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Generational trends in the transition to womanhood in lowland rural Nepal: Changes in the meaning of early marriage

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Abstract

Objective: In South Asia, studies show secular trends toward slightly later women's marriage and first reproduction. However, data on related biological and social events, such as menarche and age of coresidence with husband, are often missing from these analyses. We assessed generational trends in key life events marking the transition to womanhood in rural lowland Nepal.

Methods: We used data on 110 co-resident mother-in-law (MIL) and daughter-in-law (DIL) dyads. We used paired *t*-tests and chi-squared tests to evaluate generational trends in women's education, and mean age at menarche, marriage, cohabitation with husband, and first reproduction of MIL and DIL dyads. We examined norms held by MILs and DILs on a daughter's life opportunities.

Results: On average, MIL was 29 years older than DIL (60 years vs. 31 years). Both groups experienced menarche at average age 13.8 years. MIL was married at average 12.4 years, before menarche, and cohabitated with husbands at average 14.8 years. DIL was simultaneously married and cohabitated with husbands after menarche, at average 15 years. DIL was marginally more educated than MIL but had their first child on average 0.8 years earlier (95% CI −1.4, −0.1). MIL and DIL held similar norms on daughters' education and marriage.

Conclusion: While social norms remain similar, the meaning of "early marriage" and use of menarche in marriage decisions has changed in rural lowland Nepal. Compared to DIL, MIL who was married earlier transitioned to

womanhood more gradually. However, DIL was still married young, and had an accelerated trajectory to childbearing.

1 | INTRODUCTION

To protect girls from taking on adult responsibilities before they are emotionally and physically mature, the United Nations (UN) has established a universal minimum marriage age of 18 years (Convention on Consent to Marriage, Minimum Age for Marriage and Registration of Marriages (Article 6), 2007; UN General Assembly, 2018). Despite this, globally in 2023, 640 million women were married before 18 years (UNICEF, 2023). Forty-five percent of these early married women live in South Asia, which has the second highest prevalence of early marriage worldwide (UNICEF, 2023). Early marriage is especially common in rural populations with low levels of wealth and education, and high levels of overall gender inequality (UNICEF, 2023). Conducting research in these settings is crucial to deepen our understanding of why the practice persists.

In Nepal, including the lowland Terai region where our study is based, marriage for women is near universal (MOHP [Nepal] et al., 2023). The question for each girl is not whether she will be married, but when. Moreover, the process is transactional between households, with the decision almost always taken by older household members, primarily men. There have been substantial efforts to delay marriage, including national legislation banning the practice below the age of 20 years (Government of Nepal, 2017 (2074), 2017). Despite this, for many women, marriage and the subsequent start of their reproductive careers, still occurs at a young age. According to Nepal Demographic and Health Survey (DHS) data, in 2022, 34% of women aged 20–24 years were married below 18 years (decrease from 39.5% in 2016) and 35.7% gave birth before 20 years (down from 38.6% in 2016) (MOHP [Nepal] et al., 2023; MOHP et al., 2017).

Importantly, marriage is nested in a wider set of biological and social events, which collectively mark the transition to womanhood. Relevant biological events include menarche, the onset of sexual activity and first reproduction, whereas social changes include marriage itself and cohabitation with husbands. The timing of these events varies among age cohorts and across generations in association with secular trends in economic development, education, socio-cultural norms, and nutritional status (Bongaarts et al., 2017; Pesando et al., 2021; Raj et al., 2014; Scott et al., 2021; Wells, 2010). What is "optimal" for marriage decisions may also depend on the lens through which it is viewed—food security, education and autonomy, family honor, or Darwinian fitness (Morrow et al., 2023; Schaffnit et al., 2021; Schaffnit & Lawson, 2021; Wells, 2022).

Menarche is a key physiological marker of puberty. Socially, it may be considered a signal for the readiness for marriage (Ibitoye et al., 2017; Leone & Brown, 2020; Morabia & Costanza, 1998; Udry & Cliquet, 1982) and hence cohabitation with husbands, both of which precede first reproduction in South Asia (MacQuarrie & Juan, 2019). In Nepal, however, the timing of marriage and the onset of marital coresidence may be different, especially if marriage preceded menarche. As marriage patterns change over generations, the ages at which girl's experience the transition to womanhood may also change, but not necessarily at the same rate.

Most studies have considered secular trends in the timing of the transition to womanhood using nationally representative data (Bongaarts et al., 2017; MacQuarrie & Juan, 2019; Nguyen & Wodon, 2015; Pesando et al., 2021; Scott et al., 2021). The aim of our study is to describe in detail generational changes in this transition among Maithili-speaking Madhesi women in the Nepal Terai, who are living within the same household. We consider it important to assess generational changes at the level of households because in this society, young married women are very restricted to the family home; hence, women's social experience is dominated by relationships with other household members, among whom the mother-in-law (MIL) is uniquely influential when coresident. More nuanced understanding of these bio-social secular trends may help identify how we may better support a safe transition to womanhood.

1.1 | Secular trends at the population level

Secular trends in the various milestones (age at menarche, marriage, cohabitation, etc.) that mark the transition to womanhood can be discerned in South Asia, but the different components of this transition are rarely considered in combination.

Variations in the timing of puberty are influenced by genetic and environmental factors (Parent et al., 2003; Wells, 2010). Globally, general improvements in nutritional and health outcomes have been associated with a 2-year decline in the timing of menarche, from a median of 14.7–12.9 years between 1932 and 2002, with women

in South Asia experiencing menarche at median 13 years in 2002 (Leone & Brown, 2020). More recent studies from Nepal, conducted between 2016 and 2022, find that women experience menarche between 12 to 13 years (Bhattarai et al., 2018; Bhusal et al., 2021; Chalise et al., 2018; MOHP [Nepal] et al., 2023).

In high-income countries, improvements in nutrition have also been associated with an increase in women's stature (NCD Risk Factor Collaboration (NCD-RisC), 2016). Co-occurring trends in taller stature and earlier menarche would likely be attributable to greater growth prepuberty. However, minimal secular increases in height have occurred among women from low-income countries (Wells, 2010). In this context, moreover, a trend toward early puberty might constrain final height, by reducing the time available for growth (Wells et al., 2016). In a larger cohort from Madhesh Pradesh (previously Province 2) in Nepal, women's height did not increase after the age of 16 years (Wells et al., 2021).

Evidence of whether earlier menarche accelerates marital timing, by sending a social signal for the readiness for marriage, is inconsistent (Aryal, 2011; Ibitoye et al., 2017; Marphatia, Wells, et al., 2022; Raj et al., 2015). Between cohorts born in 1955 and 1980 in South Asia, the average age of reproductive events decreased: age at marriage declined from 15.5 to 13 years, age at first sex from 17 to 13 years and age at first birth from 17.5 to 15 years (Pesando et al., 2021). A more recent review, however, found that these trends have reversed. DHS data on 84 low- and middle-income countries between 1985 and 2016 found secular increases in mean age at first sex, first union (defined as a combination of marriage and cohabitation with husband), and first birth in most regions (Pesando et al., 2019).

Consequently, the ongoing global transition to earlier menarche contrasts with the 4% reduction in the global prevalence of early marriage (<18 years) among women aged 20–24 years in the last decade, from 23% to 19% (UNICEF, 2023). South Asia has had the steepest decline in the proportion of women aged 20–24 years marrying early, from 46% to 26%, largely due to the rapid decline in early marriage in India (UNICEF, 2023).

Girls' secondary education is generally considered to correspond with a delayed age at marriage (Bongaarts et al., 2017; Malhotra & Elnakib, 2021; Marphatia et al., 2020; Scott et al., 2021; Sekine & Hodgkin, 2017). For example, Nepalese women with secondary or higher education were typically married 3.6 years later than women with no education (20.5 years vs. 16.9 years) in 2022 (MOHP [Nepal] et al., 2023). However, the association of education with age at first birth is inconsistent. Some studies find greater education delays first reproduction (Jejeebhoy, 1995; Suwal, 2001), whereas others find that later marriage is the key factor (Marphatia et al., 2020).

1.2 | Social and legal norms

Collectively, contrasting secular trends in these key events suggest that the transition to womanhood varies according to context. Alongside biological secular trends, changes in the timing of this transition may also reflect a shift in socio-cultural or legal norms around the "appropriate" age of experiencing these events for women (Bicchieri et al., 2014; Paluck & Ball, 2010). Social norms are informal, externally motivated and maintained by approval or sanctions within groups (Bicchieri et al., 2014; Mackie & Moneti, 2014). In contrast, legal norms are formal declarations institutionalized by the state, which aim to change social norms by mandating an older age at marriage (Mackie & Moneti, 2014). Secular changes in the age at marriage therefore provide a measure of how these norms and behaviors may be changing over time.

