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# India's Sex Ratio at Birth Begins To Normalize

*Son bias declines sharply among Sikhs, while Christians continue to have a natural balance of sons and daughters*

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This report is a collaborative effort based on the input and analysis of the following individuals. Find related reports online at [pewresearch.org/religion](http://pewresearch.org/religion).

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While the analysis for this report was guided by our consultations with these advisers, Pew Research Center is solely responsible for the interpretation and reporting of the data.

## How we did this

This study describes India’s sex imbalance at birth and how it has been changing, both nationally and within major religious groups. The report focuses on India’s four biggest religious communities – Hindus, Muslims, Christians and Sikhs – because there is not enough fertility and health data to make reliable estimates for smaller groups, such as Buddhists, Jains, adherents of other minority religions, and religiously unaffiliated people. However, members of these and many other smaller religious groups are included in general population results at the country, regional and state levels.

*Sources:* Most of the analysis is based on the Indian government-supported [National Family Health Survey](#) (NFHS) and the official [census of India](#). The most recent data is from the fifth wave of the NFHS, conducted from 2019 to 2021. The most recent census data is from 2011, because India’s 2021 census was delayed by the coronavirus pandemic.

*Terminology:* “Son preference” is a phrase standardly used by scholars to describe the outlook of parents who engage in gender-biased sex selection, using abortions to give birth to more males and fewer females than would occur naturally. However, researchers sometimes also refer to “daughter aversion” as the underlying cause of skewed sex ratios at birth in India. Both phrases are used in this report, because “son preference” and “daughter aversion” are closely linked and often interchangeable. For more details, see [“Is it son preference or daughter aversion?”](#)

*Ratios:* It is natural for women to give birth to more boys than girls, on average. International convention is to present sex ratios at birth as the number of boys per 100 girls. The natural sex ratio at birth is about 105 boys per 100 girls. In India, however, this ratio is often expressed as the number of girls per 1,000 boys, in which case the natural ratio at birth is about 950 girls per 1,000 boys. This report follows the international practice, presenting ratios as the number of boys per 100 girls. Here is a sample of how the same values are expressed in each system:

International convention sex ratio	Equivalent Indian convention sex ratio
105 boys per 100 girls	950 girls per 1,000 boys
108 boys per 100 girls	925 girls per 1,000 boys
121 boys per 100 girls	826 girls per 1,000 boys

See the [Appendix](#) for a table converting all sex ratio statistics used in this report.

*Numbers:* India's number system differs from the international one. Indians use units such as lakhs and crores, placing commas at different intervals. This report presents numbers in the international system and, in parentheses, the Indian system. For example:

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International number system	Equivalent in Indian number system
One hundred thousand (100,000)	1 lakh (1,00,000)
One million (1,000,000)	10 lakh (10,00,000)
Ten million (10,000,000)	1 crore (1,00,00,000)

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# India's Sex Ratio at Birth Begins To Normalize

## *Son bias declines sharply among Sikhs, while Christians continue to have a natural balance of sons and daughters*

India's artificially wide ratio of baby boys to baby girls – which arose in the 1970s from the use of prenatal diagnostic technology to facilitate sex-selective abortions – now appears to be narrowing, according to newly released data from the country's National Family Health Survey (NFHS).

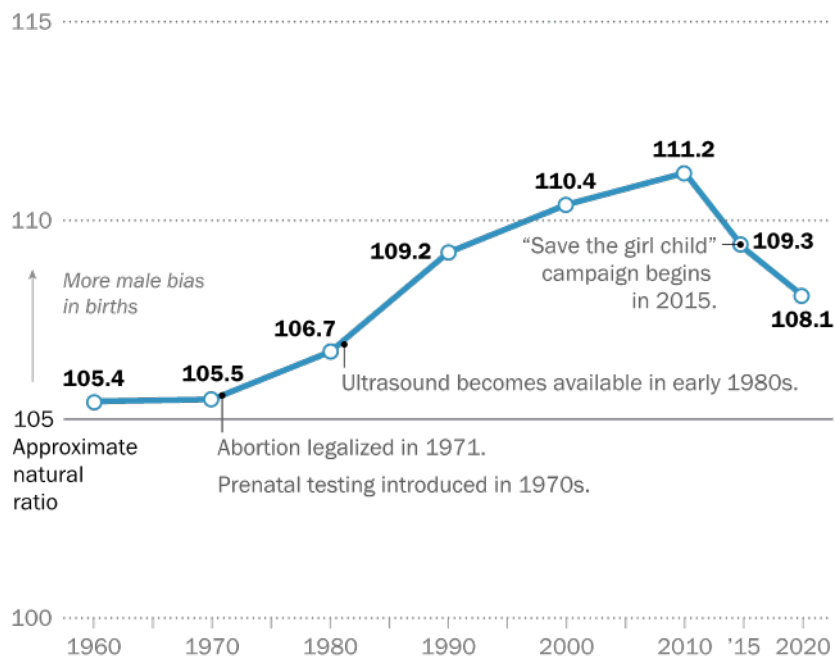
The new data suggests that Indian families are becoming less likely to use abortions to ensure the birth of sons rather than daughters. This follows years of government efforts to curb sex selection – including a ban on prenatal sex tests and a massive advertising campaign urging parents to “[save the girl child](#)” – and coincides with broader social changes such as rising education and wealth.

Among India's major religions, the biggest reduction in sex selection seems to be among the groups that previously had the greatest gender imbalances, particularly Sikhs.<sup>1</sup>

Naturally, boys modestly outnumber girls at birth, at a ratio of approximately 105 male babies for every 100 female babies. That was the

### India's sex ratio at birth has been moving toward balance in recent years

*Sex ratio at birth, or the number of male births per 100 female births*



Notes: The natural sex ratio at birth is about 105 boys per 100 girls. Numbers in this chart generally describe the sex ratio of births in the previous five years, except for the 2001 and 2011 numbers, which are from the census and are based on a question introduced in 2001 measuring the sex of babies born in the previous year.

Sources: Census of India, 2001 and 2011; National Family Health Survey, 2015-16 and 2019-21; United Nations, Department of Economic and Social Affairs, Population Division, “World Population Prospects 2019.”

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<sup>1</sup> This report focuses on India's four biggest religious groups with sufficient sample sizes to allow for a reliable analysis of sex ratios at birth: Hindus, Muslims, Christians and Sikhs.



ratio in India in the 1950s and 1960s, before prenatal sex tests became available across the country.<sup>2</sup>

In the 1970s, prenatal gender tests, conducted using amniocentesis, were rare and expensive. Since the introduction of ultrasound technology in the 1980s, gender testing has become more widespread and affordable.

**See the accordion box: “What is India’s National Family Health Survey?”**

Abortion was legalized in the country in 1971. Once prenatal testing allowed Indian families to learn the sex of a fetus during pregnancy, sex selection took off. The sex ratio at birth widened rapidly from about 105 boys per 100 girls before 1970, to 108 boys per 100 girls in the early 1980s; it reached 110 in the 1990s and remained at that level for roughly 20 years.

From a large imbalance of about 111 boys per 100 girls in India’s 2011 census, the sex ratio at birth appears to have normalized slightly over the last decade, narrowing to about 109 in the 2015-16 wave of the National Family Health Survey and to 108 boys in the latest wave of the NFHS, conducted from 2019-21.

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<sup>2</sup> Around the world, the natural sex ratio at birth ranges from 103 to 107 boys per 100 girls. In India, the natural ratio at birth is about 105 boys per 100 girls, and research indicates that India’s sex ratio at birth was balanced for decades, before the introduction of prenatal sex determination in the [mid-1970s](#) and ultrasound technology in the [early 1980s](#). See Chao, Fengqing, Patrick Gerland, Alex R. Cook, and Leontine Alkema. 2019. “[Systematic Assessment of the Sex Ratio at Birth for All Countries and Estimation of National Imbalances and Regional Reference Levels](#).” Proceedings of the National Academy of Sciences.

Nonetheless, a Pew Research Center analysis of [United Nations estimates](#) reveals that during the two decades between 2000 and 2020, India on average had one of the world's most skewed sex ratios at birth, after Azerbaijan, China, Armenia, Vietnam and Albania.<sup>3</sup>

Around the world, sex selection is often attributed to “[son preference](#)” (or “daughter aversion”), a form of gender bias in which families prioritize having sons over daughters for economic, historical or religious reasons. In India, son preference may be tied to cultural practices that make daughters more costly to raise than sons. In Indian tradition, only sons pass down the family name, thereby carrying on the family lineage, and Hindu sons are expected to [perform last rites](#) for deceased parents, including lighting the funeral pyre and scattering their ashes. Sons have also been a way for families to preserve ancestral property because males generally dominate inheritance lines (even though most Indian inheritance laws now prohibit gender discrimination).

Daughters, meanwhile, often take wealth away in the form of large dowries at the time of marriage, with payments sometimes continuing [throughout a daughter's life](#). And while sons continue to live in the parental home after marriage, with wives who often [become the primary caregivers](#) for aging in-laws, a daughter is expected to move away from her parents and into her husband's family home. (See the

## Sex ratios at birth vary among India's religious groups, but differences are shrinking

Number of male births per 100 female births, 2001-21



Notes: The natural sex ratio at birth is about 105 boys per 100 girls. Figures describe the sex ratios of births in the five years before each National Family Health Survey (NFHS), except for the 2001 and 2011 numbers, which are based on a census question introduced in 2001 measuring the sex of babies born in the previous year. NFHS estimates have sampling errors, shown as 95% confidence interval bars. See Methodology for more details. Sources: Census of India, 2001 and 2011; National Family Health Survey, 2015-21.

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<sup>3</sup> Because the United Nations uses a different method for calculating sex ratios at birth, its most recent estimate of India's male-to-female sex ratio at birth is higher than the figure published by the 2019-21 NFHS or the 2011 Indian Census. For more details, see [“Sex ratios around the world.”](#)

[“Laws, norms and traditions”](#) accordion box for more details.)

Scholars have noted that these cultural and religious traditions are often tied to geographic norms; in Northern and Western India, for example, patriarchal and patrilineal family systems are more dominant than in other parts of India, particularly the South.<sup>4</sup>

Even though it has been [illegal in India since 1996](#) for doctors and other medical practitioners to reveal the sex of a fetus to the prospective parents, at least 9.0 million (0.9 crore) female births went “missing” between 2000 and 2019 because of female-selective abortions, according to a Pew Research Center analysis of data from multiple waves of the NFHS and India’s census.

To put the recent decline in sex selection into perspective, the average annual number of baby girls “missing” in India fell from about 480,000 (4.8 lakh) in 2010 to 410,000 (4.1 lakh) in 2019, the Center’s analysis finds. (“Missing” refers to an estimate of how many more female births would have occurred during this time if there were no female-selective abortions.)

[See the accordion box: “How did we count ‘missing’ girls?”](#)

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<sup>4</sup> See Dyson, Tim, and Mick Moore. 1983. [“On Kinship Structure, Female Autonomy, and Demographic Behavior in India.”](#) Population and Development Review. See also Chakraborty, Tanika, and Sukkoo Kim. 2010. [“Kinship Institutions and Sex Ratios in India.”](#) Demography.

## Sex ratios at birth and ‘marriage squeezes’ differ among religious groups

In the past, some of India’s major religious groups varied widely in their sex ratios at birth, but today there are indications that these differences are shrinking. Sikhs, who in past decades had a particularly large imbalance of baby boys to girls, now seem gradually to be moving toward the natural level, as well as converging with other groups.

