

Changing Scenario of Sex Ratio at Birth and Its Future Implications in Nepal

□ Min Raj Adhikari, Tribhuvan University, First Author

Email: minraj.adhikari@mrc.tu.edu.np

ORCID ID: <https://orcid.org/0009-0004-5973-5973>

□ Anuradha Acharya, National Institutes of Mental Health(NIoMH), Co-author

Email: aracharyas@gmail.com, ORCID ID: <https://orcid.org/0009-0001-9916-2581>

□ Sudarshan Rijal, Tribhuvan University, Co-author

Email: sudarshan.rijal@mamc.tu.edu.np

ORCID ID: <https://orcid.org/0009-0000-2639259X>

Abstract

The sex ratio at birth (SRB) in Nepal has historically remained within or near the biologically normal range of 102–107 male births per 100 female births. However, the 2078 BS. (2021 AD.) Population and Housing Census reports an SRB of 112, indicating a distinctly male-skewed pattern. Using census-based time series data from 2009/2011 to 2078, along with disaggregated indicators by district, province, urbanization level, wealth quintile, and educational status, this paper analyzes the changing SRB trends in Nepal and their potential future implications. The analysis reveals that while earlier SRB levels were largely consistent with natural variation, recent increases—particularly in Madhes Province and districts such as Dhanusha and Siraha—strongly suggest the emergence of sex-selective practices amid declining fertility and persistent son preference. If these trends continue, Nepal may face long-term consequences, including a surplus of marriageable-age males, disruptions in family formation, and heightened risks of gender-based violence and social instability, underscoring the need for proactive, multi-sectoral policy responses.

Key Word: Sex ratio at birth (SRB), Prenatal sex selections, Sex determination technology, Son preference

Introduction

The sex ratio at birth (SRB)—defined as the number of male live births per 100 female live births—naturally ranges between 102 and 107. Persistent deviations above this range typically indicate human interference, particularly prenatal sex selection driven by son preference and enabled by access to sex determination technologies. Nepal's earlier censuses did not show a markedly abnormal national SRB, but the 2021 (2078) census reveals a clear increase to 112 boys per 100 girls, exceeding the upper biological norm (Chao et al., 2020).

According to UNFPA (2012), prenatal sex identification offers an attractive solution for couples seeking both fewer children and a socially adequate number of sons. Although Nepal liberalized abortion in 2002, the law strictly prohibits sex-selective abortion and

fetal sex disclosure. Nevertheless, the continued rise in SRB suggests these practices persist underground (Guilmoto, 2025). Cross-national evidence indicates that SRB increases with higher birth order and is highest among final births and families with no previous son. Data from India and South Korea show that Hindus, Sikhs, Buddhists, and Jains exhibit higher SRB levels than Muslims or Christians, while evidence from China, India, and Vietnam indicates that SRB also rises with educational attainment (UNFPA, 2012).

Prenatal sex selection has already distorted SRB levels to between 110 and 120 in several South, East, and Central Asian countries, reflecting deep-seated gender discrimination and son preference. Patriarchal social structures reinforce son preference and perpetuate violence and discrimination against women and girls. Declining fertility and rapid advances in fetal sex detection technologies have exacerbated this practice. Although sex selection in favor of boys is a symptom of pervasive social, cultural, political, and economic injustices against women—and a clear violation of women's human rights—it continues to spread with the wider application of diagnostic technologies.

This shift is unfolding amid rapid demographic and socioeconomic changes: fertility has declined to near-replacement level, urbanization and education have expanded, and access to ultrasound and safe abortion services has increased—yet patriarchal norms and son preference remain deeply rooted. UNFPA (2012) warns that the socioeconomic consequences of rising SRB are alarming, including heightened risks of human rights violations such as abduction, trafficking, and the sale of women and girls for marriage or sexual exploitation.

Recent research and policy discussions explicitly refer to “sex imbalances at birth” in Nepal, drawing comparisons with the experiences of China and India. Against this background, this paper—titled “Changing Scenario of Sex Ratio at Birth and Its Future Implications in Nepal”—aims to (i) describe long-term SRB trends using census data, (ii) document spatial and socioeconomic differentials, and (iii) discuss the likely demographic and social consequences if current trends are not reversed.