Increases in girls' educational attainment may contribute to shifts in social norms (Ghimire & Samuels, 2014; Jafarey et al., 2020), as might the migration of men for work, exposing them to other cultures and values (Adhikari & Sharma, 2022; Shattuck et al., 2019). However, some factors such as economic/market-based opportunities are unlikely to be relevant, as in the society of our study, women are largely confined to the home, and opportunities for work are very limited (Gram et al., 2017). Minimum marriage age legislation has not been found to delay marriage age in most low- and middle-income countries (Batyra & Pesando, 2021). In Nepal, legislation increasing the minimum marriage age from 18 to 20 years was associated with a 6%–8% point decrease in early marriage; however, as the practice is still prevalent, it is clear that the law has had only modest impact in reducing the practice (Batyra & Pesando, 2021).

1.3 | Study aims

Our study evaluates generational trends in a series of biological and social factors characterizing the transition to womanhood in rural lowland Nepal namely:

- Height
- Age at menarche
- Age at marriage
- Age at coresidence with the husband
- Age at first reproduction
- Education

Our main aim is to assess each of these generational trends in unrelated daughters-in-law (DIL) and their coresident MIL. Our secondary aims are to test whether there are correlations between MIL and DIL in these variables, which might indicate a consistent tendency for households to recruit new wives with similar characteristics across generations; and to investigate assess generational trends between the eldest daughters of MIL (married out of the household) and the DIL (who were married into the household); and to describe education and marriage norms held by MIL and DIL.

In our study, there can be no direct biological transmission of traits between the two women; however, the spouse of the MIL is always the father of the spouse of the DIL. This approach allows us to examine changes across generations in households that are independent of direct mother–daughter transmission, the latter of which has been examined by other studies (e.g., age at menarche (Ong et al., 2007)). There may still be similarity within MIL–DIL dyads, as in this patrilocal society, both women are recruited into a given household through marriage at different time-points. For example, households of higher economic status might have different norms and values regarding the duration of schooling sought in incoming wives, and the optimum timing of marriage and cohabitation. In our population, more educated women tend to have their first child later (Marphatia et al., 2020). Similarly, wealthier households might systematically recruit better-nourished adolescent women, who might therefore have taller height and earlier menarche (Leone & Brown, 2020; Subramanian et al., 2011), while the shared genes of the father-in-law and his son might also propagate a correlation between MIL and DIL in the timing of first reproduction. Across households, the two generations may also be differentially exposed to environmental and social variables, including for example minimum marriage age legislation (Batyra & Pesando, 2021). For all these reasons, we might anticipate correlated variables within MIL–DIL dyads, which could then shape the nature of the relationship within MIL–DIL pairs. For example, the experience of early-marrying DILs might reflect a tendency for the coresident MIL also to have undergone early marriage.

We test the following research questions, illustrated in the schematic diagram in Figure 1:

1. What are the generational trends in key events marking the transition to womanhood in MIL–DIL dyads?

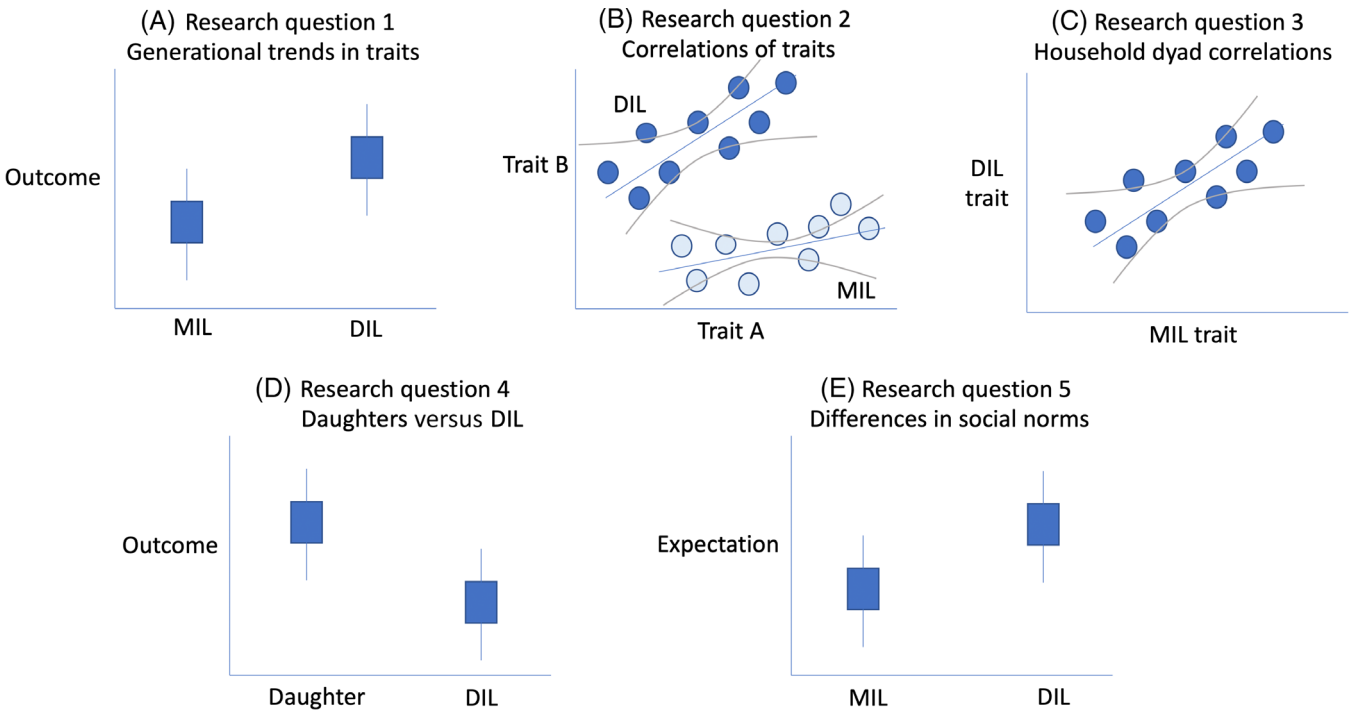

FIGURE 1 Schematic diagram of analyses. This schematic diagram illustrates the analytical approach used to answer our five research questions. Research question 1 examines generational trends between mother-in-law (MIL) and daughter-in-law (DIL). Research question 2 evaluates hypothesized correlations between traits (e.g., ages at menarche and marriage) within individual women from both MIL and DIL groups. Research question 3 examines hypothesized intra household correlations in traits indexing the transition to womanhood of these DILs and MILs. Research question 4 compares differences between the eldest daughter of the MIL and the DIL. Research question 5 explores differences in social norms and expectations around a daughter's education and marriage age held by MIL and DIL.

2. Are there correlations within MIL–DIL dyads in their traits, and in the associations between these traits (e.g., age at menarche and marriage)?
3. Is there household clustering of demographic traits across MIL–DIL dyads?
4. Do daughters of MIL have different life trajectories compared to DIL, as indicated by their education level and age at marriage?
5. What norms do MIL and DIL hold regarding their daughters' life opportunities?

2 | MATERIALS AND METHODS

In the Maithili-speaking Madhesi population of our study, women tend to have lower-education and earlier marriage compared with other women in Madhesh Pradesh (previously known as Province 2) and throughout Nepal in general (Busert et al., 2016; Marphatia et al., 2020). The norm in our study population is for marriages to be mostly arranged by parents or relatives (Maharjan & Sah, 2012), with women having little say over the timing of their marriage and choice of spouse (Niraula & Morgan, 1996). At some point after marriage a woman moves into her husband's home (patrilocal residence), and usually coresides with his parents.

There are also expected behaviors of senior and junior women and men both in and outside the home. Compared to men, women tend to have low levels of agency within and outside households (Gram et al., 2017). MILs generally have the highest status among female household members and young married women the lowest status (Gram et al., 2018; Kandiyoti, 1988; Regmi et al., 2010). Young married women tend to do the majority of unpaid care work in the home, including cooking, and generally eat last, and potentially the least if not enough food, compared to other family members (Harris-Fry et al., 2018). The physical movement of these young women outside of home is also restricted, and generally permitted only when accompanied by male household members, or their mothers-in-law (Gram et al., 2017; Harris-Fry et al., 2018).

2.1 | Data collection

Our data come from the observational Growth Monitoring Study (GMS), which was conducted in Dhanusha district in Madhesh Pradesh (Terai region) in Nepal. In 2012, 603 children were enrolled at birth and followed-up every 28 days until the age of 2 years. Data on MIL and DIL used in this analysis come from a sub-study of 200 families conducted in 2021. Our analysis focuses on the 110 DILs who were coresiding with their MIL (i.e., MIL–DIL dyads); however, we also analyzed the 90 mothers not coresiding with their MIL to test for any potential bias in our coresident sample.

Research ethics approvals for the GMS were granted by the Nepal Health Research Council for (95/2013, 13/2018) and by University College London (11 345/001). Village Development Committee secretaries consented to the inclusion of clusters. For the new data collection in 2021, research ethics approvals were granted by the Nepal Health Research Council for (28/2020P), University College London (0326/016), and the University of Cambridge (1403). Written consent was obtained from the participants.