In the 2001 census, Sikhs had a sex ratio at birth of 130 males per 100 females, far exceeding that year’s national average of 110. By the 2011 census, the Sikh ratio had narrowed to 121 boys per 100 girls. It now hovers around 110, about the same as the ratio of males to females at birth among the country’s Hindu majority (109), according to the latest NFHS.

In recent decades, Christians also have stood out from India’s other religious groups, but in the opposite direction: India’s Christian minority has maintained a sex ratio at birth around the natural level of 105 boys per 100 girls, indicating a relatively low incidence of sex-selective abortion in the Christian community. Indian Muslims also now have a sex ratio at birth (106 boys per 100 girls) that is close to the natural norm seen in India prior to the introduction of prenatal testing.

Aborting females [may have consequences](#) that reverberate beyond the families making the choice. International research shows that societies with high rates of sex-selective abortions typically suffer [within a couple of decades](#) from a shortage of marriageable women and a surplus of men seeking brides. This “marriage squeeze” can trigger a variety of [social problems](#), such as increases in [sex-related violence and crimes](#) and [trafficking of women](#).<sup>5</sup> Even if India’s sex ratio at birth continues to normalize, the large number of girls “missing” from its population could continue to have profound consequences on Indian society for decades to come.

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<sup>5</sup> Scholars disagree on the extent to which such dire consequences will materialize. Professor Ravinder Kaur at Indian Institute of Technology, for example, notes that India can readily absorb [a large share of the shortage of brides](#) through voluntary cross-regional marriages. However, evidence indicates that in some parts of India, such as the Northern states of Punjab and Haryana, there has [been a shortage of brides](#) and that [women are being sold](#) into [forced marriages or prostitution](#). The [United Nations](#) in 2016 projected that there is a 7% excess of marriageable men in India; it projected the share of extra marriageable males could reach 16% by 2040, well above the 5% norm.

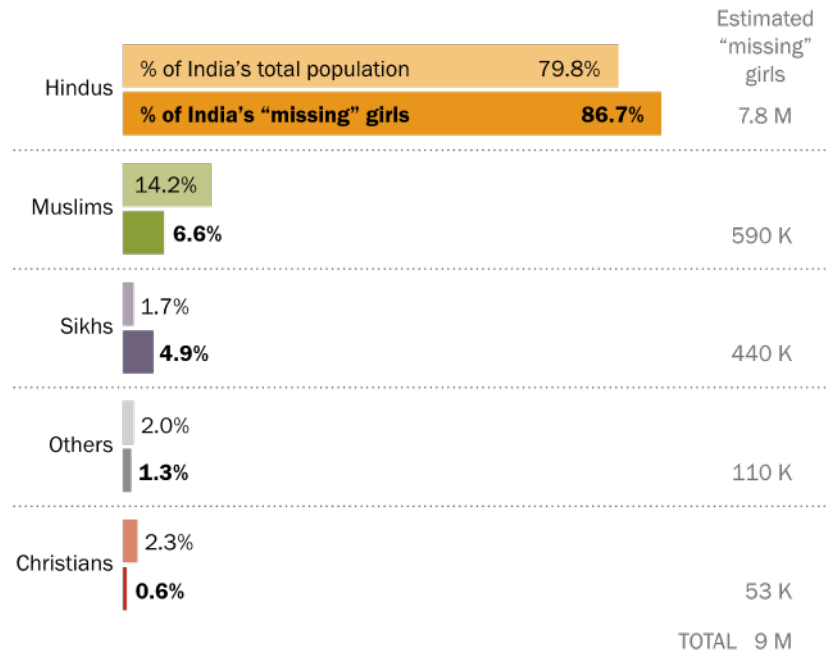
Religious groups are already experiencing [varying magnitudes](#) of marriage squeeze, depending on their history of sex selection, as few Indians marry outside their religion. [Sikhs](#), in particular, face an [acute shortage](#) of single women of marriageable age. Sikhs make up less than 2% of the Indian population but accounted for an estimated 5%, or approximately 440,000 (4.4 lakh), of the 9.0 million (0.9 crore) baby girls who went “missing” in India between 2000 and 2019.

The share of “missing” girls among Hindus is also above their respective population share. Hindus make up 80% of India’s population but accounted for an estimated 87%, or approximately 7.8 million (0.8 crore), of the females “missing” due to sex-selective abortions.

The share of female births “missing” among Muslims and Christians during this period is lower than each group’s share of the Indian population, meaning they were less likely than others to engage in sex-selective abortions. Muslims, who make up about 14% of India’s population, accounted for 7%, or approximately 590,000 (5.9 lakh), of the country’s “missing” girls. Christians, who make up 2.3% of the population, have had an estimated 0.6%, or about 53,000 (0.5 lakh), of the total number of sex-selective abortions.

## Hindus and Sikhs account for a disproportionate share of India’s ‘missing’ girls

*How each group’s share of India’s population compares with its estimated share of sex-selective abortions of females between 2000 and 2019*



Notes: “Missing” refers to an estimate of how many more female births would have occurred during this time if there were no female-selective abortions. See Methodology for details. Population sizes are from the 2011 Indian census. “Others” include Buddhists, Jains, adherents of smaller religious groups, and religiously unaffiliated people. Total may not add up due to rounding.

Sources: Census of India, 2011; Pew Research Center analysis of National Family Health Survey, 2005-21.

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## Aside from religion, many demographic factors are tied to sex selection

A review of the academic literature indicates that this is the first published report to estimate the numbers of females “missing” at birth in India *by religious group*. However, the estimates are not meant to suggest that differences in childbearing choices are caused *solely* by religion.

In India and around the world, family choices – such as [how many children to have](#) and [whom to share a home with](#) – are also bound up with a myriad of other factors, such as educational attainment, wealth, urbanicity and regional culture. Sex ratios at birth, too, appear to be linked to many demographic factors. Some characteristics of religious groups have competing influences on sex ratios.

For example, NFHS data shows that women who are wealthier and more educated are less likely to favor having sons.<sup>6</sup> At first glance, this might lead some to expect that wealthier women and women with more education would be less likely to abort girls. Families who live in cities also are less likely than their rural counterparts to favor having sons, according to the NFHS, which may be because they are wealthier and more educated. (For a closer look at gender attitudes in India, see Pew Research Center’s survey report “[How Indians View Gender Roles in Families and Society](#).”)

On the other hand, education, wealth and urbanicity can make it easier for a woman to get

### Abortion laws and practices in India

Abortion is [legal in India](#) up to the 24th week of pregnancy under a range of criteria, including to save a woman’s life. Abortions are allowed after the 24th week if a medical board of at least three experts detects “substantial fetal abnormalities.”

However, the use of ultrasound devices and other technologies to determine the sex of fetuses is [prohibited](#), and violators – including family members who seek this information and medical personnel who provide it – face fines and even imprisonment.

It is difficult to know exactly how many abortions take place in India each year, because the stigma surrounding abortions leads to [serious underreporting](#). For example, while the most recent National Family Health Survey finds that [around 3% of pregnancies in India](#) end with an abortion in any given year, academic researchers often estimate the number to be much higher. A 2018 study published in *The Lancet* suggests that [roughly half of pregnancies](#) in India are unintended, and that there were 15.6 million (about 1.6 crore) induced abortions in 2015 alone – roughly one-third of all pregnancies that year. The 2018 study finds that most abortions in India take place using medications outside of health facilities. (Such medications are commonly purchased at pharmacies or from informal vendors.)

It is likely that sex-selective procedures account for only a small fraction of all abortions in India, given that about 9.0 million (0.9 crore) sex-selective abortions were performed between 2000 and 2019, according to Pew Research Center’s estimate.

<sup>6</sup> See Robitaille, Marie-Claire. 2013. “[Determinants of Stated Son Preference in India: Are Men and Women Different?](#)” *The Journal of Development Studies*.

access to (and pay for) an ultrasound test or other prenatal sex screening. In India, undergoing such a test during pregnancy is correlated with a higher probability of giving birth to a son.<sup>7</sup>

Caste is a social stratification rooted in Hindu tradition but shared by other religious groups in India. Upper-caste status in particular has complex associations with sex selection. Brahmins and other upper-caste families, who are generally wealthier and more educated, may not need to worry about the cost of having a daughter.<sup>8</sup> At the same time, upper-caste Indians, especially those in Northern and Western India, traditionally may have been more likely to observe rigid gender norms.<sup>9</sup>

Fertility and birth order also [play an important role in these choices](#). Families who are planning to have just one or two children may be more inclined to abort a female to ensure having at least one son. [In China](#), for example, the government's former one-child policy, introduced in 1980, likely contributed to a widening of China's sex ratio at birth.

Religion, meanwhile, is tied to these demographic characteristics in numerous ways. Adherents of a particular religion may live near each other and therefore have similar educational opportunities, economic challenges and fertility patterns. Religious groups also may share certain cultural norms or historical or geographical backgrounds, or a particular status in society, that influence their life choices and the expectations they pass on to future generations. In other words, many of the factors that affect sex selection are connected to each other – and to religious affiliation – in ways that are difficult to untangle.

This report does not attempt to determine the exact causal connections between religion and family choices. Its main goals are to describe the childbearing patterns and attitudes revealed in Indian census data and in surveys, and to use statistical techniques to show how these patterns vary by religion.

The rest of this report takes a closer look at each of the dynamics that underlie sex selection – namely son preference, ultrasound use and fertility – including a detailed analysis of trends in each of the major religious groups and across India's six administrative regions. An overview of sex ratios around the world can be found in the next section. Subsequent sections include a

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<sup>7</sup> Madan, Kamlesh, and Martijn H. Breuning. 2014. "[Impact of Prenatal Technologies on the Sex Ratio in India: An Overview](#)." *Genetics in Medicine*.

<sup>8</sup> Gaudin, Sylvestre. 2011. "[Son Preference in Indian Families: Absolute Versus Relative Wealth Effects](#)." *Demography*.

<sup>9</sup> See Pande, Rohini P., and Nan Marie Astone. 2007. "[Explaining Son Preference in Rural India: The Independent Role of Structural versus Individual Factors](#)." *Population Research and Policy Review*. Also see Sekher, T. V., and Neelambar Hatti. 2005. "[Discrimination of Female Children in Modern India: From Conception through Childhood](#)." United Nations Population Fund.

summary of Indian religious groups' demographic characteristics, and brief explanations of some of the Indian traditions, norms and laws referenced in this report.

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### **Related India research**

This is the fourth in a series of Pew Research Center reports on India. Other reports can be found here:

[Religion in India: Tolerance and Segregation](#)

[Religious Composition of India](#)

[How Indians View Gender Roles in Families and Society](#)



### Sidebar: Sex ratios around the world

At any given time, there are almost as many women as men in the world – the typical balance is around 101 males per 100 females, according to the [United Nations](#). At birth, without any human intervention, boys slightly outnumber girls, at a rate of around 105 boys per 100 girls, with male births ranging from 103 to 107 per 100 girls [in most countries](#).

But females catch up over time, because males are more likely to succumb to disease during childhood or to die young in adulthood from smoking or other unhealthy and risky behaviors. Globally, women outlive men by an average of five years, and among older cohorts, women vastly outnumber men. Among people in the U.S. ages 85 and older, for example, there were only 56 males per 100 females in 2020, according to the most recent [census](#).