Methodology

Data sources

This study is based on secondary data from Nepal's Population and Housing Censuses, with particular emphasis on the 2021 (2078 BS.) census results and associated analytical reports. The following quantitative inputs are used: national SRB for census years from BS. 2052/2054 to 2078 (2021 AD.), district-level SRB for those with the highest (>120) and lowest (<100) values in the 2021 census; and SRB disaggregated by province, degree of urbanization, wealth quintile, and educational status for 2011 and 2021. Additional contextual information—including fertility trends, internal migration, and broader demographic shifts—is drawn from UNFPA Nepal, other relevant reports, and analytical summaries of the 2021 census.

Variables and indicators

The key outcome variable is the sex ratio at birth (SRB), defined as the number of male live births per 100 female live births. The background variables include province (Koshi, Madhes, Bagmati, Gandaki, Lumbini, Karnali, Sudurpaschim), degree of urbanization (urban, peri-urban, rural), wealth quintile (lowest to highest), and women's educational status (never attended school, basic schooling, secondary, higher).

Analytical approach

The analysis is descriptive and comparative. Time series trends are examined using line charts, while cross-sectional differences are visualized through bar charts generated from tabulated data. Observed patterns are interpreted in light of international literature on SRB and Nepal-specific evidence on sex selection and gender norms. No inferential statistics are applied; instead, emphasis is placed on the magnitude and direction of differences and their consistency with known demographic mechanisms.

Results and discussion

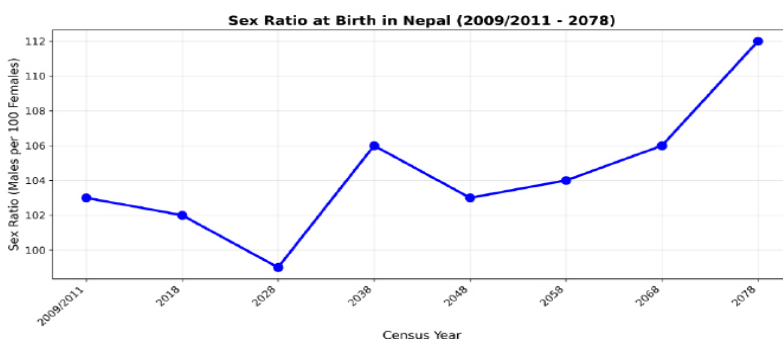
National trend in sex ratio at birth

The national SRB time series shows modest fluctuations around the biologically normal range up to 2068, followed by a sharp increase in 2078. Based on the pattern of SRB results obtained from the population censuses, the trajectory can be divided into three phases for analytical purposes. In the early period (2009/2011–2028), SRB decreases from 103 to 102 and then to 99, temporarily dipping just below the typical lower bound of 102. In the middle period (2038–2068), SRB rises to 106 in 2038 and hovers between 103 and 106 in 2048, 2058, and 2068—values consistent with natural variation. In the recent period (2078), SRB jumps to 112, clearly above 107 and thus indicative of a male-skewed imbalance.

A line chart highlights this pattern, showing a relatively stable trend until 2068 and a pronounced upward spike in 2078. According to UNFPA and the 2021 census report, 112 boys were born for every 100 girls in the year preceding the census, with about 52.8 percent of newborns being male—reinforcing the reliability of this figure.

Figure 1:

Sex Ratio at Birth in Nepal, 2009/2011–2078



Spatial disparity: districts with highest and lowest SRB

Approximately 47 districts in Nepal have an SRB below the national average (112), 22 districts above the national average, and 8 districts at the same level as the national average (NSO, 2021). Table 1 highlights a striking contrast between highly male-biased districts—such as Dhanusha (133) and Siraha (128)—and the strongly female-favored district of Mustang (92). Among the four highest SRB districts, three are in Madhes/Terai (Dhanusha, Siraha, Saptari) and one is a hill district (Arghakhanchi), indicating that son preference and sex selection are not confined to a single ecological belt.

These extreme values far exceed normal biological variation and almost certainly reflect deliberate prenatal sex selection. In contrast, the low SRB in Mustang and Rolpa may be attributed to small population sizes, migration patterns, or local sociocultural norms that do not emphasize strong son preference. However, more detailed micro-level research is needed to confirm these hypotheses (UNFPA, 2012).

Table 1.