Four trained female researchers from the Centre for Research on Environment, Health and Population Activities (CREHPA) in Nepal administered oral questionnaires to coresident DIL and MIL in their homes. Questionnaires were administered to the DILs and MILs in each dyad simultaneously, but in separate locations, to ensure confidentiality of responses. Data on household characteristics come from the recent 2018 follow-up and included their caste–ethnicity, wealth, and household food security. Household wealth was classified by enumerating different aspects of household status and infrastructure and ownership of material goods, similar to the method used by DHS (Rutstein & Johnson, 2004). The individual variables assessed comprised: house wall, floor and roof material, number of bedrooms in the house, toilet type, and possession of the following assets: motorbike, color television, electricity supply, and water supply. Household food security was measured by the standard Household Food Insecurity Access Scale questionnaire, which was used to generate food security categories (Coates et al., 2007).

MIL and DIL were asked about their age (year), year of birth, current marital status (married, separated or widowed), menarche (year), marriage age (year), age at cohabitation with spouse (year), and first reproduction (year) in completed integer years. We also asked which of menarche or marriage occurred first, and why women were married at that age.

The question regarding first reproduction differed between DIL and MIL (Supplementary methods). DIL were asked their age at first pregnancy, which could have resulted in a live birth, but also a miscarriage or abortion. In contrast, MIL was asked their age at their first live birth, which therefore ignored potential miscarriage or abortion. This date would therefore on average be 9 months later than the DIL's pregnancy value.

DIL and MIL were also how much education they had completed (year), why they never went to school or

dropped out, their husbands' ages (year), education (year), and the age gaps between their husbands and themselves (year). We also asked about the age, age at marriage, and education of the eldest daughter of DIL and MIL.

Using questionnaires developed by the research team on the basis of literature review (Allendorf et al., 2017; Madjdian et al., 2021; Maertens, 2013; Santhya et al., 2017) and prior research in this and similar populations in South Asia (Marphatia, 2016), we inquired about the norms the DILs and MILs held toward a daughter's life opportunities, including their education, age at marriage, when would be too early or too late to marry and why, and who should make these decisions. We specifically asked about "a daughter" in order to include the full sample, and not only those women who actually had a daughter.

2.2 | Data coding

Caste/ethnicity groups were coded as disadvantaged (Dalit, Muslim), mid (Janajati, other Terai) or advantaged (Sudi, Yadav, Brahmin), using customized questionnaires developed by the research team for previous studies in this region on this population (Saville et al., 2018). Principal component analysis was used to construct a wealth index based on the list of household infrastructure and material assets described above, and categorized into quartiles (1 = poorest), as described in Supplementary methods.

The assessment of food security involves nine questions, each with scores of 0 to 3. Different levels (e.g., mildly/moderately/severely food insecure and food insecure) are signaled by responses to certain questions (e.g., any response indicating going to sleep hungry or going day and night without food indicates severe food insecurity regardless of the score for that question) as per the Coates 2007 guidance (Coates et al., 2007). We further aggregated this measure to a binary outcome, food secure versus insecure, based on the distribution of these data in our sample.

Age at marriage, first pregnancy, menarche, cohabitation with husband, husband's age, and age gap between spouses were described as continuous values. Women's age at marriage was also categorized according to the distribution of data: ≤10, 11–15, 16–17, and ≥18 years. Women's age at pregnancy was categorized as <18 years and ≥18 years.

Difference in years between events were calculated for: age at menarche and marriage age, menarche and cohabitation, marriage to first reproduction, and the age difference between MIL and DIL. A total of 9 months were subtracted from the age at first birth provided by MIL to attain a comparable age at first pregnancy value with DIL. Schooling was categorized as none, primary (grades 1–5), lower-secondary (grades 6–8), and secondary or higher (grades 9 onwards).

Data on norms held on a daughter's life opportunities were reported as continuous values and included: the ideal years of education (coded into education levels), ages at marriage and first childbearing, and the age considered as being too early or too late. Responses relating to whether daughters were an economic burden to the household should earn income outside the home and live with their MIL were categorized as yes/no. The questions used are given in full in Supplementary methods.

2.3 | Statistical analysis

We assessed potential bias in our sample by comparing (a) traits of DIL coresiding with MIL versus DIL residing in nuclear households, and (b) the characteristics of women with missing versus available data (separate analyses for MIL and DIL), as described in Table S1, S2, and S3.

To provide contextual information, we first analyzed all women together regardless of MIL or DIL status, to ascertain whether ages at marriage, menarche, cohabitation, and first pregnancy exhibit secular changes per decade. We fitted linear regression models with woman's age as the predictor to ascertain the change per decade and plotted the data to visualize the linearity of the trends.

To test our research questions, we used paired *t*-tests (with 95% CI, confidence interval), chi-squared tests, and scatterplots (with Spearman's correlation, *r*). A sample size of 100 dyads would be able to detect a difference of 0.28 *z*-scores in a continuous variable with 80% power, $p < .05$.

Given the wide age span of the DILs and MILs, we also used logistic regression analysis in the whole sample, to test whether older age of women was associated with higher or lower odds of a positive response to the questions on social norms that had a binary response option (i.e., yes or no). We similarly used linear regression to analyze if age was associated with a secular change in the ideal ages for daughters to marry and have their first child.

Our main interest is in understanding the magnitude of the effect, but we report *p*-values for information. Statistical analyses were conducted in SPSS 27 (IBM Corp., Armonk, NY) and R (version 2202.07.0 + 548) (R Core Team, 2022). Graphs were drawn using library `ggplot2` (Wickham, 2016) and box plot in SPSS.

3 | RESULTS

We first tested whether the sample included in this analysis, that is, those living in extended households, differed from the remainder of the cohort who were excluded from the analysis since the MIL was not coresident. Table S1 shows that compared to DIL residing in nuclear families, our subsample of DIL coresiding with MIL was younger with higher levels of husband's education, but otherwise showed no differences in other characteristics. Among the 90 households where the MIL was not coresident, the primary reasons were that she had died ($n = 39$) or was alive but living in another household ($n = 49$) Data were missing for two households.

Within the 110 households that we analyzed, Table S2 shows that MIL missing data were generally older, indicating that it may be harder to remember the age at experiencing these events over a longer time period. Table S3 shows differences by caste groups among DIL with missing data.

3.1 | Characteristics of sample

Table 1 shows the household characteristics of coresident dyads. Approximately a third of households were from each of the disadvantaged, mid, and advantaged caste groups. About 19% were from poor households, and the rest roughly equally divided in the second, third, and highest wealth categories. Three-fourths of households were food secure. Most DIL and MIL pairs had coresided for 14.7 years (SD 5.2), or since the DIL's marriage, which was on average 15.5 (SD 5.8) years ago.

Table 2 describes characteristics of the sample, their spouses and the MIL's eldest daughter. MIL was on average aged 60 years (SD 7.6) and DIL 31 years (SD 4.2) (Figure S1). The youngest MIL was similar in age to the oldest DIL and there was a greater age span between the youngest and oldest MIL than between the youngest MIL and oldest DIL. There was evidence of heaping for current age for MIL at 70 years, though this may also reflect a bimodal distribution of age (Figure S2). There was weaker evidence for heaping for current age of DIL at 28, 30, and 32 years. None of the other age-associated outcomes indicated heaping.

Average MIL's stature was 148 cm (SD 5.4) and DIL 152 cm (SD 5.1). The average age at menarche of both groups of women was around 13.8 years. MIL was married on average at 12.4 years (SD 2.6), cohabitated with their husbands at 14.7 years (SD 2.2) and had their first pregnancy at 17.7 years (SD 2.9). In contrast, DIL were married on average at 15.2 years (SD 1.7), cohabitated with their husbands just after marriage at 15.7 years (SD 2.0), and had their first pregnancy at 16.9 years (SD 1.5). Almost all MIL (94%) was uneducated compared to 61% of DIL. A total of 6% of MIL had completed primary school and 18% of DIL. None of the MIL had completed secondary school whereas 10% and 11% of DIL had completed lower secondary and secondary school, respectively.

As DIL was on average 31 years old, their experience of marriage and first pregnancy was 15–17 years ago on average. Hence, the generational trends are not comparing the current generation of women with the past, but rather women who were married about 15 years ago (DIL) with women (MIL) who were married on average 48 years ago.

The spouses of the MIL (fathers) and DIL (sons) had average ages of 64.5 years (SD 8.4) and 35.1 years (SD 6.1), respectively, and married at 17.4 years (SD 4.9) and 19.9 years (SD 4.5), respectively. Both men were median 4 years older than their wives. Fathers were mostly uneducated compared to sons, who had completed primary school. The MIL's eldest daughter was on average 34.5 years of age (SD 8.7), was married at average 17 years (SD 2.9), and was also largely uneducated (median 0 years of schooling, IQR 5).

Linear regression models for the whole sample, regressing age at marriage, menarche, cohabitation, or first reproduction on current age, showed that there were secular increases in age marriage (+1.0 years/decade, 95% CI 0.8, 1.2, $p < .001$), cohabitation (+0.4 years/decade, CI 0.2, 0.5, $p < .001$), and a decrease in age at first pregnancy (−0.2 years/decade, CI −0.4, −0.0, $p = .031$), whereas age at menarche showed a very weak trend that was not significant (−0.1 years/decade, CI −0.1, 0.0, $p = .2$). Plots confirmed that these trends were relatively linear over time (Figure S3).

