban-specific ratios observed in 1980.	Census of India	Updated and projected using the approach of (9)
Potential daughters-in-law	Not estimated	Estimated from the age-specific prevalence of co-residing spouses among men using NFHS from 1990 to 2020.	Not projected

Table S3. Expected number of sons, daughters, and daughters-in-law by state and rural-urban residence for a Focal aged 65 years in 2020.

State	Kin type	Rural	Urban
Andhra Pradesh	Sons	1.48	1.22
Andhra Pradesh	Daughters-in-law	1.24	1.02
Andhra Pradesh	Daughters	1.45	1.18
Assam	Sons	1.53	1.06
Assam	Daughters-in-law	1.14	0.66
Assam	Daughters	1.5	1.02
Bihar	Sons	1.41	1.88
Bihar	Daughters-in-law	1.03	1.39
Bihar	Daughters	2	1.77
Chhattisgarh	Sons	1.61	0.97
Chhattisgarh	Daughters-in-law	1.26	0.72
Chhattisgarh	Daughters	1.48	0.92
Gujarat	Sons	1.61	1.45
Gujarat	Daughters-in-law	1.26	1.06
Gujarat	Daughters	1.56	1.29
Haryana	Sons	1.91	1.5
Haryana	Daughters-in-law	1.44	1.08
Haryana	Daughters	1.72	1.27
Jharkhand	Sons	1.71	1.08
Jharkhand	Daughters-in-law	1.37	0.81
Jharkhand	Daughters	1.54	0.99
Karnataka	Sons	1.24	1.24
Karnataka	Daughters-in-law	0.87	0.86
Karnataka	Daughters	1.3	1.17
Kerala	Sons	1.14	1.04
Kerala	Daughters-in-law	0.77	0.71
Kerala	Daughters	1.07	1.03
Madhya Pradesh	Sons	1.85	1.49
Madhya Pradesh	Daughters-in-law	1.47	1.15
Madhya Pradesh	Daughters	1.77	1.41
Maharashtra	Sons	1.5	1.26
Maharashtra	Daughters-in-law	1.24	0.95
Maharashtra	Daughters	1.43	1.18
Odisha	Sons	1.53	1.35
Odisha	Daughters-in-law	1.21	0.99
Odisha	Daughters	1.46	1.24
Punjab	Sons	1.45	1.45

State	Kin type	Rural	Urban
Punjab	Daughters-in-law	1.02	0.97
Punjab	Daughters	1.29	1.23
Rajasthan	Sons	1.94	1.59
Rajasthan	Daughters-in-law	1.54	1.25
Rajasthan	Daughters	1.83	1.39
Tamil Nadu	Sons	1.26	1.01
Tamil Nadu	Daughters-in-law	1	0.8
Tamil Nadu	Daughters	1.23	0.94
Uttar Pradesh	Sons	2.18	1.65
Uttar Pradesh	Daughters-in-law	1.55	1.11
Uttar Pradesh	Daughters	2.04	1.54
West Bengal	Sons	1.77	0.96
West Bengal	Daughters-in-law	1.47	0.68
West Bengal	Daughters	1.71	0.9

Table S4. Expected number of working-age kin by sex per older person for Focal aged 65years (kin support ratio) in 2026, 2050 and 2080 by state, and rural-urban area.

States	Sex	Rural			Urban		
		2026	2050	2080	2026	2050	2080
Andhra Pradesh	female	1.84	0.96	0.69	1.47	0.83	0.57
Andhra Pradesh	male	1.87	1.01	0.73	1.51	0.86	0.61
Assam	female	2.14	1.36	0.87	1.28	0.74	0.52
Assam	male	2.15	1.4	0.92	1.33	0.79	0.56
Bihar	female	2.11	1.56	0.78	1.66	0.86	0.53
Bihar	male	1.85	1.72	0.82	1.76	0.97	0.58
Chhattisgarh	female	2.24	1.6	0.95	1.43	1.12	0.79
Chhattisgarh	male	2.37	1.66	0.97	1.48	1.19	0.84
Gujarat	female	2.03	1.16	0.78	1.51	0.89	0.61
Gujarat	male	1.88	1.23	0.8	1.67	1.04	0.66
Haryana	female	1.87	1.05	0.76	1.44	0.85	0.61
Haryana	male	2.01	1.2	0.81	1.65	1.02	0.67
Jharkhand	female	2.08	1.43	0.84	1.36	1.01	0.68
Jharkhand	male	2.29	1.58	0.89	1.49	1.16	0.75
Karnataka	female	1.81	1.17	0.88	1.42	0.8	0.61
Karnataka	male	1.77	1.19	0.9	1.48	0.85	0.65
Kerala	female	1.22	0.75	0.76	1.2	0.76	0.58
Kerala	male	1.26	0.78	0.78	1.21	0.77	0.61
Maharashtra	female	1.74	1.01	0.7	1.45	0.82	0.55
Maharashtra	male	1.8	1.1	0.75	1.53	0.9	0.59
Madhya Pradesh	female	2.34	1.5	0.87	1.64	0.94	0.63
Madhya Pradesh	male	2.39	1.56	0.89	1.72	1.01	0.67
Odisha	female	1.87	1.11	0.79	1.42	0.69	0.5
Odisha	male	1.92	1.15	0.81	1.53	0.77	0.54
Punjab	female	1.51	0.82	0.69	1.29	0.72	0.54
Punjab	male	1.66	0.98	0.75	1.48	0.86	0.58
Rajasthan	female	2.14	1.41	0.84	1.57	0.93	0.59
Rajasthan	male	2.22	1.52	0.87	1.83	1.09	0.65
Tamil Nadu	female	1.6	0.87	0.78	1.25	0.75	0.6
Tamil Nadu	male	1.6	0.9	0.81	1.32	0.8	0.63
Uttar Pradesh	female	2.41	1.57	0.88	1.81	1.17	0.66
Uttar Pradesh	male	2.54	1.75	0.93	1.92	1.31	0.72
West Bengal	female	1.85	0.93	0.66	1.19	0.68	0.44
West Bengal	male	1.88	0.96	0.7	1.26	0.74	0.47