In some countries, sex ratios are in the natural range at birth but become lopsided among adults for reasons other than men's shorter life expectancy. Migration often explains this phenomenon. In Ukraine, for example, there were only [86 males per 100 females in 2020](#), because so many [young men had left to work](#) in neighboring European Union countries. Now, this situation is reversing: Russia's invasion has led to an exodus of nearly [6.0 million \(0.6 crore\) Ukrainians](#), predominantly women and children. Men ages 18 to 60 are barred from leaving the country.

In other places, largely in South Asia and East Asia, a widespread preference for sons, coupled with sex-selective abortions, is the cause of unnatural sex ratios at birth. Some scholars have noted that countries with heavy imbalances generally meet three preconditions: a widespread desire for sons and/or aversion to daughters; parents seeking to have smaller families; and the availability of prenatal sex detection (typically, ultrasound technology) and abortion services.<sup>10</sup>

An analysis of 2000-20 birth data from the UN shows that over these two decades, China and Azerbaijan had the most skewed sex ratios at birth, with an annual average of around 115 boys per 100 girls. In China, the government's decades-long enforcement of a one-child policy starting in 1980 and the spread of ultrasound technology led to a sharp increase in sex-selective abortions at the end of the last century. In Azerbaijan, as well as in the neighboring former Soviet republics of Armenia (114) and Georgia (109), sex ratios at birth were not skewed toward boys until the 1990s. Some scholars blame the economic turmoil that followed the collapse of the Soviet Union, which they say drove couples to have fewer children but increased the need for sons who could support aging parents as government benefits shrank.<sup>11</sup>

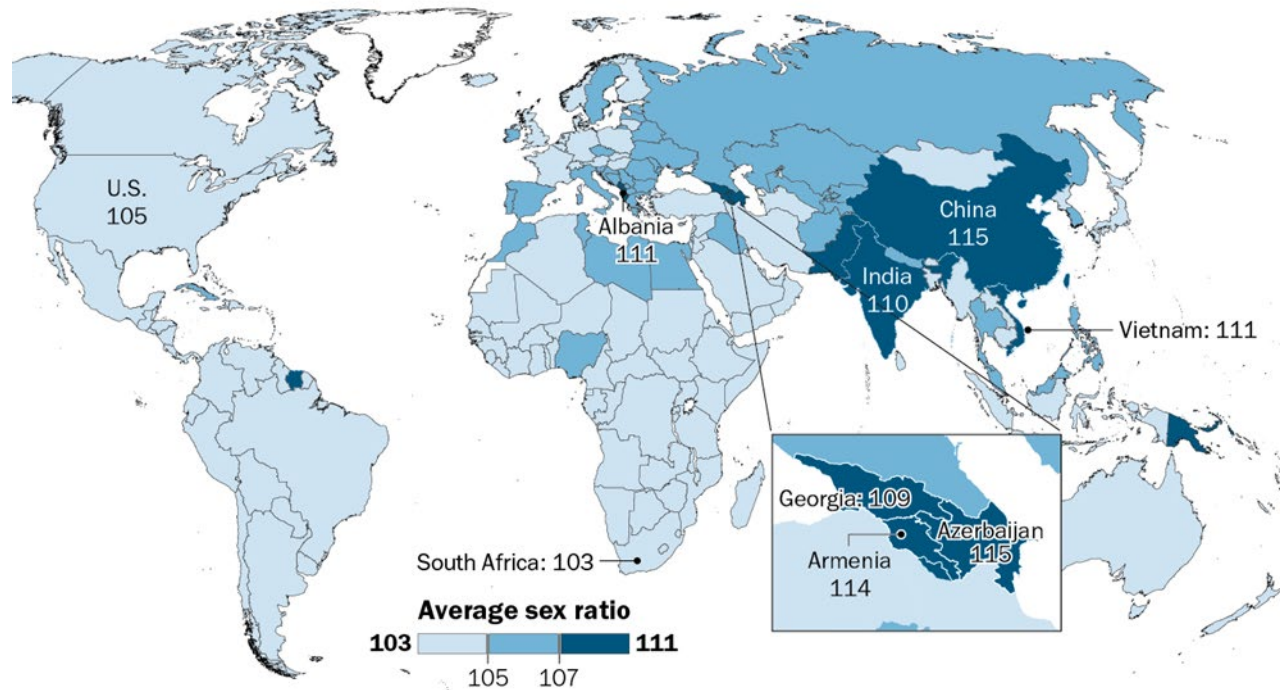
In Vietnam, where abortion has been legal since the 1960s, the sex ratio at birth was balanced until [the early 2000s](#), when ultrasound services started to spread. Similarly, [Albania's sex ratio](#) became skewed toward boys in the 1990s, following the legalization of abortion and widening access to ultrasound technology. From 2000 to 2020, Vietnam and Albania had the world's fourth- and fifth-widest average annual sex ratio at birth (111 each).

<sup>10</sup> See Guilmoto, Christophe Z. 2009. "[The Sex Ratio Transition in Asia](#)." Population and Development Review.

<sup>11</sup> See Das Gupta, Monica. 2015. "'[Missing Girls](#)' in the South Caucasus Countries: Trends, Possible Causes, and Policy Options." In Policy Research Working Papers. Duthé, Géraldine, France Meslé, Jacques Vallin, Irina Badurashvili, and Karine Kuyumjyan. 2012. "[High Sex Ratios at Birth in the Caucasus: Modern Technology to Satisfy Old Desires](#)." Population and Development Review. See also Guilmoto, Christophe Z., Nora Dudwick, Arjan Gjonça, and Laura Rahm. 2018. "[How Do Demographic Trends Change? The Onset of Birth Masculinization in Albania, Georgia, and Vietnam 1990–2005](#)." Population and Development Review.

## Azerbaijan, China, Armenia, Vietnam, Albania and India had world's most male-biased sex ratios at birth from 2000 to 2020

Average sex ratio at birth, or the number of male births per 100 female births, from 2000-20



Note: Globally, the natural sex ratio at birth ranges from 103 to 107 boys per 100 girls.

Source: United Nations World Population Division, 2019.

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Over the same two-decade period, India was near the top of the global list, with an average sex ratio at birth of around 110.

In countries where males heavily outnumber females at birth, the childhood mortality rate for girls also tends to be high, either because girls are being killed soon after birth, or because they are neglected – intentionally or unintentionally – by their parents during childhood.<sup>12</sup>

Worldwide, an estimated 142.6 million (14.3 crore) females went “missing” between 1970 and 2020, due to sex-selective abortion or to neglect, according to [a 2020 UN report](#). China (51%) and India (32%) accounted for most of these “missing” females. (In this context, “missing” females refers to an estimate of how many more females, including girls and women of all ages, there would be if there were no sex-selective abortions, mistreatment or neglect of females.)

<sup>12</sup> See Kashyap, Ridhi. 2019. “[Is Prenatal Sex Selection Associated with Lower Female Child Mortality?](#)” Population Studies.

## 1. Changes in son preference, ultrasound use and fertility

Among Indians overall, sex selection during pregnancy is at least in part a result of a cultural preference for sons over daughters, which may be thought of as “son preference” or “daughter aversion,” or both.

A preference for sons seems to be implied in the ancient Hindu epic “Mahabharata,” in which Gandhari is blessed to be a mother of a hundred sons and one daughter.<sup>13</sup> [Sex selection](#) may not be entirely new, either. Studies have documented female infanticide for decades well before prenatal testing was introduced in the 1970s.<sup>14</sup>

Because “son preference” is a sensitive topic, measuring it in surveys can be challenging.<sup>15</sup> One common approach is to ask parents how many boys and how many girls they would like to have, if given the choice. In the 2019-21 National Family Health Survey (NFHS), 15% of Indian women ages 15 to 49 reported wanting to have more sons than daughters, while just 3% said they wanted more daughters than sons. (The NFHS asks this question of women ages 15 to 49, which covers the birthing span for the vast majority of Indian women. For Pew Research Center survey data on Indian gender attitudes, see [“How Indians View Gender Roles in Families and Society.”](#))

**[See the accordion box: “Is it son preference or daughter aversion?”](#)**

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<sup>13</sup> Ganga, Romilla Devi. 1994. [“Hindu Views on Euthanasia, Suicide and Abortion in the Durban Area.”](#)

<sup>14</sup> Chakraborty, Tanika, and Sukkoo Kim. 2010. [“Kinship Institutions and Sex Ratios in India.”](#) Demography. Also see Robitaille, Marie-Claire. 2013. [“Determinants of Stated Son Preference in India: Are Men and Women Different?”](#) The Journal of Development Studies.

<sup>15</sup> There are several conventional ways of inferring son preference in social science, such as stated son preference (how important people say it is to have at least one son); ideal gender composition (whether potential parents say they would prefer having more boys than daughters in their ideal scenario); and fertility intention (whether potential parents would continue childbearing after having girls). Some surveys also have asked respondents whether they would have a preferred gender for their child, if they were able to have only one child.

To counter the widespread aversion to having daughters in Indian society, the government in 2015 launched a campaign to “[Save the girl child, educate the girl child](#)” (*Beti Bachao Beti Padhao*).

[Advertisements](#) bearing that slogan often appear on radio and television, as well as on the sides of buses and trucks, especially in [Northern India](#).

While a stated preference for sons (or aversion to daughters) is the main theoretical cause of India’s skewed sex ratio, it is not an exact predictor of actual birth patterns. Instead, the use of prenatal sex screenings, and a subsequent decision to abort female fetuses, more directly result in an elimination of girls from the population.

Prenatal diagnostic technology was first introduced to India in the 1970s in the form of amniocentesis, though that service was prohibitively expensive for all but the most affluent families. Around the early 1980s, a cheaper alternative – ultrasound – was introduced to India as a method of [detecting fetal anomalies](#).<sup>16</sup> Ultrasound technology was soon being used for prenatal sex detection in the wealthier parts of the country, but it did not become widely available and affordable outside major cities until the 1990s and even the 2000s.<sup>17</sup>

Meanwhile, abortion was legalized in 1971. Starting in the 1970s and accelerating in the 1980s, the use of prenatal testing to detect the sex of a fetus, and the use of abortion to prevent the birth of girls and ensure the birth of boys, became increasingly common throughout India.

The practice became so widespread that in 1994, India passed the [Prenatal Diagnostic Techniques Act](#), making it illegal for doctors and other medical service providers to reveal the sex of the fetus to parents. The act threatens violators, including family members who seek information about a fetus’s sex and medical personnel who provide this detail, with fines and even imprisonment.<sup>18</sup>

Today, ultrasound services for legal health screenings are common throughout India, although they can still be prohibitively expensive for women from [low-income families](#).

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<sup>16</sup> There are several methods of prenatal sex detection, such as amniocentesis or chorionic villus sampling (introduced in the 1980s), and other techniques for sex selection, [including sperm sorting and pre-implantation genetic testing](#) or in vitro fertilization (IVF). But these are much more expensive and complicated than ultrasound technology, which is the most common method for sex determination in utero in India.