Sex Ratio at Birth (SRB) by Selected Districts, 2021/2078

District with Highest SRB(>120):	Sex Ratio at Birth (SRB)
Dhanusa	133
Siraha	128
Arghakhanchi	124
Saptari	123
District with Lowest SRB(<100):	
Humla	99
Dhankuta	99
Okhaldhunga	99
Ilam	99
Rolpa	97
Mustang	92

Provincial Trends and the rise of Madesh

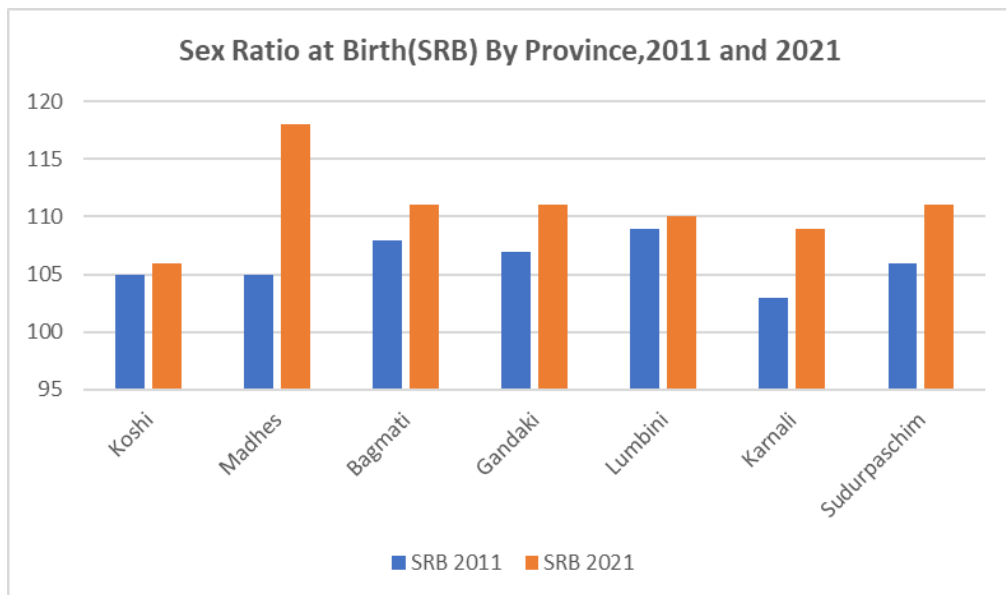
A grouped bar chart (Figure 2) shows mild increases in SRB between 2011 and 2021 in most provinces, remaining within or close to the normal range (Koshi, Bagmati, Gandaki, Lumbini, Karnali, Sudurpaschim). However, Madhes Province experienced a dramatic jump from 105 to 118—far above the biological norm and higher than the national average of 112.

Madhes has the most pronounced provincial SRB anomaly at 118 boys per 100 girls, while Koshi has the lowest at 106, still elevated but within a plausible biological range. The combination of very high SRB in several Madhes districts (Dhanusha, Siraha, Saptari) and the provincial average of 118 points to strong son preference in

the region, likely reinforced by dowry practices, patrilocal residence, and lineage-based land inheritance (Guilmoto, 2025).

Figure 2

Sex Ratio at Birth by Province, 2011 -2021



Urban–rural differences

According to the 2021 Population Census, about two-thirds (66%) of the population lives in urban municipalities, but in reality, less than one-third (27%) resides in urban areas (NSO, 2021). Table 2 shows that SRB is highest in urban areas (115), closely followed by peri-urban areas (114), and comparatively lower in rural areas (108)—though still above the biological norm. This gradient is consistent with the hypothesis that access to ultrasound and abortion services, along with the financial means to use them, is greater in urban and peri-urban settings, where households can more readily act on son preference.

Additionally, urban and peri-urban residents tend to have lower fertility and stronger "small family" ideals, increasing the incentive to ensure at least one son within a limited number of births. Rural areas, while not free of son preference, may face more constraints in accessing sex selection technologies and may maintain somewhat larger desired family sizes, thereby reducing the need for sex-selective behavior to achieve a son (UNFPA, 2012).