TABLE 1 Household characteristics of coresident dyads.

	F	%
Caste		
Disadvantaged (Dalit/Muslim)	33	30
Mid (Janajati, other Terai)	42	38
Advantaged (Sudi, Yadav, Brahmin)	35	32
Assets		
1: Poorest	21	19
2	28	26
3	30	27
4: Richest	31	28
Household food secure (yes)	83	76

Abbreviations: %, percentage; F, frequency.

TABLE 2 Description of sample.

	MIL ($n = 110$)			DIL ($n = 110$)		
Women's traits						
	n	**Mean**	**SD**	***n***	**Mean**	**SD**
Age (years)	110	60.2	7.6	110	31.2	4.2
Height (centimeter)	110	148.2	5.4	108	151.5	5.1
Age at menarche (years)	77	13.8	1.0	101	13.7	1.1
Age at marriage (years)	110	12.4	2.6	110	15.2	1.7
Age at cohabitation with husband (years)	110	14.7	2.2	110	15.7	2.0
Age at first pregnancy (years)	110	17.7	2.9	91	16.9	1.5
	n	**F**	**%**	***n***	**F**	**%**
Education (years)	110			110		
None		103	94		67	61
Primary (1–5 years)		7	6		20	18
Lower-secondary (6–8 years)		0	0		11	10
Secondary (≥9 years)		0	0		12	11
Husband's traits						
	n	**Mean**	**SD**	***n***	**Mean**	**SD**
Husband's age (years)	110	64.5	8.4	110	35.1	6.1
Husband's age at marriage (years) MIL	104	17.4	4.9	106	19.9	4.5
Spousal age gap (years)	104	5.1	3.8	106	4.7	4.2
	n	**F**	**%**	***n***	**F**	**%**
Husband's education (years)	109			110		
None		69	63		20	41
Primary (1–5 years)		18	17		29	22
Lower-secondary (6–8 years)		12	11		23	16
Secondary (≥9 years)		10	9		38	22
	n	**Mean**	**SD**	NA		
Daughter's age (years)	86	34.5	8.7			
Daughter's age at marriage (years)	83	17.0	2.9			
	n	**F**	**%**			
Daughter's education (years)	89					
None		55	62	NA		
Primary (1–5 years)		19	21			
Lower-secondary (6–8 years)		5	6			
Secondary (≥9 years)		10	11			

Abbreviations: %, percentage; DIL, daughter-in-law; F, frequency; MIL, mother-in-law; *n*, number; NA, not applicable; SD, standard deviation.

3.2 | Research question 1

Almost all DIL was currently married, whereas 78% of MIL was currently married, 2% separated and 20% widowed. Table 3 examines differences in MIL and DIL dyad traits and by spousal characteristics.

Using the data from Table 3 and Figure 2 illustrates the transition to womanhood for DIL and MIL, showing the average timing of different events in each group. There was no generational trend in age at menarche, with both women experiencing this event on average at 13.8 years. However, for the MIL generation, marriage

TABLE 3 Paired differences in bio-social traits, coresident mothers-in-law (MIL) and daughters-in-law (DIL) dyads and their spouses.

	MIL–DIL dyads ($n = 110$)	MIL		DIL		Paired differences (DIL–MIL)		
Women's traits								
	n	**Mean**	**SD**	**Mean**	**SD**	**△**	**95% CI**	***p*-value**[a]
Age (years)	110	60.2	7.6	31.1	4.2	−29.0	−30.2, −27.7	<0.001
Height (centimeter)	108	148.3	5.3	151.5	5.1	3.2	1.8, 4.5	<0.001
Age at menarche (years)	73	13.9	1.0	13.8	1.1	−0.1	−0.5, 0.2	0.541
Age at marriage (years)	110	12.4	2.6	15.2	2.3	2.8	2.3, 3.4	<0.001
Age at cohabitation (years)	110	14.8	2.4	15.7	2.0	0.9	0.4, 1.5	0.001
Age at first pregnancy (years)	91	17.6	3.0	16.9	1.5	−0.8	−1.4, −0.1	0.027
Gap, menarche to marriage (years)	73	−1.0	2.6	1.4	1.7	2.5	1.8, 3.1	<0.001
Gap, menarche to cohabitation (years)	73	0.9	2.1	2.1	1.7	1.1	0.5, 1.7	<0.001
Gap, marriage to cohabitation (years)	110	2.4	2.5	−0.5	2.3	−1.9	−2.6, −1.3	<0.001
Gap, marriage to first pregnancy (years)	91	5.3	3.7	1.6	2.0	−3.6	−4.5, −2.8	<0.001
Gap, cohabitation to first pregnancy	91	2.8	2.9	1.1	2.3	−1.7	−2.5, −1.0	<0.001
Husband's traits								
		Mean	**SD**	**Mean**	**SD**	**△**	**95% CI**	***p*-value**[a]
Husband's age (years)	102	64.9	7.8	35.1	6.2	−29.8	−31.3, −28.4	<0.001
Husband's age at marriage (years)	102	17.5	4.9	19.9	4.5	2.5	1.1, 3.8	<0.001
Spousal age gap (years)	102	5.2	3.8	4.7	4.3	−0.5	−1.6, 0.7	0.415
		F	**%**	***F***	**%**	***p*-value**[b]		
Husband's education (years)	See footnote[c]					<0.001		
None		69	63	20	41			
Primary (1–5 years)		18	17	29	22			
Lower-secondary (6–8 years)		12	11	23	16			
Secondary (≥9 years)		10	9	38	22			

Abbreviations: %, percentage; CI, confidence interval; Difference, DIL value minus MIL value; son value minus Father's value; F, frequency; *n*, number; SD, standard deviation.

[a]Paired *t*-test.

[b]Chi-squared test.

[c]109 MIL, 110 DIL.

typically preceded menarche (53%), which may be due to the custom of marrying a prepubescent girl to ensure her virginity, whereas for the DIL, marriage typically postdated menarche (89%; $p < .001$). However, DIL was still married relatively young, at 15 years, which may help to ensure her virginity at marriage.

MIL was married on average at 12.4 years (SD 2.6), but they did not cohabitate with their spouse until 2.4 years (SD 2.5) later, at an average of 14.8 years (SD 2.4). In contrast, DIL was both married and started to cohabitate with their spouses around the same age: 15.2 years for marriage (SD 2.3) and 15.7 years for cohabitation (SD 2.0). On average, the DIL cohabitated with their spouses after menarche, however, five started cohabiting before menarche. Although MIL was married earlier than DIL on average, they had their first pregnancy at a slightly later age, 17.6 years versus 16.9 years ($\Delta = 0.8$ years, 95% CI 0.1, 1.4). MILs had a much greater gap marriage and first pregnancy ($p < .001$): mean 5.3 years (SD 3.7) versus 1.6 years (SD 2.0) for DILs. The gap between first pregnancy and cohabitation was also larger for MIL ($p < .001$): mean 2.8 years (SD 2.9) versus mean 1.1 years (SD 2.3) for DIL.

Table 3 also shows that the age gap between sons and fathers was 30 years (95% CI 28.4, 31.3), which was similar to the age gap between MIL and DIL. Both MIL and