<sup>17</sup> In the early 1980s, ultrasound technology first spread in the affluent areas of India, particularly the North, West and South. Beginning in the 1990s, ultrasound use expanded throughout the country as India liberalized the economy, and ultrasound tests have become more affordable and accessible to average Indians. Meanwhile, the linkage between ultrasounds and sex selection has weakened; ultrasound use now is less strongly tied to abortion of female fetuses. See Madan, Kamlesh, and Martijn H. Breuning. 2014. “[Impact of Prenatal Technologies on the Sex Ratio in India: An Overview](#).” *Genetics in Medicine*. See also Akbulut-Yuksel, Mevlude, and Daniel Rosenblum. 2012. “[The Indian Ultrasound Paradox](#).” Institute of Labor Economics, IZA Discussion Papers.

<sup>18</sup> In 2003, the act was renamed the Pre-Conception and Prenatal Diagnostic Techniques Act and amended to ban sex selection by any method; it also imposed tougher consequences for breaking the law. While the [law has been enforced](#) in some widely publicized cases, it has not stopped the illegal use of ultrasounds for prenatal sex determination, nor has it eliminated sex-selective abortions.

The 2019-21 NFHS found that an ultrasound test was performed on nearly eight-in-ten Indian pregnancies (78%) in the five years leading up to the survey, compared with just one-quarter of pregnancies in a similar period before the 2005-06 survey.

Meanwhile, Indian women seem to have become more likely to use ultrasound tests exclusively for medical purposes rather than to facilitate sex selection. Of course, researchers cannot know for sure what a woman's intention is when she obtains an ultrasound, but an analysis of pregnancy outcomes reveals that the share of male versus female births among "ultrasound pregnancies" (those that involve prenatal testing) is moving toward balance, from 49% male versus 42% female in 2005-06 to 49% versus 44% in 2019-21. (These percentages do not add up to 100%, as some remaining pregnancies ended in abortion, miscarriage, or stillbirth.) Put another way, the sex ratio at birth following ultrasound use during pregnancy is now 109 boys per 100 girls. In the 2005-06 NFHS, it was 118.

There is also evidence that over the past two decades, the underlying preference for sons (or aversion to daughters) in Indian society has weakened. In the 2019-21 NFHS survey, 15% of Indian women of reproductive age reported wanting to have more boys than girls, less than half the share who expressed that desire in the 1998-99 NFHS (33%). Meanwhile, the share of Indian women wanting more daughters than sons remained steady over the same period, at around 3%.

Indeed, a 2019-20 Pew Research Center survey of 29,999 adults across India found that 94% of Indians say it is "very important" for a family to have at least one son, while 90% separately say it is very important for a family to have at least one daughter. This indicates that the vast majority of Indian adults view both sons and daughters as key parts of a family, and only a slightly greater share feel it is imperative to have at least one son. (For more on India's changing gender norms, see the Center's report, "[How Indians View Gender Roles in Families and Society](#).")

## In India, ultrasound use now less closely tied to abortion of female fetuses

% of ultrasound pregnancies that ended in ...



2005-06      2019-21

Notes: Among all pregnancies by women ages 15 to 49 with an ultrasound test in the five years preceding the survey. Pregnancies that end in termination are not shown. The analysis excludes ongoing pregnancies.

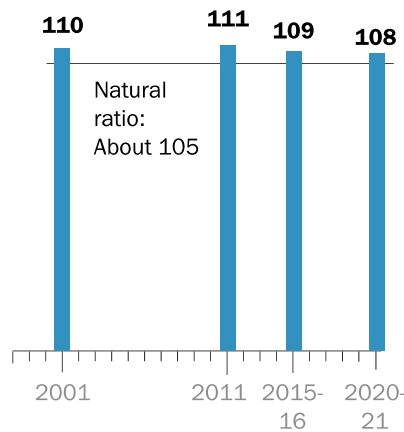
Source: National Family Health Survey India Reports, 2005-06 and 2019-21.

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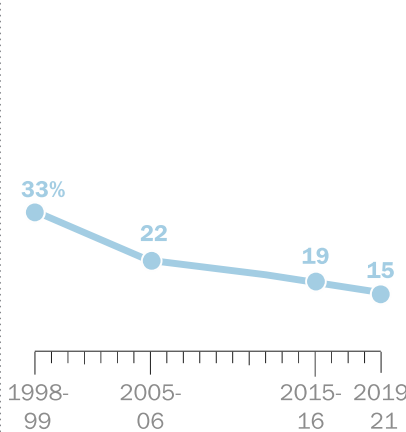
### India's sex ratio at birth appears to be narrowing ...

Sex ratio at birth, or male births per 100 female births, 2001-21



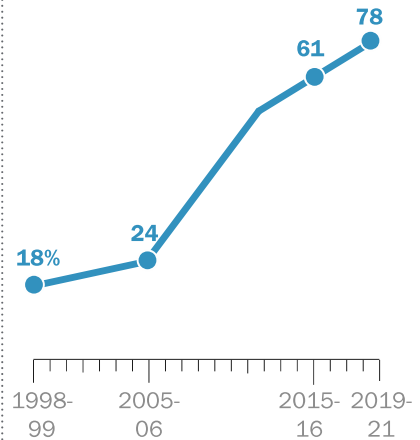
### ... as son preference has weakened ...

% of Indian women who want more sons than daughters



### ... even though ultrasound use has risen

% of pregnancies with ultrasound test



Notes: The natural sex ratio at birth is about 105 boys per 100 girls. Sex ratio at birth is based on births in the five years before each National Family Health Survey (NFHS), except for the 2001 and 2011 numbers, which are based on a census question measuring the sex of babies born in the previous year. Question on wanting more sons than daughters: The 1998-99 survey wave excluded women who had never been married; subsequent waves included all women 15 to 49, regardless of marital status. Ultrasound use data includes all pregnancies by women ages 15 to 49 in the five years preceding the NFHS.

Sources: Census of India, 2001 and 2011; National Family Health Survey, 1998-2021.  
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These changes in ultrasound use and son preference also have coincided with socioeconomic advances for women, and better educational opportunities. Currently, fewer than three-in-ten women ages 15 to 49 (28%) have no formal schooling, compared with four-in-ten women in that age group in 2005-06, according to the NFHS.

And, finally, the changes have been underpinned by extensive government efforts to stop sex-selective abortions – not just in the form of advertisements on billboards and buses, but also with [stiffer penalties](#) for the illegal use of ultrasound tests for sex screenings and [sting operations](#) that have resulted in high-profile arrests of doctors. (Although critics say the government's attempts to curb sex selection practices have been [ineffective](#) or [insufficient](#).)

On the other hand, changes in fertility patterns may be pulling in the opposite direction, helping to perpetuate unnatural sex ratios at birth.

In India and elsewhere around the world, a desire for smaller families is often tied to wider sex ratios: When parents plan to have more than one child, they may accept the birth of a daughter while they wait for a son to be born. But when their ideal family size shrinks to just one child, they might be more motivated to turn to sex selection to ensure the birth of a boy.<sup>19</sup> India's total fertility rate has fallen sharply in the past two decades; in 2019-21, the average Indian woman was expected to have 2.0 children in her lifetime, nearly one child fewer than in 1998-99 (2.9).

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<sup>19</sup> Researchers describe this as the "intensification of gender bias." In a society with strong son preference and no sex selection, one might expect that families would tend to keep having children when their first child is a girl, which leads to higher fertility rates but a balanced sex ratio at birth. However, with sex selection, parents can obtain their ideal number of sons within a limited number of births, resulting in both a skewed birth ratio *and* a decreased fertility rate. See Das Gupta, Monica, and P. N. Mari Bhat. 1997. "[Fertility Decline and Increased Manifestation of Sex Bias in India](#)." Population Studies.

## Sikhs have seen biggest change in sex ratios, son preference

All of these [underlying dynamics](#) have moved at different speeds for different religious groups, and in the past two decades, trends in sex ratios at birth have differed considerably by religion. Sikhs, who had the widest gap in the sex ratio at birth in the early 2000s, have seen the fastest narrowing in the past two decades.

Sikhs are on average the wealthiest of India's major religious groups, and they are geographically concentrated in the economically advanced northwestern states of Punjab and Haryana, where ultrasound services were more common than in other parts of India [as early as the 1990s](#). By the time the Sikh sex ratio peaked (at 130) in the early 2000s, Sikh women were obtaining ultrasounds at about twice the rate of Indian women overall.

Hindus tend to receive less education than Sikhs and are poorer, on average. Even today, ultrasound use among Hindus lags far behind Sikhs. Hindus and Muslims experienced a slight increase in the share of male births between the 2001 and 2011 censuses, but in recent years they, too, have seen a decline. In particular, Muslims' sex ratio now is close to the natural level. Meanwhile, Christians have long had the least male-biased ratio.

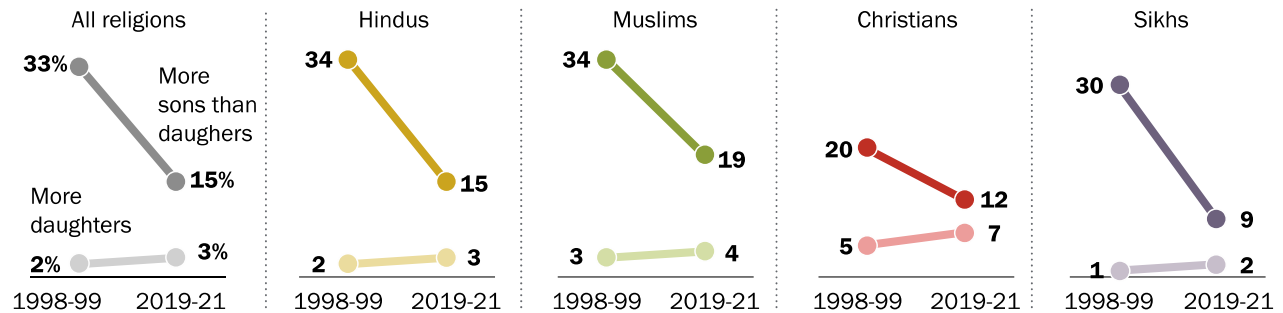
Over the past two decades, all of India's major religious groups experienced a waning preference for sons. The change among Sikhs is the most pronounced. In the most recent NFHS, just 9% of Sikh women said they wanted more sons than daughters, compared with three-in-ten in the 1998-99 survey.



By this measure, Sikh women now are close to Christians in their low levels of expressed preference for having more boys than girls. Christians have consistently shown a relatively weak preference for sons. In the 2019-21 NFHS, 12% said they would prefer to have more sons than daughters, compared with 20% in 1998-99.

## Son preference in India has fallen most among Sikhs

% of Indian women ages 15 to 49 who say they ideally want ...



Notes: Ideal (or desired) gender composition is derived based on an analysis of survey questions asking women ages 15 to 49, "If you could go back to the time you did not have any children and could choose the number of children to have in your life, how many would that be? How many sons? How many girls?" The 1998-99 survey wave excluded women who had never been married and included only women in this age range who were married or had been married at the time of the survey; the 2019-21 wave included all women 15 to 49, regardless of marital status.

Source: National Family Health Survey India Reports, 1998-99 and 2019-21.

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Muslims and Hindus, who together started out with India's highest levels of son preference – as measured in surveys – have seen a moderate decline, though Muslims now have the greatest share of women saying they would prefer more sons than daughters (19% in 2019-21 vs. 34% in 1998-99), followed by Hindus (15% vs. 34%).

When it comes to the question of preferring daughters over sons, the change over the past two decades has been modest. Among Christians in India, 7% now say they would prefer to have more daughters than sons, compared with smaller shares of Muslims (4%), Hindus (3%) and Sikhs (2%).