Table 2.
Sex Ratio at Birth by Degree of Urbanization, 2021

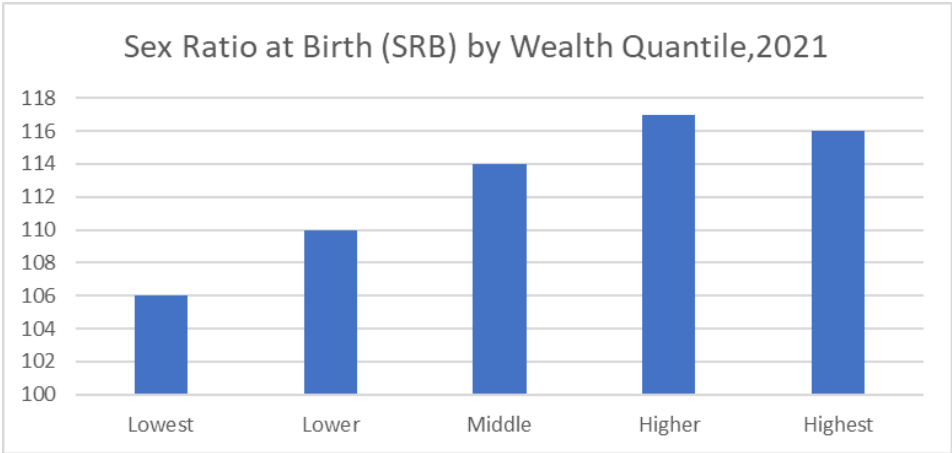
Degree of urbanization	Sex Ratio at Birth (SRB), 2021
Urban	115
Peri-urban	114
Rural	108

Wealth differentials

Figure 3 reveals a clear upward gradient in SRB across wealth quintiles, rising from 106 in the lowest quintile to 117 in the higher quintile and 116 in the highest quintile. This pattern indicates that sex selection is more prevalent among economically better-off households, which are more likely to have access to private diagnostic and abortion services and to be strongly committed to small family sizes (Guilmoto, 2025).

International literature suggests a similar relationship in other Asian contexts, where wealthier families first adopt sex selection technologies and drive early increases in SRB, which may later diffuse to other groups. However, the fact that even the lowest wealth quintile has an SRB of 106—above the biological norm—suggests that sex-selective practices are not limited to elites and that underlying son preference is widespread (UNFPA, 2012).

Figure 3.
Sex Ratio at Birth by Wealth Quintile, 2021



Educational status and SRB

Table 3 shows that SRB is elevated among women with no schooling (110) and basic schooling (112), peaks at 115 among those with secondary or intermediate education, and drops slightly to 110 among women with higher education (Bachelor's degree and above). This pattern suggests that moderately educated women (secondary level) may

be at the center of sex selection practices, as they combine strong aspirations for smaller, better-educated families with persistent son preference and relatively good access to medical technology. The somewhat lower SRB among highly educated women may indicate more gender-egalitarian norms or greater awareness of the ethical and legal issues surrounding sex selection, although the value of 110 still exceeds the biological norm (Guilmoto, 2025).

Table 3.

Sex Ratio at Birth by Educational Status of Women, 2021

Educational Status	Sex Ratio at Birth (SRB),2021
Never been to school	110
Basic schooling (0-5)	112
Secondary (5- intermediate)	115
Higher (Bachelor and above)	110

Interpreting the patterns and future implications

The national, spatial, and socioeconomic patterns indicate that SRB in Nepal has moved from a largely natural range to a clearly male-skewed level (112 nationally), particularly in Madhes Province and selected districts.. The imbalance is strongest in urban and peri-urban areas, wealthier households, and women with at least some schooling-consistent with technology-enabled sex selection (Guilmoto, 2025).

If this male-skewed SRB persists over multiple decades, Nepal will produce cohorts with an excess of men relative to women, especially in certain regions and socioeconomic groups. According to UNFPA (2012), such "marriage squeezes" can lead to: (i) increased numbers of men unable to find partners, leading to delayed or foregone marriage and greater pressure on women in partner selection; (ii) growth in cross-regional and cross-border marriages, sometimes involving unequal power relations, trafficking, or exploitation; and (iii) heightened risks of gender-based violence and social unrest where large numbers of young men face limited economic and marital opportunities.

In Nepal's context of rapid demographic aging and significant out-migration, a skewed SRB may further complicate the future population structure, affecting caregiving patterns, labor markets, and social protection systems—particularly if women remain central to unpaid care (NSO, 2021).