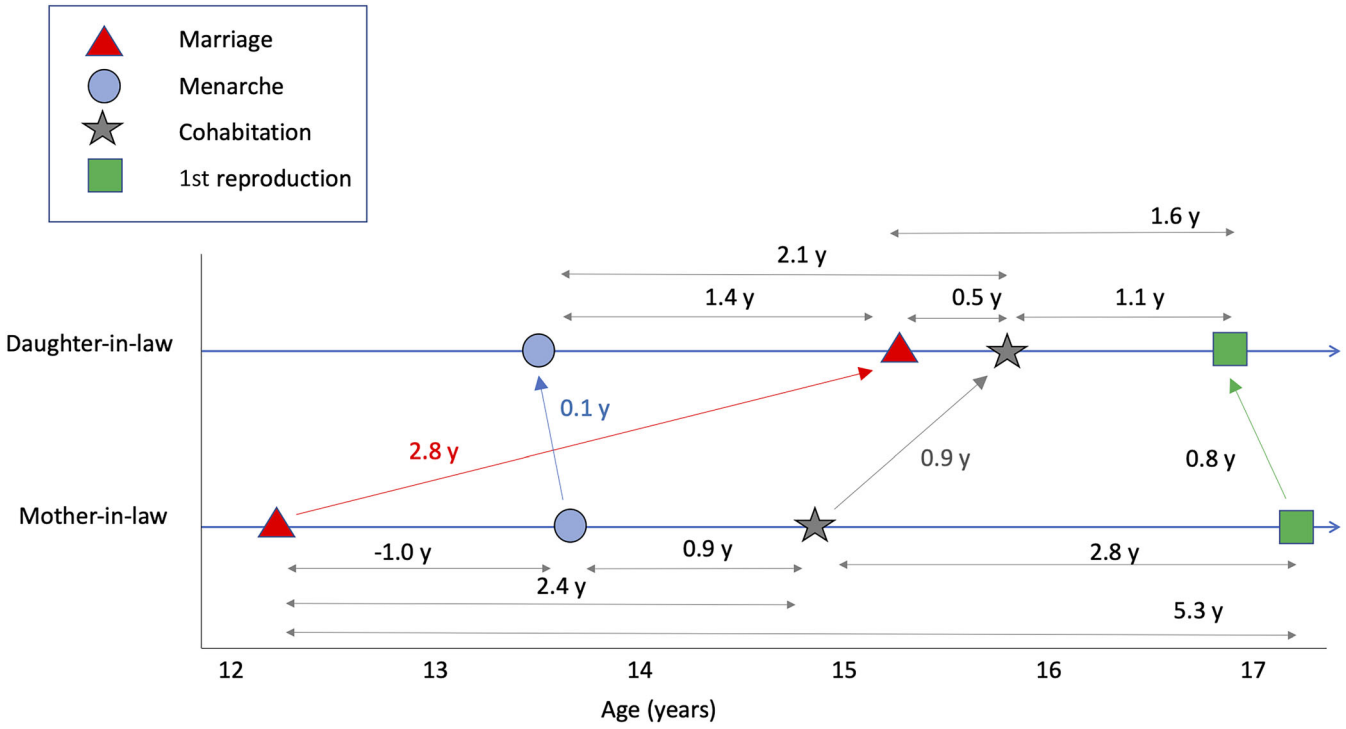

FIGURE 2 Average gap in secular trends of co-resident mother-in-law (MIL) and daughter-in-law (DIL) dyads. This figure compares the average age (mean values) of experiencing marriage, menarche, cohabitation with husbands and first reproduction of MIL and DIL. Arrows indicated the average gap between events. Gaps are shown between the arrows to emphasis the difference between two events. Both women experienced menarche around mean age 13.8 years. Although the MIL was married on average 2.8 years earlier than her DIL, she had a more gradual transition to co-residing with her husband, and typically had her first child on average 0.8 years later than her DIL. In contrast, the DIL tended to cohabitate with her husband soon after marriage and typically had her first pregnancy in the first year of her marriage. The data for each group of women are reported in Table 2, while the differences between dyads are given in Table 3.

DIL were married to men of median 4.0 years older ($p < .001$). Fathers tended to marry on average 2.5 years (95% CI −3.8, −1.1) earlier compared to their sons (17.5 years (SD 4.9) vs. 19.9 years (SD 4.5)). Fathers were also less educated than their sons ($p < .001$), with only 9% of fathers but 22% of sons having attained 9 or more years of education.

Table 4 shows that among MIL, 93% were uneducated and only 6% had attended primary school. In comparison, 61% of DIL was uneducated, 18% had attended primary school and 21% had lower secondary or higher education. Although DIL was on average more educated than their MIL, the generational change in education is modest as more than half of DIL had never been to school. Overall, the most common reasons cited by both women for not going to school included: to help at home/on the farm, education was not considered important for girls, family could not afford school, the women themselves were not interested in school, and that school was far away.

Only 1% of MIL and 18% of DIL were married after the universal minimum age at marriage of 18 years. Looking closer at their age at marriage, a greater proportion of MIL (26%) was married during childhood (≤10 years) or early-adolescence (11–15 years) (64%), compared to DIL: 4% and 54%, respectively. However, a greater proportion of DIL was married in late-adolescence (16–17 years) than MIL: 25% versus 8%, respectively. The most common reasons cited by both women included parents wanted them to marry at that age, a good husband/family was found, to pay less dowry, and families could not afford to keep them at home. DIL was also married because they were considered to be emotionally mature (MIL 0%, DIL 8%), had already left school (MIL 0%, DIL 6%), or due to fears of elopement (MIL 2%, DIL 8%).

A greater proportion of MIL than DIL had their first pregnancy either after the universal minimum age of 20 years (19% vs. 4%, respectively), or at a very young age (≤15 years): 19% versus 15%, respectively.

3.3 | Research question 2

Figure 3A plots age at marriage against age at menarche for MIL and DIL. Most MIL was married before

TABLE 4 Details on education and marital and first pregnancy timing of coresident mothers-in-law (MIL) and daughters-in-law (DIL).

	MIL ($n = 110$)		DIL ($n = 110$)		Difference
	F	%	*F*	%	*p*-value[a]
Education level					<0.001
None	103	93	67	61	
Primary (1–5 years)	7	6	20	18	
Lower-secondary (6–8 years)	0	0	11	10	
Secondary (≥9 years)	0	0	12	11	
Reasons for never going to school					
Not ready (too small, not interacting)	1	1	1	2	0.758
Family could not afford school	58	56	37	55	0.889
Help at home or farm	81	79	49	73	0.408
Not interested in school	13	13	14	21	0.149
Education was not important for girls	65	63	74	59	0.547
School too far away	9	9	11	16	0.129
Frequently ill	0	0	0	0	NA
To marry	2	2	0	0	0.251
Age at marriage (years)					<0.001
≤ 10 years	29	26	4	4	
11–15 years	71	64	59	54	
16–17 years	9	8	27	25	
≥ 18 years	1	1	20	18	
Reasons why they married at this age					
Parents wanted me to	98	89	91	83	0.175
Family could not afford to keep me	19	17	21	19	0.727
Started menarche	7	6	10	9	0.449
Emotionally mature	0	0	9	8	0.002
Doing poorly in school	1	1	3	3	0.313
Already left school	0	0	7	6	0.007
To pay less dowry	24	22	23	21	0.869
Found good husband/family	39	36	38	34	0.888
Finished my education	0	0	0	0	NA
Parents worried I would elope	2	2	9	8	0.030
Age at first pregnancy (years)					0.033
<18 years	60	55	63	69	
≥ 18 years	50	46	28	31	

Note: For all responses under the heading "reasons," each row represents an individual chi-square test, that is, we are comparing the frequency of positive responses by MIL versus DIL to this specific question. Bold font in the first column on the left indicate different questions.

Abbreviations: %, percentage; F, frequency; *n*, number; NA, not applicable.

[a]Chi-squared test.

menarche, with negligible correlation between the traits ($\rho = 0.1$, 95% CI −0.1, 0.4). In contrast, DIL tended to marry after menarche, but there was still a negligible correlation between these traits ($r = 0.1$, 95% CI −0.1, 0.2). Figure 3B plots age at cohabitation against menarche age. For MIL, these traits were weakly correlated ($r = 0.2$, 95% CI −0.1, 0.4), but there was a short gap between menarche and cohabitating if they were married early. For DIL, later menarche was moderately correlated with later cohabitation ($r = 0.4$, 95% CI 0.2, 0.6), and the

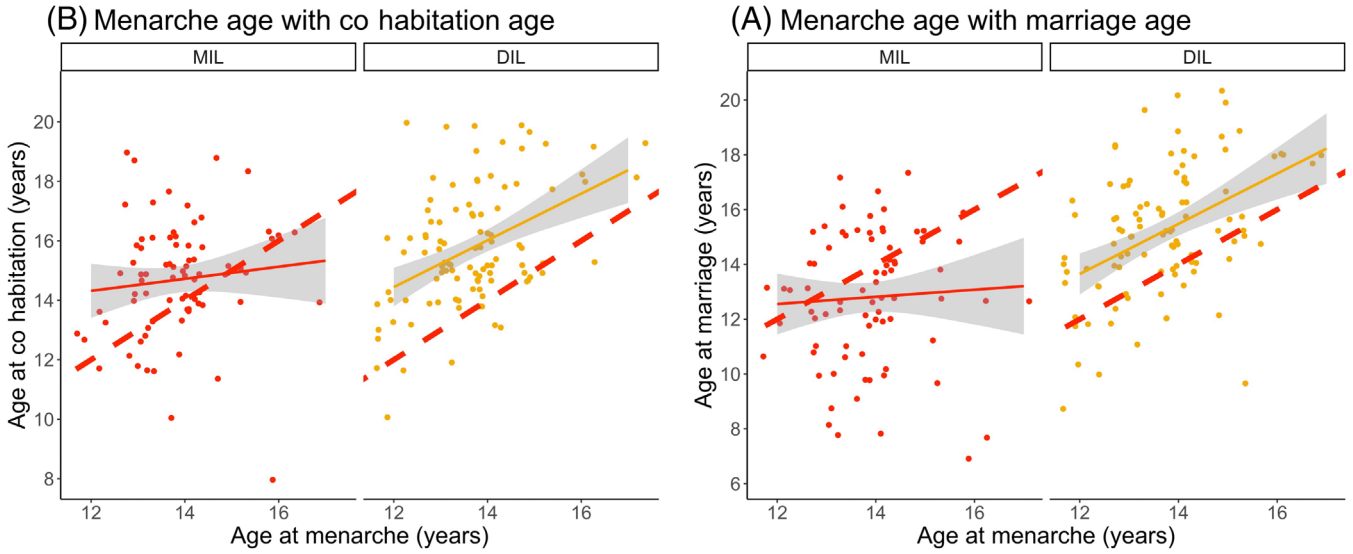

FIGURE 3 Correlation between key life events traits within individual women, stratified by mother-in-law and daughter-in-law. Mother-in-law (MIL) (shown in red). Daughter-in-law (DIL) (shown in yellow). Scatterplots with jitter examine correlations of the following traits within individual women: (A) age at menarche and marriage and (B) age at menarche and cohabitation. The solid red and yellow lines show the linear trend line fitted to the data and the gray shaded areas show the 95% confidence Interval. We superimposed the line of identity (red dotted line) onto the graph.

gap was around 2.1 years, such that only a minority started cohabiting prior to menarche.