## Ultrasound use is becoming more common across India's religious groups

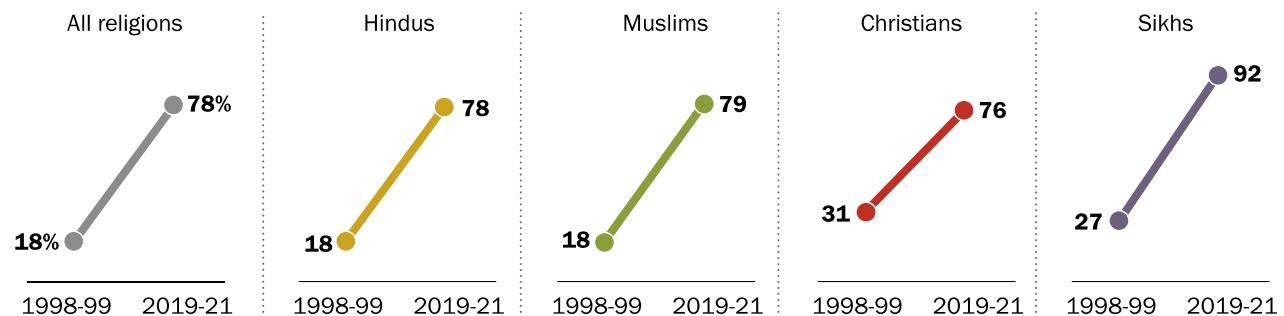
Meanwhile, as ultrasound tests have become more affordable and accessible, the gaps in use of ultrasounds among religious groups have narrowed significantly.

In 2019-21, an ultrasound test was performed among approximately eight-in-ten pregnancies by Muslim women in the prior five years preceding the survey, which is 12 percentage points lower than the figure for Sikh women. Roughly 15 years earlier, in the 2005-06 NFHS, Sikh women were more than twice as likely as Muslims to have had an ultrasound test during pregnancy (47% vs. 20%).

Still, ultrasound use remains most common among Sikhs, while other religious groups lag far behind. The religious gaps are partly due to geographic distributions. Most Sikhs reside in India's relatively affluent North, where the vast majority of *all* women (88%) have an ultrasound during pregnancy.

### Among Indian women, Sikhs are the most likely to have an ultrasound exam during pregnancy

*% of pregnancies with ultrasound test in India*



Notes: Among all pregnancies in the preceding five years by women ages 15 to 49. The 1998-99 survey wave included only women in this age group who were married or had been married at the time of the survey, and their pregnancies in the preceding three years. The 2019-21 wave included all women 15 to 49, regardless of marital status.

Sources: National Family Health Survey (NFHS) 1998-99 and NFHS India Report, 2019-21.

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A woman's wealth and education are robust predictors of ultrasound use: Indian women from the wealthiest households are 35 points more likely than those from the poorest households to have an ultrasound during pregnancy (92% vs. 57%).<sup>20</sup> Ultrasound use is much more common among women with 12 or more years of formal schooling than among women who have no formal

<sup>20</sup> The National Family Health Survey's standard wealth measure is an index made up of a range of indicators, such as whether the household owns consumer goods such as televisions and cars, and other housing characteristics, such as their source of drinking water.

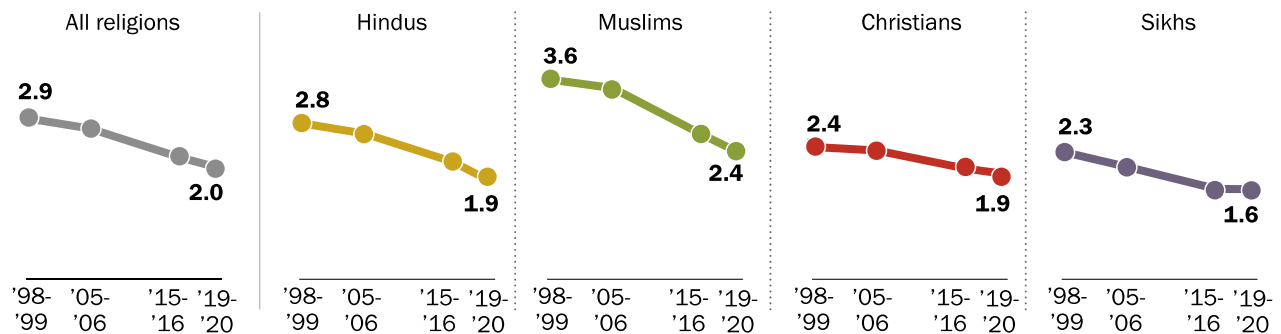
education (89% vs. 60%). There is also a significant urban versus rural gap in ultrasound use during pregnancy (87% vs. 75%).

## Fertility tied to variations in sex imbalance at birth among religious groups

Aside from wealth and education, fertility also may play a role, because parents who plan to have fewer children may be more motivated to have an abortion to ensure having a boy. In India, fertility has declined across all groups in recent decades, though Sikhs have consistently been the religious group with the lowest rates, and Muslims the highest. The fertility rate among Sikhs has fallen from an average of 2.3 children per woman in 1998-99 to 1.6 in 2019-21; among Muslims, it has dropped from 3.6 children to 2.4 over the same period.

### In India, overall fertility rates have fallen, and gaps among religions have shrunk

*Number of children an average woman in India is expected to have in her lifetime*



Notes: Total fertility rates are calculated based on births to women ages 15 to 49 in the three years preceding each survey. The 1998-99 survey wave included only women in this age group who were married or had been married at the time of the survey.

Source: National Family Health Survey India Reports, 1998-2021.

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In societies with son preference but no prenatal sex selection, families often keep having children to achieve the ideal number of boys. For example, they may continue childbearing if their first child is a girl, though they might stop having children if their first child is a boy. In those communities, the *overall* gender composition of births is balanced, though boys are overrepresented in smaller families, while girls tend to grow up in larger families as their parents continued to try having a son.

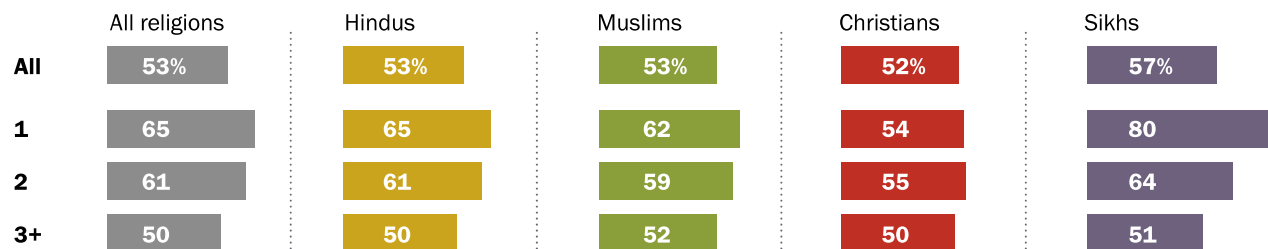
Christians in India are an example: The gender composition of children born to Christian women varies depending on the mother’s fertility – ranging from 55% of boys among women who had only

two births to 50% among women with three or more births. (This data is based on women in their 40s, who have typically completed their childbearing.) The average gender composition of Christian children is largely balanced, with roughly 52% boys.

The overall gender balance becomes skewed when sex-selective abortion – which allows parents to prevent the birth of a child whose sex is not wanted – is common. In such communities, male births are even more overrepresented among women with fewer children than they would be if there was no prenatal sex selection, because sex selection makes it possible to achieve a desired number of boys within a limited number of total births.

### In India, women with fewer children have a greater excess of boys

*% of boys among total children that women in their 40s in India have, by religion and family size*



Notes: Among women ages 40 to 49. This analysis excludes women with zero births.  
Source: National Family Health Survey, 2019-21  
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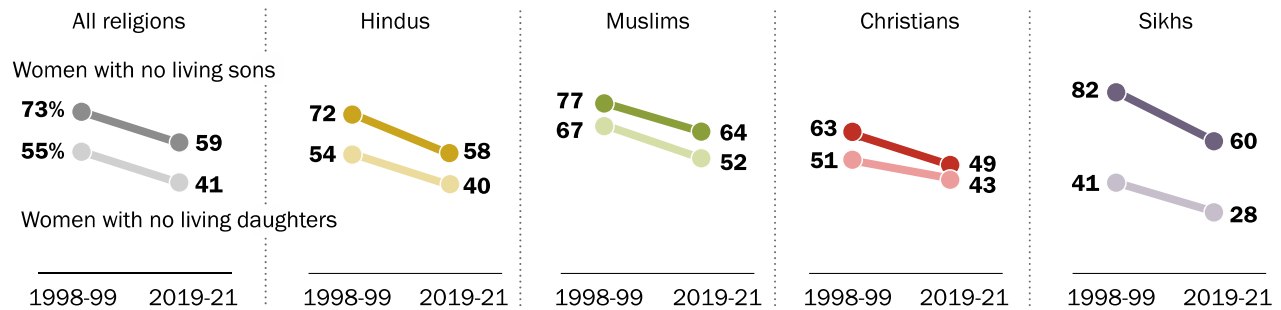
Among India’s major religious groups, Sikhs have the most skewed gender composition of children in small nuclear families. Among Sikh women in their 40s who have given birth only once, 80% had a male child. The same is true of 65% of Hindus and 62% of Muslims. By contrast, the share of boys born to Christian women with just one child is closer to normal, at 54%.

Meanwhile, the *overall* gender composition of children tends to skew less in communities with a greater number of large families. Theoretically, if women did not practice sex selection and instead kept having children until their ideal number of sons were born, their gender composition would be more balanced. Indeed, Muslim women in their 40s have, on average, given birth to more boys (1.9) than Sikh women have (1.4). The gender composition of children in Muslim families is less skewed: 53% boys, compared with 57% among Sikhs. In other words, high fertility rates tend to help reduce sex imbalances. (Inversely, Muslim women having more children may be a result of their tendency to continue trying for sons, instead of turning to sex-selective abortions.)

The relatively moderate bias toward males in the gender composition of Muslim children in India also may reflect an acceptance of having daughters. Muslim women in their 40s have had an average of 1.7 girls, compared with 1.4 among Hindus and 1.2 among Christians. Sikhs seem to hold a relatively strong aversion to daughters, because their families are relatively small and have a disproportionately high number of boys: The average Sikh woman in her 40s has 1.4 boys and 1.1 girls.

## Indian women without a son are more likely to want another child

% of married Indian women ages 15 to 49 who say they want more children



Notes: Among women ages 15 to 49 who are married and have no living sons/daughters at time of the interview.

Source: National Family Health Survey, 1998-99 and 2019-21.

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A closer look at NFHS data reveals yet another indicator of widespread son preference: In India, married women with *no living sons* are much more likely than those with *no living daughters* to say they want to have more children (59% vs. 41%). Such gender bias in fertility desire is most striking among Sikhs. In the 2019-21 survey, six-in-ten married Sikh women with no living sons said they want to have more children, double the share of Sikhs with no living daughters who voiced the same desire (28%).

While Muslim women (ages 15 to 49) with no living sons tend to express a strong intention of continued childbearing, Muslims with no living daughters are also the most likely of women in all major Indian religious groups to say they want more children. Christians continue to stand out for comparatively weak gender discrimination in decisions about childbearing. About half of Christian women with no living sons want more children, only 6 points greater than those with no living daughters.