Although governments of all countries, including Nepal, agreed at the 1994 International Conference on Population and Development (ICPD) in Cairo to eliminate "all forms of discrimination against the girl child and the root causes of son preference, which results in harmful and unethical practices regarding female infanticide and prenatal sex selection," progress has been limited. Several UNFPA-organized conferences in the Republic of Korea (1994), China (2004), India (2007), and Vietnam (2011) aimed to combat sex ratio imbalances, yet their impact has been significantly weaker than anticipated, as evidenced by persistently high SRB levels observed today in South Asian

countries, including Nepal.

Policy responses therefore need to move beyond narrow legal bans on sex-selective abortion to address the deeper determinants of son preference—such as inheritance systems, social protection for old age, dowry and marriage practices, and girls' access to quality education and decent work. Evidence from other countries suggests that comprehensive, gender-transformative approaches, rather than standalone population or fertility policies, are more likely to succeed in moderating SRB and preventing long-term demographic distortions (Puri & Tamang, 2015).

Findings and conclusion

Key findings

National Trend: Nepal's sex ratio at birth remained within or close to the biologically normal range (approximately 102–107) from 2009/2011 to 2068 but rose sharply to 112 in the 2078 census, indicating a clear male-biased imbalance.

Spatial and Socioeconomic Disparities: Extremely high SRB values are observed in districts such as Dhanusha (133), Siraha (128), Arghakhanchi (124), and Saptari (123), while some districts like Mustang (92) and Rolpa (97) show below-normal SRB. Madhes Province experienced a dramatic increase from 105 to 118 between 2011 and 2021, making it the province with the most distorted SRB, whereas Koshi remains closer to the biological norm. SRB is higher in urban (115) and peri-urban (114) areas than in rural areas (108) and rises with wealth—from 106 in the poorest quintile to approximately 116–117 in the richer quintiles. SRB peaks among women with secondary or intermediate education (115) while remaining elevated among women with no schooling or higher education (around 110–112).

Drivers and Implications: These patterns strongly suggest technology-mediated prenatal sex selection in a context of strong son preference, declining fertility, and expanding access to ultrasound and abortion services—particularly among better-off and more urbanized groups. If unaddressed, the skewed SRB is likely to produce future cohorts with a surplus of men, increasing the risk of marriage squeezes, gender-based violence, trafficking, and social tensions. These dynamics will interact with aging and migration patterns to reshape Nepal's demographic and social landscape.

Conclusion

The changing scenario of the sex ratio at birth in Nepal—culminating in an SRB of 112 in the 2078 (2021 AD) Population and Housing Census, along with pronounced regional and socioeconomic disparities—marks a transition from largely natural demographic variation to deliberate, technology-enabled gender bias at birth. This transformation reflects broader socioeconomic changes, including declining fertility, increased urbanization, and expanded access to reproductive technologies. However, it also exposes the persistence of patriarchal norms and son preference, which have adapted to new conditions rather than disappeared.

To avert severe long-term consequences, Nepal must act now to integrate SRB

concerns into its wider population and gender equality agenda. Key actions include enforcing laws against sex-selective practices, regulating diagnostic services, strengthening social protection and property rights for women and girls, and promoting positive norms that value daughters equally to sons. Only such a comprehensive and forward-looking approach can stabilize the sex ratio at birth and ensure that Nepal's demographic future supports—rather than undermines—inclusive and equitable development.

References

- Chao, F., KC, S., & Ombao, H. (2020). *Levels and trends in the sex ratio at birth in seven provinces of Nepal between 1980 and 2016 with probabilistic projections to 2050: A Bayesian modeling approach*. arXiv. <https://arxiv.org/abs/2007.00437>
- Guilmoto, C. Z. (2025). *Tracing and understanding the emergence of sex imbalances at birth in Nepal over the last two decades*. Institut de Recherche pour le Développement (IRD). <https://ipc2025.popconf.org/abstracts/250506>
- National Statistics Office. (2021). *National population and housing census 2021: National report*.
- National Statistics Office. (2025). *National population and housing census 2021: Fertility in Nepal*.
- Puri, M., & Tamang, A. (2015). *Assessment of interventions on sex-selection in Nepal: Literature review*. CREHPA.
- United Nations Population Fund (UNFPA). (2012). *Sex imbalances at birth: Current trends, consequences and policy implications*.
- United Nations Population Fund (UNFPA). (2024). *Future-proofing Nepal's population strategy*. <https://nepal.unfpa.org/en/news/future-proofing-nepals-population-strategy>