3.4 | Research question 3

Figure 4A shows a similar mean age at menarche of the DILs and MILs, but no correlation across the dyads (Spearman's correlation = −0.1, 95% CI −0.3, 0.2). Figure 4B shows a broad trend for MIL who had been married early to have early marrying DIL, however, this trend was rather weak relative to the tendency for DIL to have been married at an older age than the MIL ($\rho = 0.1$, 95% CI −0.1, 0.3). Figure 4C shows a broad trend for MIL who had a later first pregnancy to have a later reproducing DIL, but there was a low correlation between the dyads ($\rho = 0.1$, 95% CI −0.1, 0.3). Figure 4D shows DIL was taller than MIL, but there was no tendency for taller MILs to have taller DILs ($\rho = 0.1$, 95% CI −0.1, 0.3).

3.5 | Research question 4

Table 5 shows paired results of the DIL and MIL's eldest daughter. Compared to the MIL's eldest daughter, the DIL was on average 3.3 years (95% CI −5.2, −1.4) younger. Despite this relative similarity in age, the DIL nevertheless was married on average 1.6 years (95% CI −2.2, −1.0) earlier. However, the DIL was not necessarily the eldest daughter of their own natal family, and MIL may have accepted bringing in younger DIL but marrying their own daughter at a later age, both of which may partly explain the earlier marriage age compared with the MIL's eldest daughter. Both women had completed similar levels of education ($p = .697$): ∼60% were uneducated and 11% had completed 9 or more years of education.

3.6 | Research question 5

Table 6 shows few differences between MIL and DIL in their attitudes toward their daughters' life opportunities. This suggests that gendered norms and expectation of women have changed relatively little across the two generations. Among the few differences, MIL differed (Δ = -0.6 years, 95% CI −1.0, −0.1) slightly in when they thought it was too early for a daughter to marry (14.1 years vs. 14.6 years) compared to DIL, whereas they did not differ in their idea of when marriage would be too late (MIL 28.1 years, DIL 27.5 years). Based on these individual-level criteria, DIL was more likely than MIL to think that very early marriage would be problematic due to the lack of physical maturity (MIL 66%, DIL 77%, $p = .053$) or daughters being unhappy (MIL 11%, DIL 23%, $p = .019$), and that later marriage would be a problem because of lower physical attractiveness (MIL 21%, DIL 39%, $p = .003$).

A greater proportion of MIL thought daughters was an economic burden than DIL (MIL 63%, DIL 46%,

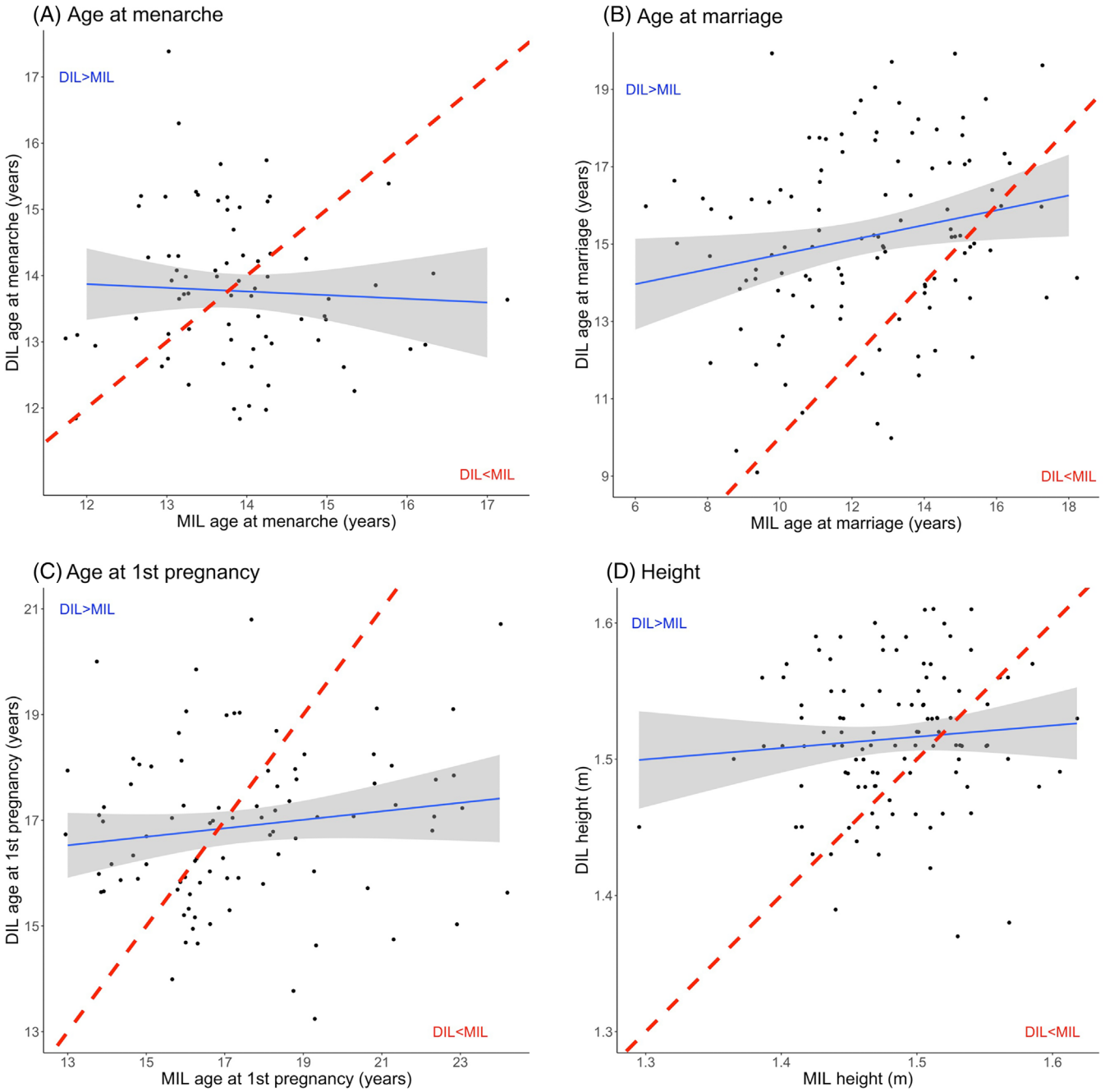

FIGURE 4 Comparison of mother-in-law (MIL) and daughter-in-law (DIL) traits. Scatterplots with jitter evaluate potential intra-household clustering of specific traits related to the transition to womanhood: (A) age at menarche, (B) age at marriage, (C) age at first pregnancy, and (D) height. A linear trend line (blue) was fitted to examine the correlation between MIL and DIL traits with 95% confidence Interval (shown by the area shaded in gray). The line of identity (red dotted line) was superimposed onto the graph. Data above the line of identity indicates values which were large for DIL, and data below the line of identity indicate values which were smaller for DIL.

$p = .01$), and that marrying too late may bring on shame onto families if the daughter eloped (MIL 55%, DIL 31%, $p = .001$), or that there would be no problem with marrying later (MIL 43%, DIL 28%, $p = .024$). Both MIL and DIL thought that one or both parents should decide whether a daughter should go to school and when she should marry. However, a greater proportion of MIL also thought a daughter's brother (MIL 4%, DIL 0%, $p = .044$) or grandfather (MIL 19%, DIL 6%, $p = .005$) could decide her education and grandfathers (MIL 20%, DIL 10%, $p = 0.038$) on her marriage age.

Given that both MIL and DIL groups encompassed age variability, we further assessed in the whole sample whether a woman's age was associated with the

TABLE 5 Comparison of daughter-in-law (DIL) and eldest daughter of mother-in-law (MIL).

	DIL ($n = 89$)		Eldest daughter of MIL ($n = 89$)		DIL-eldest daughter of MIL dyads: Paired differences		
	Mean	SD	Mean	SD	△	95% CI	*p*-value[a]
Age (years)[c]	31.1	4.2	34.5	8.7	−3.3	−5.2, −1.4	<.001
Age at marriage (years)[d]	15.4	1.6	17.0	2.9	−1.6	−2.2, −1.0	<.001
	F	%	F	%	*p*-value[b]		
Education (years)					.697		
None	67	61	55	62			
Primary (1–5 years)	20	18	19	21			
Lower-secondary (6–8 years)	11	10	5	6			
Secondary (≥9 years)	12	11	10	11			

Abbreviations: %, percentage; CI, confidence interval; Difference, DIL minus eldest daughter of MIL; F, frequency; *n*, number; SD, standard deviation.
[a]Paired *t*-test.
[b]Chi-squared test.
[c]*Eldest daughter of MIL* $n = 86$.
[d]*Eldest daughter of MIL* $n = 83$.

likelihood of her holding a specific norm. We found that older age was associated with lower odds of women considering that physical or emotional immaturity, inadequate education, or being unhappy would be the consequence of a daughter being married too early. Older age was also associated with lower odds of considering that the daughter would no longer be physically attractive, but increased odds of fearing that the daughter might elope and shame the family, if the daughter was married too late. Finally, older age was associated with lower odds of expecting that the daughter would complete secondary education, and increased odds of considering a daughter as an economic burden on the household. Linear regression models showed that there was a secular increase in the ideal age specified for marriage (+0.12 years/decade, CI 0.03, 0.20, $p = .009$) and first reproduction (+ 0.09 years/decade, CI 0.00, 0.19, $p = .052$) (Figure S4). The threshold considered to define marriage as too early also increased (+0.26 years/decade, CI 0.13, 0.38, $p < .001$), whereas the threshold considered to define marriage as too late showed no trend (−0.10 years/decade, CI −0.53, 0.33, $p = .6$).