Moreover, whether Indian women have a living son at the time of their pregnancy strongly predicts sex selection: Among women with no living sons, the sex ratio at birth after ultrasound use is heavily male-biased, at 118 boys per 100 girls, compared with a naturally balanced ratio among women with sons (105).

## Wealth, education and regional distribution tied to differences among religious groups

These differences in fertility notwithstanding, it is difficult to say with certainty why religious groups have followed such different paths when it comes to sex selection more broadly. The dynamic may be tied to the country's overall rise in education and wealth, which does not always have the same effect across socioeconomic levels.

Among Hindus and Muslims, who have relatively low educational attainment and wealth, it seems that socioeconomic advancement in the 2000s facilitated abortions by making ultrasound testing more affordable and accessible. But among Sikhs, who were wealthier and have more education to begin with, socioeconomic advancement seems to have reduced abortions by dampening the desire to have sons or avoid daughters.<sup>21</sup>

This diverging trend in sex ratios across socioeconomic levels has been observed elsewhere. Studies in South Korea, for example, show that the most educated groups were the first to experience a widening in the ratio, in the 1980s, before the same trend spread to others. Later, South Korea's most educated groups also were the first to experience a shift back toward the natural ratio.<sup>22</sup> Demographers including Christophe Z. Guilmoto refer to such groups as "pioneers" in the sex ratio transition.<sup>23</sup>

Another major factor that underlies differences among religious groups is their regional distribution. With roughly 1.4 billion people spread across 28 states and eight union territories, Indians are dispersed across widely differing economies, with a range of histories, education levels and family norms. Members of one religious group in the North may have more in common with other Northern Indians than they do with members of their own religion in the South.

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<sup>21</sup> Previous research has identified an inverted U-shaped relationship between education and the sex ratio at birth: The imbalance first intensifies as education increases, but continued improvement in education weakens son preference and subsequently produces less male-dominated ratios. See Echávarri, Rebeca A., and Roberto Ezcurra. 2010. "[Education and Gender Bias in the Sex Ratio at Birth: Evidence from India.](#)" *Demography*.

<sup>22</sup> For example, see Chun, Heeran, Il-Ho Kim, and Young-Ho Khang. 2009. "[Trends in Sex Ratio at Birth according to Parental Social Positions: Results from Vital Statistics Birth, 1981-2004 in Korea.](#)" *Journal of Preventive Medicine and Public Health*. Also, see Chun, Heeran. 2019. "[South Korea Case Study Report on the "Success Story" of Sex Ratio at Birth Transition.](#)"

<sup>23</sup> See Guilmoto, Christophe Z. 2009. "[The Sex Ratio Transition in Asia.](#)" *Population and Development Review*.

There are several possible ways to examine the regional distribution of religious groups in India. This report focuses on the regions of India's six administrative zones – North, Northeast, Central, East, South and West – with a brief mention of some noteworthy states.

Hindus are a majority in most of India's states and union territories. Most Muslims reside as religious minorities in the Central and Eastern states. Muslims make up a majority in Jammu and Kashmir, a union territory adjacent to Pakistan, and in the sparsely populated archipelago of Lakshadweep.

The largest numbers of Christians live as religious minorities in the Southern states of Kerala and Tamil Nadu. Their biggest population shares are in the smaller Northeastern states that border China, Bhutan, Myanmar or Bangladesh, such as Mizoram, Nagaland and Meghalaya. Sikhs mostly reside in the northwestern state of Punjab, where they make up a majority (58%). (See Pew Research Center's report, "[Religious Composition of India](#).”)

Northern, Western and Southern India are the wealthiest regions, with higher levels of education and earlier access to advanced health care systems such as ultrasound screenings. The Central, Eastern and Northeastern states tend to be poorer, with lower levels of urbanization and [economic development](#).

Historically, cultural norms on family and marriage also vary considerably by region. Generally speaking, Northern Indian family norms have been strictly patrilineal: Sons inherit property, while daughters move into their husband's home after marriage and usually do not inherit or own property. Even beyond the nuclear household, money, gifts and other resources in the form of dowry [flow in one direction](#) – from the woman's natal family to her husband's family.<sup>24</sup>

Indians in the South and the Northeast practice less stringent patrilineal norms. Parents expect their daughters as well as their sons to help in old age, and it is socially acceptable for married daughters to inherit property and help their birth family financially. Women in the South also face fewer restrictions on their mobility and job opportunities than those who live in the North and Western states.<sup>25</sup>

To be sure, gender norms are not uniform within regions – or even within families – and cultures everywhere are always undergoing change. A [2019-20 Pew Research Center survey](#) finds that while

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<sup>24</sup> Dyson, Tim, and Mick Moore. 1983. "[On Kinship Structure, Female Autonomy, and Demographic Behavior in India](#)." Population and Development Review.

<sup>25</sup> For instance, some communities in the [South](#) and [Northeast](#) espouse matrilineal systems that prioritize women and their ability to live in the natal home after marriage.

women in India's Southern states generally fare better on education and health measures than women in other parts of the country, some Southern Indians may still espouse traditional, patriarchal values. For example, while Kerala tends to be most consistently egalitarian in gender attitudes, neighboring Tamil Nadu sometimes stands out with more male-biased views. Tamil Nadu residents are about twice as likely as people in Kerala to agree sons should have the primary responsibility for their parents' last rites or burial rituals (56% vs. 30%). They are also more likely to say sons should have greater rights to inheritance (27% vs. 12%). (See Pew Research Center's survey report, "[How Indians View Gender Roles in Families and Society](#).")



**How regions of India are defined in this section**



Notes: These regions reflect zonal council divisions. Population shares based on individuals of all ages and exclude the union territories of Andaman and Nicobar Islands and Lakshadweep.

Source: Census of India, 2011.

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India's sex ratio at birth is slightly more skewed in the North (111) than in the South (108), according to the 2019-21 NFHS. The North-South divide was more pronounced in the past. In the 2001 census, for example, the sex ratio at birth was most heavily skewed in the North (118) and almost balanced in the South (106).

Over the past two decades, the sex ratio gap has fallen most in India's North region, driven by states such as Punjab, Haryana and Delhi. Today, the sex ratio gap in the North is 111 boys per 100 girls, close to the Indian average, according to NFHS data.

India's Southern and Northeastern regions have consistently had sex ratios close to the natural balance, although the sex ratio in the South has recently started to skew toward males. In the relatively affluent South, the sex ratio at birth now is 108.

The Central and Eastern states have a moderate skew, ranging between 106 and 111 in the past two decades. These two regions are characterized by dense populations, low economic development and educational attainment, and a concentration of Muslims. Women in this area are more likely to prefer sons than women in any other region, with 20% of women who would want more sons than daughters in 2019. Central India's moderate sex imbalance over the past two decades is likely due to limited access to ultrasounds and their higher fertility rates.

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## India's sex ratio gap has shrunk rapidly in the North

*Sex ratio at birth, or the number of male births per 100 female births*

Region	2001	2019-21
All	110	108
North	118	111
West	116	108
Central	111	106
East	107	109
South	106	108
Northeast	105	104

Note: Data for 2019 shows sex ratio among all births in the five years preceding the survey, and the 2001 estimates are from births in the year prior to the census.

Sources: Census of India, 2001; National Family Health Survey, 2019-21

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### Spotlight on Sikhs: Rapid changes in recent decades

Sikhs' concentration in northwestern India is often cited as a key factor in their male biased ratio, and Sikhs' unique caste composition also seems to play a critical role.

The vast majority of India's Sikhs live in the northwestern states of Punjab (where they account for 58% of the population) and Haryana (where they are a minority). For many years, Punjab and Haryana had heavily skewed sex ratios, at 127 boys per 100 girls in 2001 and about 120 in 2011, according to the census.

Traditionally, Indians – not just Sikhs – who live in this region have tended to follow [strict patrilineal norms](#), such as giving sons greater access to inheritances.

Sex ratios at birth have been strongly male-biased among both Sikhs and Hindus in Punjab, which has a Sikh majority, and Haryana, where Sikhs are about 5% of the population. In the 2011 census, Hindus living as a minority in Punjab had a sex ratio of 116 boys per 100 girls. In Haryana, where Hindus are the majority of the population, there were 123 boys per 100 girls at birth. However, in each state the sex ratio was even more male-biased among Sikhs (121 in Punjab and 127 in Haryana).

In addition, many Sikhs in Punjab and Haryana belong to the [land-owning Jat caste](#) that passes ancestral properties down through male lines. Today, Sikhs' sex ratio at birth (110) is not very different from the national average (108), neither are the overall ratios in [Punjab](#) (111) and [Haryana](#) (112), according to births in the five years prior to the 2019-21 NFHS.

Much of the movement in Sikhs' sex ratio in recent decades can be attributed to upper-caste families – who are generally more educated, affluent and likely to own land.<sup>26</sup> The sex ratio among upper-caste Sikhs was far more skewed than among lower-caste Sikhs in the 1990s and early

### Several Indian states, including Punjab and Haryana, saw significant narrowing in sex ratio gap

*Sex ratio at birth, or the number of male births per 100 female births*

	Region	2001	2011	2019-21
Punjab	North	127	119	111
Uttarakhand	Central	117	115	102
Haryana	North	127	121	112
Gujarat	West	120	115	105
Delhi	North	117	115	108
Madhya Pradesh	Central	111	110	105

Notes: Data for 2019-21 shows sex ratio among all births in the five years preceding the survey; 2001 and 2011 estimates are from births in the year prior to the census. Delhi is a union territory. Sources: Census of India, 2001 and 2011; National Family Health Survey State Fact Sheets, 2019-21  
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<sup>26</sup> Scholars, including University of Maryland sociologist Monica Das Gupta, posit that male-biased sex selection is an effort by Jats to consolidate ancestral land and maintain their social and economic dominance in northwestern India. See Das Gupta, Monica. 1987. "Selective Discrimination against Female Children in Rural Punjab, India." Population and Development Review. See also Gill, Gurjeet K. 1998. "Female Feticide as a Contemporary Cultural Practice in the Punjab." Dialectical Anthropology.

2000s. Over the past two decades, the ratio has narrowed sharply among upper-caste Sikhs. For instance, Sikh women in the higher “General Category” caste saw a 30-point change between the 2005-06 and 2019-21 waves of the NFHS (151 vs. 121, respectively), compared with a 5-point change among Sikhs in the lower “Scheduled Caste” category (107 vs. 102).<sup>27</sup> As upper-caste families account for about 40% of all Sikhs, they play an important role in shaping Sikhs’ overall sex ratio at birth. (For a deeper analysis of the connections between caste and sex selection among Indians overall and within religious groups, see [“What role does caste play?”](#))

If the 2019-21 NFHS is accurate, the Sikh “correction” toward a more natural ratio in the past decade means that Sikhs (with a sex ratio at birth of 110) are no longer very different from Hindus (109) on this measure.

### **Spotlight on Christians: Low rates of sex selection**

Among Christians, the sex ratio at birth has consistently stayed between 103 and 105 in each of the datasets in this analysis. Partially due to their concentration in the South, Christian women ages 15 to 49 are less likely than the average Indian woman in this age group to say they would prefer to have more sons than daughters (12% vs. 15% for all Indian women ages 15 to 49) and more likely to say they would prefer to have more daughters than sons (7% vs. 3%, respectively).