Table S5. Percentage of older adults of age 65 years and 75 years co-residing with a son and/or daughter-in-law or with a daughter and/or son-in-law, by age group and state in India, 2017-18.

State or Union Territory	Co-resident with a son and/or his spouse (daughter-in-law)		Co-resident with a daughter and/or her spouse (son-in-law), when no son or daughter-in-law present	
	65 y+	75 y+	65 y+	75 y+
India	74.9	77.2	5.8	5.6
States				
Andhra Pradesh	60.1	71.1	7.8	8.7
Assam	85.3	85.6	5.7	4.5
Bihar	78.4	82.8	5.8	8
Chhattisgarh	65.7	77.1	4.7	4.9
Gujarat	78.2	74.8	3.2	3.9
Haryana	87.9	88.8	1.1	0.5
Jharkhand	77.4	82.5	3.9	3.3
Karnataka	83.1	83.7	12.2	4
Kerala	77.3	82	9.6	10.8
Madhya Pradesh	70.4	71.2	3.3	2.4
Maharashtra	76.6	79	5.3	5.4
Odisha	75.4	77.2	6.1	7.1
Punjab	84.2	84	5.7	4.2
Rajasthan	74.2	78.7	2.7	1.4
Tamil Nadu	51.6	53.8	8.5	12.4
Uttar Pradesh	78.6	80.5	2.9	2.7
West Bengal	76.3	77.8	6.8	7.2

Source: Author's calculation from Longitudinal Aging Study in India, wave 1. The two kin-type columns are mutually exclusive: the second counts co-residence with a daughter and/or son-in-law only where no son or daughter-in-law is present in the household.

Table S6. Living arrangements of the population aged 60 year and above, by state, India, in 2004-05 to 2017-18.

State	2004-2005 (NSS 60th round)			2014-2015 (NSS 71st round)			2017-2018 (NSS 75th round)		
	Alone	Spouse only	Children or others	Alone	Spouse only	Children or others	Alone	Spouse only	Children or others
India	5.2	12.2	82.6	4.1	14.8	81.1	4.2	14.1	81.7
<i>States</i>									
Andhra Pradesh	8.6	21.1	70.3	5.8	22.6	71.6	10.3	20.8	69
Assam	2.7	3.7	93.6	2.2	3	94.8	1.5	4.3	94.2
Bihar	4	12	84	2.1	12	85.9	2.3	8.5	89.2
Chhattisgarh	8.9	11.7	79.5	9.5	18.1	72.4	5	14.1	80.9
Gujarat	5.7	13.7	80.6	3.1	15.1	81.9	2.4	17.3	80.3
Haryana	1.1	7.3	91.6	0.8	10.6	88.5	1.2	10.6	88.3
Jharkhand	3.8	9.9	86.3	5.6	10	84.4	2.5	11.9	85.6
Karnataka	5.3	9.3	85.4	2.5	9	88.5	3.7	10.4	85.9
Kerala	3.1	9.4	87.5	2.5	17.8	79.7	3.4	16	80.6
Madhya Pradesh	5.6	14.5	80	4.4	17.4	78.2	3.2	11.3	85.5
Maharashtra	5.8	12.8	81.4	4.4	14.4	81.2	3.6	17.9	78.5
Odisha	3.4	12.3	84.3	3.5	14	82.5	5.6	15	79.4
Punjab	3	9.6	87.5	0.8	7.1	92.2	2.4	8.5	89.1
Rajasthan	3.5	9.9	86.6	4.1	14.8	81.1	1.4	15.3	83.3
Tamil Nadu	10.9	18.9	70.2	8.5	27.6	64	8.4	19.2	72.4
Uttar Pradesh	4.2	10.2	85.6	2.3	10.7	87	3	9.1	87.9
West Bengal	3.5	8	88.4	4.7	15.6	79.7	4.6	14.4	81

Source: National Sample Survey rounds 60, 71 and 75. Rows sum to 100.0 across the three living-arrangement columns within each round, subject to rounding. “Children or others” denotes living with children and/or other co-resident persons.