4 | DISCUSSION

The UN considers girls who were married before the minimum age of 18 years to be "children" (UN General Assembly, 2018), whereas in early-marrying societies, they are considered to have transitioned to womanhood through marriage (Melchiorre, 2004). Understanding the factors shaping the timing of marriage has profound implications for understanding both the duration of childhood, and the safe transition to womanhood.

The issue of "how early is too early" for women's marriage is complex, and can be approached through a variety of lenses, examples including economic and livelihood security, family honor and social status, health outcomes, or Darwinian fitness. The early marriage of women may be considered a decision that is weighed against whatever other options are locally feasible (Schaffnit et al., 2021). In a study of female adolescents in north-western Tanzania, for example, early marriage was considered to provide benefits including increased social status, whereas remaining unmarried might also lead to outcomes such as early pregnancy, with less social support (Schaffnit et al., 2021). From a Darwinian perspective, early marriage might increase reproductive fitness if mortality risk is high (Schaffnit & Lawson, 2021). However, women's marriage may also be embedded in different forms of intra−/inter-family conflicts of interest. For example, parents may take economic benefits from marrying their daughters early, while the daughters pay the costs (Schaffnit & Lawson, 2021). Family honor may be impacted if an unmarried daughter falls pregnant, with implications for the marital prospects of other offspring (Morrow et al., 2023).

We have also suggested that where it can reduce the risk of infidelity, husbands gain fitness advantages from marrying women early, even though this can increase the risk of child mortality and ill-health of the wife (Wells, 2022). In our own research on our study population, we have identified numerous adverse consequences of women's early marriage, including maternal and child undernutrition, shorter final height with implications for

TABLE 6 Norms held by mother-in-law (MIL) and daughter-in-law (DIL) on a daughters' life opportunities.

	MIL ($n = 110$)		DIL ($n = 110$)		Difference[a]	
	Mean	SD	Mean	SD	△ (95%CI)	*p*-value[a]
Ideal age at marriage for daughter (years)	19.8	1.0	20.0	1.3	−0.2 (−0.5, −0.1)	.146
Age too early to marry for daughter? (years)	14.1	1.9	14.6	1.6	−0.6 (−1.0, −0.1)	.010
Age too late to marry for daughter? (years)	28.1	6.4	27.5	5.4	0.6 (−1.0, 2.3)	.452
Age daughters should have first child? (years)	21.5	1.3	21.7	1.2	−0.1 (−0.5, 0.2)	.459
	F	%	*F*	%		*p*-value[b]
Daughters' education and marriage						
Ideal level of schooling for daughter						.442
None	1	1	0	0		
Primary	1	1	1	1		
Secondary	49	46	40	36		
More than secondary	59	54	69	63		
Who should decide if daughter goes to school						
Daughter herself	3	3	5	5		.471
Her mother	44	40	40	36		.579
Her father	42	38	35	32		.322
Mother and father together	59	53	60	55		.892
Her brother	4	4	0	0		.044
Her grandmother	17	16	11	10		.225
Her grandfather	21	19	7	6		.005
Problems, daughter marrying too early						
Below legal marriage age	49	45	46	45		1.00
Not physically mature (pre-pubertal)	72	66	85	77		.053
Not emotionally mature	31	28	40	36		.194
Problem during pregnancy or birth	96	87	99	90		.524
Not enough education	7	6	12	11		.230
Pay more dowry	1	1	2	2		.561
Pay less dowry	8	7	3	3		.122
Daughter may be unhappy	12	11	25	23		.019
Problems, daughter marrying too late						
Community looks badly on family	46	42	41	37		.491
Difficulty in marrying other children	14	13	12	11		.676
May not find good husband/family	19	17	28	26		.139
May marry into poorer family	3	3	0	0		.081
May be too educated	2	2	1	1		.561
Too long after menarche	0	0	0	0		NA
Unwanted sexual advances/virginity	8	7	11	10		.471
Pay less dowry	1	1	1	1		1.00
Pay more dowry	16	15	13	12		.550
Daughter may elope and shame family	60	55	34	31		.001
Will not be physically attractive	23	21	43	39		.003
No problem	47	43	31	28		.024

(Continues)

TABLE 6 (Continued)

	F	%	F	%	p-value[b]
Daughters' education and marriage					
Who should decide when daughter marries?					
Daughter herself	3	3	7	6	.195
Her mother	37	34	34	31	.665
Her father	42	38	40	36	.780
Mother and father together	60	55	62	56	.786
Her brother	3	3	0	0	.081
Her grandmother	20	18	14	13	.263
Her grandfather	22	20	11	10	.038
Expectations for daughters					
Daughters are an economic burden (yes)	69	63	50	46	.010
Daughters earn income outside of home (yes)	106	96	103	94	.353
Daughters should live with MIL (yes)	105	96	107	97	.471

Note: For all responses except education, each row represents an individual chi-square test, that is, we are comparing the frequency of positive responses by MIL versus DIL to this specific question. Bold font in the first column on the left indicate different questions.
Abbreviations: %, percentage; CI, confidence interval; Difference, MIL minus DIL; F, frequency; *n*, number; NA, not applicable; SD, standard deviation.
[a]Paired *t*-test.
[b]Chi-squared test.

childbirth complications, increased risk of preterm birth, lack of education, and lack of economic advantage (Marphatia et al., 2020; Marphatia, Saville, et al., 2022; Marphatia, Saville, Manandhar, Amable, et al., 2021; Marphatia, Saville, Manandhar, Cortina-Borja, et al., 2021; Miller et al., 2022; Wells, Marphatia, Cortina-Borja, et al., 2022; Wells, Marphatia, Manandhar, et al., 2022). On this basis, we consider that a safe transition to womanhood in this population would include completing secondary education, being within the Body Mass Index (BMI) thresholds that are used to define malnutrition ($>= 18.5$ and $<25\ kg/m^2$), reaching adult height prior to marriage, and coresidence after menarche.

To ascertain the degree of change toward this safe transition, we therefore assessed generational trends in key life events marking the transition to womanhood in rural lowland Nepal at the level of households, between coresident MIL and DIL dyads. We also examined whether norms held by MIL and DIL for a daughter's education and marriage age had changed.

At a broader scale, we identified secular increases in age at marriage and cohabitation, but paradoxically a secular decrease in the age at first reproduction, and no secular change in age at menarche. This pattern of results suggests that any trends are happening because of social changes, rather than in nutritional status, which might have impacted age at menarche. However, we believe it is valuable to assess these trends from a generational perspective by comparing women coresiding within households, as the lived experience of each DIL is strongly shaped by her MIL. By focusing on intra-household variability, we are able to understand how successive generations experience the transition to womanhood in different ways, while also standardizing for current household characteristics such as household caste and wealth.

We found that the meaning of "early marriage" has changed between the MIL and DIL generations, despite similar timing of maturation, or age at menarche. MIL was typically married before menarche, but DIL typically after menarche. However, the "earliness" in marriage of the MIL generation should be interpreted with caution, because their actual transition to womanhood was attenuated, on the assumption that cohabitation led to the commencement of sexual relations with their husband. Though DIL was married almost 3 years later than MIL, they tended to cohabitate with their husbands right after marriage and their age at first reproduction was earlier compared with MIL. However, both women were married and had reproduced at ages that are considered too early by the UN (UN General Assembly, 2018).

We also found negligible correlations in biological traits, which are expected, as the MIL and DIL grew up in different households and were not genetic relatives. Hence, the only pathway to correlations would be social selection of the wife, or a degree of matching across households in socioeconomic status. Greater

undernutrition leading to subfecundity (Sowell et al., 2015; Vitzthum, 2009) might have interacted with the earlier age of cohabitation of the MIL. Other influences, which may have changed across the two generations, include coital frequency, deliberate attempts to delay pregnancy and access to contraception (Mukherjee et al., 1996; Subedi et al., 2018).

MIL and DIL differed in the way that their individual traits were correlated. Among MIL, age at menarche was essentially unconnected with age at marriage or cohabitation, suggesting that it may not have been used as a social signal of the readiness of the transition to womanhood. In contrast, among DIL, age at menarche was positively associated with age at both marriage and cohabitation, indicating that families may have used the onset of menarche to guide decisions regarding when to marry their daughter and arrange her movement to her husband's household.