Some scholars suggest Christians’ balanced sex ratio at birth is due in part to the religion’s history in India, and the prevalence of Christian social programs and cultural practices that focus on girls and women.

Many of India’s Christians are descendants of Dalit Hindus who converted to Christianity in part to escape caste-based discrimination. Large-scale conversions are reported to have taken place in the late 19th and early 20th centuries in connection with famines, natural disasters, epidemics and other crises that resulted in economic hardship.<sup>28</sup> After conversion, missionary organizations often provided low-caste Christians with educational opportunities, and converts could take jobs that previously had been denied to them based on caste status.

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<sup>27</sup> Due to the small sample size, the 30-point change for upper-caste Sikhs is significant at 90% confidence level, but the 5-point change for lower-caste Sikh women is not statistically significant

<sup>28</sup> Kent, Eliza F. 2004. [“Converting women: gender and Protestant Christianity in colonial South India.”](#)

Some scholars suggest that low-caste Hindus who converted to Christianity gained more than just material benefits. Converting may have given former Dalit Hindus a new self-image, eased the transition away from their traditional, “unclean” occupations and made new educational opportunities possible for their children.<sup>29</sup>

Women, in particular, may have benefited from these types of changes. Christian missions in India have emphasized evangelical work among women since the 19th century, operating schools for girls as well as for boys. There were also missionary programs dedicated to educating women and training them for employment, such as the *Mukti* (Salvation) Mission.<sup>30</sup> In addition, many Christian organizations prioritize maternal and child health by improving women’s access to health care facilities. Some scholars trace Christian missionary work to long-lasting benefits for Christians and cite the Christian emphasis on empowering women as a partial explanation for Christian girls’ better health outcomes.<sup>31</sup>

This history may help explain why Christians are the least likely of India’s religious groups to engage in sex-selective abortions, and why the share of Christians who would prefer to have more daughters than sons (7%) is several percentage points greater than other religious groups. Nevertheless, Pew Research Center estimates that Christians have practiced sex selection at least to some extent, given the roughly 53,000 female births missing among Christians in India between 2000-19. To some degree, the estimate reflects the pervasive influence of son preference throughout Indian society. Christians, especially those who live in the North and West, may not be immune to this bias and the practice of sex selection. For instance, in the most recent census, the sex ratio at birth among Christians in these two regions was around 110 boys per 100 girls.

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<sup>29</sup> Shah, Rebecca S. and Timothy S. Shah. 2011. “[How Evangelicalism – including Pentecostalism – helps the poor: The role of spiritual capital.](#)” In Berger, Peter L., and S. Gordon, eds. “The Hidden Form of Capital: Spiritual Influences in Societal Progress.” There is some debate on the extent of gains experienced by Dalit converts to Christianity. For example, see Louis, Prakash. 2007. “[Dalit Christians: Betrayed by State and Church.](#)” *Economic and Political Weekly*.

<sup>30</sup> Anderson, Allan. 2006. “[Pandita Ramabai, the Mukti Revival and Global Pentecostalism.](#)” *Transformation*.

<sup>31</sup> For example, see Menon, Nidhiya, and Kathleen McQueeney. 2020. “[Christianity and Girl Child Health in India.](#)” *World Development*. See also Calvi, Rossella, and Federico G. Mantovanelli. 2018. “[Long-Term Effects of Access to Health Care: Medical Missions in Colonial India.](#)” *Journal of Development Economics*.

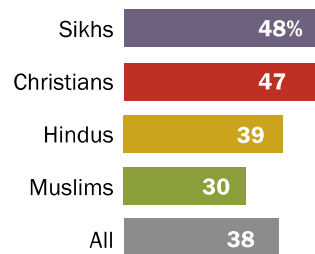
### Sidebar: Demographic profiles

In India and around the world, family patterns are usually tied to a variety of demographic measures, such as education, wealth, urbanicity and fertility. And these, in turn, are tied to religion. In other words, to understand sex selection patterns among India's major religious communities, it is important to examine other factors that might be correlated.

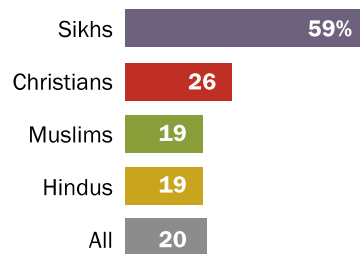
Among India's four major religious groups, Christians and Sikhs have the highest levels of educational attainment: Nearly half of these adults have completed 10 or more years of schooling, according to the 2019-21 NFHS.<sup>32</sup> Muslims and Hindus, who together make up more than 90% of the population, tend to have fewer years of schooling. Indeed, roughly a quarter of Hindu adults (26%) and three-in-ten Muslim adults (30%) have received no formal schooling, compared with 23% of Sikhs and 18% of Christians.

### Sikhs are the wealthiest of India's major religious groups; Muslims are the most urban

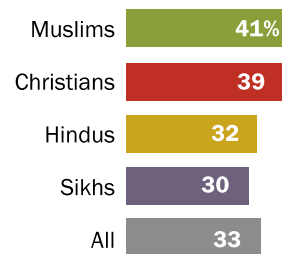
*% of Indian adults with 10 or more years of schooling*



*% of households in the top wealth quintile*



*% of households in urban areas*



Notes: Wealth is based on a measure of a household's living standards that accounts for a wide range of factors including whether homes have running water or flooring. "All" includes Hindus, Muslims, Christians, Buddhists, Sikhs, Jains, adherents of smaller religious groups and people with no religious affiliation. "Religion" refers to the religious affiliation of the head of the household.

Source: National Family Health Survey, 2019-21.

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Of India's four major religious groups, Sikhs on average are the wealthiest, by a wide margin. Approximately six-in-ten Sikh households fall in the highest wealth quintile, according to the [NFHS wealth index](#), which includes measures such as whether a household has certain appliances and where it obtains drinking water. This may be tied to their geographic concentration in India's northwest, which is home to a disproportionately high share of wealthy households. But even *within* regions, Sikhs tend to be more affluent than other religious groups.

<sup>32</sup> A [2016 Pew Research Center global study](#) that analyzed the educational attainment of India's Hindus, Christians, Muslims and Buddhists found that among these four groups, Christians receive the most years of formal education, on average, and Muslims receive the fewest. Since this was a global report, it focused on groups that could be measured in many countries. Because Sikhs are present in comparatively small numbers outside India, they were not measured separately in this earlier Pew Research Center report.

According to NFHS data, Christians are the second wealthiest group, with a quarter of Christian households (26%) in the top wealth quintile, followed by roughly one-in-five Hindus and Muslims. Although nearly half of India's Christians are concentrated in the affluent South, the remainder reside mainly in the relatively impoverished Northeast and East, so Christians overall lag far behind Sikhs.

Christians and Muslims tend to be more urban than Hindus and Sikhs. About four-in-ten Christian and Muslim households are in urban areas, compared with roughly three-in-ten Hindu and Sikh households. Cities usually offer more advanced hospitals, public transportation and other essential facilities. However, Muslims who live in cities tend to be [concentrated in poorer urban areas](#) with limited access to basic services such as water, health care, education and sanitation. The same is true of other socially disadvantaged groups, such as [Dalits and tribal communities](#).

## 2. What role does caste play?

Many of the patterns described in this report vary by caste. In India, castes are hereditary social classes. Historically, the caste someone was born into determined their status in the social hierarchy, along with their social circle and what careers they could pursue. Caste also is tied to many family patterns – including sex selection. Sex ratios at birth, son preference and ultrasound use vary widely *within* religions, by caste.

Upper-caste Sikhs, in particular, have a very imbalanced sex ratio at birth. Indeed, upper-caste families were primarily responsible for the large skew among Sikhs in India over the past two decades. This is partly a result of Sikhs’ relatively high share of upper-caste families.

The most recent National Family Health Survey uses five broad caste categories.<sup>33</sup> These include three lower castes made up of groups that were historically disadvantaged and are eligible for tiered affirmative action programs known as “reservations.”

- **Scheduled Caste**, also known as Dalit (or by the pejorative term “untouchable”), is made up of groups that were [traditionally ostracized](#) and were relegated to “polluting” occupations like fishing, scavenging and sewer cleaning.
- **Scheduled Tribe** is made up of [Indigenous peoples](#). Most of the Scheduled Tribe [population lives in rural areas](#).
- **Other Backward Class (OBC)** is made up of Indians who inherited other social class identities that have been socially and educationally disadvantaged.
- **General Category** consists of people who do not fall into any socially or economically disadvantaged caste category. Brahmin – historically the priests and other religious leaders who also served as educators – is the General Category’s highest caste.<sup>34</sup>
- **No caste/tribe** is made up of a minority of Indians who do not identify with any caste or tribe.

Most Indian households (73%) belong to a caste category that is eligible for government reservations, according to the NFHS. But shares vary widely by religious affiliation, ranging from 49% of Muslims to 77% of Hindus. About three-quarters of Christian households (74%) belong to a historically disadvantaged caste, including 22% who say they are members of a Scheduled Caste.<sup>35</sup> Just 4% of Muslims say they belong to a Scheduled Caste or Tribe, but more than four-in-ten

<sup>33</sup> See Pew Research Center’s Decoded post, “[Measuring Caste in India](#).”

<sup>34</sup> This category is made up of respondents who answered “none of the above.”

<sup>35</sup> On the Indian census, Christians are not able to identify as members of a Scheduled Caste. As a result, some Christian members of Scheduled Castes reportedly identify themselves as Hindus when completing official forms such as the census, potentially leading to an undercount of Christians in India. See [Methodology](#) for details.



(44%) say they are members of OBCs. In addition, among India's major religious groups, Muslims are the most likely to say they have no caste or tribe.

Each group's unique caste composition may influence its patterns of son preference, daughter aversion, and sex ratios at birth. This is not just because caste is an important indicator of socioeconomic status, but also because caste entails cultural norms that may limit women's autonomy in different ways.

For example, Brahmin women (members of the General Category caste) are less likely to be employed or be allowed to work outside the home. Scheduled Caste women, on the other hand, often experience fewer restrictions on their [freedom of mobility and employment](#), but they are also [disproportionately victims of sexual violence](#).

Despite the caste system's [roots in historical Hindu writings](#), caste continues to affect the lives of Dalit non-Hindus in India. They are often regarded as socially inferior communities by their non-Dalit co-religionists and experience various forms of discrimination and exclusion, such as segregation in social interactions and [in religious spaces](#).<sup>36</sup>

## In India, Sikhs and Muslims have larger upper-caste shares than other Indians

*% of Indian households in each class category, by religion*

	General Category	No caste/tribe	Scheduled Caste	Scheduled Tribe	Other Backward Class
All households	22%	5%	22%	10%	42%
Sikh	40	1	41	1	15
Muslim	31	18	3	1	44
Christian	21	5	22	29	23
Hindu	20	3	24	10	43

Note: Don't know/refused responses not shown.  
Source: National Family Health Survey, 2019-21.  
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## India's Tribal women are the least likely to practice sex selection

*Sex ratio at birth, or the number of male births per 100 female births, by caste*

	Sex ratio at birth
General Category	110
Other Backward Class	109
Scheduled Caste	108
Scheduled Tribe	104

Note: Among births in the five years preceding the survey.  
Source: National Family Health Survey, 2019-21.  
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<sup>36</sup> See Trivedi, Prashant K., Srinivas Goli, Fahimuddin and Surinder Kumar. 2016. "[Does Untouchability Exist among Muslims?](#)" Economic and Political Weekly. See also Deshpande, Satish, and Geetika Bapna. 2008. "[Dalits in the Muslim and Christian Communities. A Status Report on Current Social Scientific Knowledge.](#)" Insight. Also see Ram, Ronki. 2007. "[Social Exclusion, Resistance and Deras: Exploring the Myth of Casteless Sikh Society in Punjab.](#)" Economic and Political Weekly. Meanwhile, a recent study finds that Muslims and Christians are less likely to practice untouchability than their Hindu counterparts; see Thorat, Amit, and Omkar Joshi. 2020. "[The Continuing Practice of Untouchability in India.](#)" Economic and Political Weekly.