MIL's later commencement of reproduction may be biased by the fact that unlike DIL, we did not record first pregnancies in MIL that did not result in live birth. However, it is unlikely that any potential different reporting of miscarriages could explain more than a small minority of the difference in age at first pregnancy between MIL and DIL. On the basis of stillbirth rates in Nepal in 2010 of ~20 per 1000 (Hug et al., 2021), we estimate that only two MIL might have had a stillbirth before their first live birth. If these stillbirths occurred at age of 15 years instead of the of age 17.7 years as stated in our study, then the average age of MIL first pregnancy would reduce only marginally to 17.5 years, suggesting this bias would be very negligible. Studies also suggest that around 10% of pregnancies among women who know they are pregnant end in miscarriage (Dugas & Slane, 2023; Kuppusamy et al., 2023).

MILs also had a much greater gap between marriage and first pregnancy, and between cohabitation and first pregnancy, than DIL. If, as proposed above, MIL's later age at first pregnancy can be explained by stillbirths and miscarriages to only a minimal extent, then this gap may reflect other factors. From a biological perspective, MILs may not have started a sexual relationship with their husbands directly on cohabitation, or they may have engaged in sexual relations less intensively at cohabitation, tried to delay their first conception, or have been sub-fecund due to undernutrition.

To provide context on these changes, we collected data from both MIL and DIL on social norms relating to women's marriage and education and found minimal contrast on average between the two generations. Whilst men tend to be the primary decision-makers around women's education and marriage, it is nevertheless important to understand women's perspectives. Older women also have some influence, especially if her husband is deceased, or he, or other male family members have migrated for work. Equally important, young wives are future mothers-in-law; hence, it is interesting to know what norms they hold earlier in their reproductive career, and if these are different from their MIL. These data also enable us to understand whether norms are shifting across generations, and whether women, if given the chance to make decisions, are more likely to uphold gendered expectations, or to change them.

There was general accord between MIL and DIL regarding why they had been married at the age that they were. These reasons broadly mapped onto the problems identified regarding daughters being married "too early" (before 15 years) or "too late" (28 years), suggesting little generational shift in socio-cultural norms around women's life opportunities. The only differences of importance were that DIL specified a slightly higher age threshold than MIL for defining a girl's marriage as "too early," and DIL was less likely to consider that daughters are an economic burden on the household. As both MIL and DIL groups encompassed age variability, we conducted further analyses that showed an overall trend toward younger women being more concerned about the welfare of daughters, indicated by greater concerns over potential penalties of early marriage. Younger women was more likely to expect daughters to complete secondary education, and less likely to consider daughters as an economic burden. Thus, secular trends in social norms appear to be evident, but the magnitude is small, hence the relative lack of differences between MILs and DILs at the group level. There has also been a secular trend in the age at which women consider daughters should marry and have their first child. These shifts are interesting, given our finding that marriage does indeed happen much later for DIL compared with MIL, but first reproduction slightly earlier.

Furthermore, we recognize that in this society, women's values regarding their daughters' education and marriage decisions may have limited impact on what actually happens, and we cannot be certain that the responses provided reflected the women's actual preferences, as opposed to their restating of familiar norms. In this context, it is informative to evaluate the MIL's norms/preferences against the actual experience of her eldest daughter. On average, MIL specified 19.8 years as the ideal age for a daughter's marriage, and 99% wanted secondary education for their daughters. In contrast, their actual daughter was married at mean age of 17 years, and only 17% of these daughters had any secondary education. Therefore, we suggest that the women were reporting their preferences, and that these preferences were not met.

However, we also found that the MILs' daughters, who were genetically related and perceived as part of one's family, married later than DILs who were not genetically related, and instead were "recruited" into the family. This indicates that households place contrasting value on young women, depending on whether they are blood kin or not. However, every DIL is another household's own daughter, and at a population level not all families may be able to practice this contrasting "incoming/outgoing" treatment.

Our approach was similar in design to another study in the far Western region of Nepal, which also found striking increases in the age at marriage between three generations of women: grandmothers were married at an average of 5–6 years (child betrothals), mothers at 10 and 12 years, and daughters between 14 and 18 years (Ghimire & Samuels, 2014). The spousal age gap had also decreased substantially across these three generations in this study, from 18 years to 7 and 3 years, whereas in our study, both MIL and DIL had about a 5-year gap. However, while girls' education had increased in far Western Nepal (Ghimire & Samuels, 2014), in our population the shift toward later marriage across cohorts occurred with only modest increases in education in the DIL generation. In both populations, social norms around education and marriage were slow to change, indicating that the "value" of education was related to marriage transactions (Ghimire & Samuels, 2014).

Our study had some limitations. Our sample size was small with some missing values, but still enabled us to assess generational trends across and within generations of genetically unrelated and related women. Given women's high illiteracy and the low importance given to knowing one's age in this population, values for current age and age-related traits may be recalled with error, especially in MILs with greater age, who were recalling events from longer ago (Liang et al., 2021). This may lead to potential heaping of age-related data, but we did not find evidence of this in our outcome data, and the fieldworkers were trained to ask questions to address these issues. We assume that error was randomly distributed.

MIL and DIL were asked different questions about the commencement of their reproductive careers. We addressed this by subtracting 9 months from the age at first birth provided by MIL to attain a comparable age at first pregnancy value with DIL. The later age at first pregnancy of MIL compared to DIL and gap between MIL marriage age and first pregnancy age was also smaller. Collectively, we may therefore have overestimated the downward generational trend in age at first reproduction. The data on norms were inevitably shaped by the questionnaires that we developed, and we are unable to know the extent to which responses reflect preferences.

We did not have data on the MIL not coresiding with DIL, and hence we do not know whether the MIL in our sample were comparatively longer-living, early/late marrying, and so on. Our study on the Maithili-speaking Madhesi women may not be generalizable to all women, but would apply to other early marrying low educated and undernourished populations in South Asia. Our findings may also be more applicable to DIL coresiding with MIL, though there were no substantial differences in the characteristics of DILs living in nuclear households. If the balance shifts toward nuclear families in the future, then our results would have understated generational changes across the population. We did not know the birth order of DIL, rendering the comparison of women entering and leaving a given household exploratory.

Our study also had some strengths. Our research was conducted in an extremely marginalized population with high levels of early marriage, relative poverty and illiteracy, and we obtained substantial information about women's lives in this challenging setting. The comparison of MIL and DIL minimized the role of shared alleles in shaping the outcomes across the two generations, though the fertility of the DIL might be impacted by the fecundity of her husband, in turn potentially influenced by alleles shared with the MIL. We used several bio-social markers to describe generational trends in the transition to womanhood. Our study was unique in having intergenerational data on secular trends of coresident women who were genetically unrelated (MIL and DIL), transgenerational trends on mother–eldest daughter dyads, and data within generations on women coming into, or leaving, the household (DIL and eldest daughter of MIL). We could also assess whether normative attitudes held by MIL and DIL toward a daughter's life opportunities were different.

5 | CONCLUSION

While marital timing has shifted across cohorts in our study, strict socio-cultural norms may explain why the initiation of cohabitation and first intercourse has been slower to change. Data on changing marriage age may therefore suggest a bigger change in women's lives than has actually happened. The persistent early marriage of women across and within generations suggests that legal norms have not been successful in shifting social norms, which may partly explain the lower effectiveness of interventions aiming to change them (Batyra & Pesando, 2021; Prakash et al., 2019). We emphasize that the most influential household members regarding norms of women's marriage are men; hence, the most powerful driver of change may be the combination of

increased education among men, followed by the time-lag required for them to achieve maximal influence in household decision-making. Further qualitative investigation of MIL and DIL attitudes and beliefs around the entire chain of events marking the transition to womanhood, would enrich our understanding of their experiences.

AUTHOR CONTRIBUTIONS

A. Marphatia: Conceptualization (equal); data curation (equal); formal analysis (lead); methodology (equal); visualization (equal); writing—original draft (lead). **L. Busert-Sebela**: Data curation (supporting); funding acquisition (supporting); investigation (supporting); writing—review and editing (equal). **D. S. Manandhar**: Funding acquisition (equal); project administration (equal); writing—review and editing (equal). **A. Reid**: Formal analysis (supporting); methodology (supportive); writing—review and editing (equal). **M. Cortina-Borja**: Formal analysis (supporting); methodology (equal); visualization (supporting); writing—review and editing (equal). **N. Saville**: Conceptualization (equal); funding acquisition (equal); data curation (lead); investigation (supporting); methodology (supportive); project administration (lead); writing—review and editing (equal). **M. Puri**: Conceptualization (equal); data curation (lead); project investigation (lead); methodology (supportive); administration (lead); writing— review and editing (equal). **M. Dahal**: Data curation (supporting); project administration (supporting); investigation (supporting); writing—review and editing (equal). **J. C. K. Wells**: Conceptualization (lead); formal analysis (supporting); data curation (equal); funding acquisition (lead); methodology (equal); project administration (lead); visualization (equal); writing—review and editing (equal).

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the senior author upon reasonable request.

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