General Category women ages 15 to 49 express weaker son preference attitudes than other groups, according to the 2019-21 NFHS. Indian authorities exclude Scheduled Caste Christians and Muslims from government reservations.

When asked about the ideal gender composition of their children, 12% of General Caste women want to have more sons than daughters, compared with 16% of Scheduled Caste women, 16% of OBC women, and 18% of Scheduled Tribe women.

However, General Category women seem to be at least as likely as women from OBCs and Scheduled Castes to practice sex selection to avoid having daughters. The birth ratio after ultrasound use during pregnancy for General Category women is around 110 boys per 100 girls, compared with 109 among OBCs, 108 among Scheduled Castes, and a nearly balanced ratio of 104 boys per 100 girls among Scheduled Tribe women.

Combined with wider ultrasound use among upper-caste women, their sex ratio at birth tends to be more male-biased than that among lower-caste ones, especially in the past when gaps in ultrasound use were wider. For instance, the birth ratio among General Category women was 9 points wider than among women of Scheduled Castes in the 2005-06 NFHS, when the rate of ultrasound use among upper-caste women was twice as high.

Among General Category Sikh women, the sex ratio at birth is 121 boys per 100 girls, significantly more imbalanced than among Scheduled Caste Sikhs (102). The sex ratio gap is smaller between General Category and Scheduled Caste Hindus (112 vs. 108). (The number of births by Muslim or Christian women in these caste categories is too small for this analysis.)

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## Birth ratio difference between India's upper and lower castes is narrowing

*% of pregnancies with ultrasound test, by caste*

	2005-06	2015-16	2019-21
General Category	34%	71%	84%
Scheduled Caste	17	58	75

*Sex ratio at birth, or the number of male births per 100 female births*

General Category	112	113	110
Scheduled Caste	103	107	108

Note: Among pregnancies and births in the past five years preceding the survey.

Source: National Family Health Survey, 2005-21. "India's Sex Ratio at Birth Begins To Normalize"

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Land ownership may partially explain sex ratio differences by caste among Sikhs. Upper-caste Sikh households are more likely than underprivileged, Scheduled Caste Sikh households to own land (59% vs. 8%), according to NFHS data. Land-owning caste groups may be more motivated than others to avoid having daughters, especially when their regional norms exclude daughters from inheriting family property.<sup>37</sup>

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### **Birth ratio difference between India's upper and lower castes remains wide among Sikhs**

*Sikhs' sex ratio at birth, or the number of male births per 100 female births, by caste*

	<b>2005-06</b>	<b>2015-16</b>	<b>2019-21</b>
General Category	151	119	121
Scheduled Caste	107	104	102

Note: Among births in the five years preceding the survey.  
Source: National Family Health Survey, 2005-21.  
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<sup>37</sup> See Das Gupta, Monica. 2010. "[Family Systems, Political Systems and Asia's 'Missing Girls.'](#)" Asian Population Studies.

## Methodology

This section describes the sources and variables used for the analyses in this report. First, it explains the known limitations of the data measuring sex ratios at birth in India. Next, it outlines how each of the key variables – including son preference, ultrasound use and sex selection – was derived. Finally, the methodology for estimating the number of “missing” female births is described in detail.

Data underlying this study came primarily from the India censuses (2001, 2011) and four waves of the National Family Health Survey (NFHS) conducted from 1998-2021. The Indian censuses provide estimates for sex ratio at birth by religion and state. The NFHS provides data on son preference and ultrasound use; it has also provided data on sex ratios at birth since the last 2011 Indian census. Pew Research Center chose these datasets because they are well-established, publicly available sources of data that include measures relevant for this report. In 2001, the census began asking about the sex of children born in the last year. Estimates of sex ratios prior to 2001 are based on five-year estimates made by the United Nations using India’s [birth register sample data](#).

The NFHS, which has been conducted since 1992-93, is a nationally representative cross-sectional household survey. It provides extensive information on fertility desire and pregnancy/birth histories among women of reproductive age (15 to 49). Its large sample size – around 640,000 (6.4 lakh) households and 720,000 (7.2 lakh) individual women ages 15 to 49 in the most recent wave (2019-21) – also allows for investigating sex-ratio-at-birth trends over time and differences among religious groups. One of the recognized strengths of the NFHS is its high item response rate. The rates are particularly high across demographic measures such as religion, caste, place of residence, wealth and education. For example, data is available to classify the religion, place of residence, and wealth level of all respondents. Only a small share of respondents (<1%) are missing information on caste and education in the latest round of the NFHS.<sup>38</sup>

The fieldwork for the 2019-21 NFHS was split in two phases due to the coronavirus pandemic. Phase I of the survey, covering 22 states and union territories, was completed before the pandemic lockdown that began in March 2020. Phase II, surveying the remaining 14 states and union territories, had fieldwork suspended due to the pandemic; it resumed in November 2020, and was completed by April 2021. Interviews conducted prior to the lockdown account for about 70% of the sample.

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<sup>38</sup> The small share of respondents missing information on these variables are included in this report’s analysis, but missing cases are not reported separately in the report’s charts and text.

## Sex ratio at birth

In this report, we rely on data on births in the year preceding the Indian census – approximately 20 million (2.0 crore) births – to compute the sex ratio at birth in 2001 and 2011.<sup>39</sup> Because of its comprehensive effort to count every household, the census is the best available source to discern patterns in the sex ratio at birth across religious groups in India, though there are some known issues with the reliability of census data on religious identification in India.<sup>40</sup>

Because the census is available only every 10 years – and the 2021 census was delayed by the coronavirus pandemic – we also draw on data from the National Family Health Survey, specifically births in the five years preceding each wave of the NFHS, to understand trends in the sex ratio at birth since 2001 and variation across religious groups.

There are several other data sources that can be used to infer India’s sex ratio at birth. The [Civil Registration System](#) (CRS) produces sex ratio estimates among registered births, but the CRS estimates suffer from known biases: Parents are more likely to register male than female births. The level of India’s birth registration has been improving over time (from 56% in 2000 to 93% in 2019), making the CRS an unfit source to discern clear trends over time in the sex ratio at birth.

The [Sample Registration System](#) (SRS) is another source of vital statistics in India. It is based on continuous enumeration of births and deaths in fairly representative sampling units across India. Some scholars point out that the SRS tends to overestimate the skew in India’s sex ratio at birth because the survey relies on local enumerators or household heads – who may underreport female births and/or misreport birthdates – for birth information.<sup>41</sup>

Retired professor Purushottam M. Kulkarni, formerly at Jawaharlal Nehru University, has carefully reviewed estimates of India’s sex ratio at birth from various sources and finds that the NFHS produces sex ratio estimates that are comparable to the census.<sup>42</sup> Dr. Kulkarni derived an indirect estimate of sex ratio at birth from the census by applying the [reverse survival](#) method to

<sup>39</sup> Some researchers use the child sex ratio (children under 6) to approximate or impute sex ratio at birth with age- and sex-specific mortality information from survey data. But this approach is subject to limitations such as sampling errors and age misreporting because parents tend to overstate boys’ ages. See Kumar, Sanjay, and K. M. Sathyanarayana. 2012. “[District-Level Estimates of Fertility and Implied Sex Ratio at Birth in India](#).” *Economic and Political Weekly*.

<sup>40</sup> Christians in particular appear to be undercounted; some Christians who belong to Scheduled Castes may choose to identify as Hindu when completing official forms such as the census. This is due to a mandate in the Indian Constitution specifying that only Hindus, Sikhs and Buddhists can receive some types of caste-based government affirmative action benefits (known in India as “reservations”). Analyses in Pew Research Center’s “[Global Religious Landscape](#)” and “[Future of World Religions](#)” reports accounted for this by estimating that 10% of Christians in India state their affiliations as Hindu in the census, and by adjusting the population figures accordingly.

<sup>41</sup> According to scholars, the SRS is more likely than the NFHS to suffer from some issues, including underreporting of female births and misreporting of age. See Mahapatra, Prasanta. 2017. “[The Sample Registration System \(SRS\) in India](#).”

<sup>42</sup> For more discussion on estimates of sex ratio at birth from different sources in India, see Kulkarni, Purushottam M. 2020. “[Sex Ratio at Birth in India](#).” United Nations Population Fund. See also Rajan, S. Irudaya, Sharada Srinivasan, and Arjun S. Bedi. 2017. “[Update on Trends in Sex Ratio at Birth in India](#).” *Economic and Political Weekly*.

child sex ratio (a technique to numerically “resurrect” those no longer present among the population using survivorship probabilities), and he showed that the NFHS results are closer than the SRS to the census. For instance, the NFHS shows the average birth ratio between 1994 and 2000 is 108 boys per 100 girls, close to the indirect estimate from the 2001 census (107), while the SRS ratio (112) is more male-biased. In other words, Dr. Kulkarni’s research indicates that India’s birth ratios are not as male-biased as the SRS suggests, and that the NFHS produces more reliable estimates than the SRS of sex ratios at birth.

### Wide confidence interval for Sikhs’ sex ratio estimate

*Sex ratio at birth, or the number of boys per 100 girls*

Religion	Sex ratio at birth	95% Confidence interval	
		Lower	Upper
All	108	107	109
Hindu	109	107	110
Muslim	106	102	109
Christian	103	96	110
Sikh	110	102	119

Notes: Among births in the five years preceding the survey.

Source: National Family Health Survey, 2019-21.

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While the sex ratio at birth estimates from the NFHS are generally considered reliable, they come with confidence intervals, just like other survey estimates. As precise estimates require [a large sample size](#), the 95% confidence interval is particularly wide for small religious groups. For instance, the estimated sex ratio at birth for Muslim women (based on over 33,000 or 0.3 lakh births in the past five years preceding the survey) is 106 boys per 100 girls, with the confidence interval between 102 and 109 boys per 100 girls. Due to its wide confidence intervals, the Hindu-Muslim difference in sex ratios (109 vs. 103) is only marginally significant at the 90% confidence level. To ensure relatively precise sex ratio at birth estimates, we limit the analysis to India’s four major religious groups: Hindus, Muslims, Christians and Sikhs.

In addition, as mentioned above, the fieldwork for the recent 2019-21 NFHS was conducted in two phases: before and during the pandemic. Some scholars have [expressed concerns](#) about inferring trends in health and economic measures using the 2019-21 data as it is unclear whether some changes might be due partly to disruptions and/or reporting biases caused by the pandemic. For example, there were some news reports about pregnant women [forgoing ultrasound tests](#) and [losing access to abortion services](#) during the coronavirus lockdown. Thus, it is possible that there could be some “pandemic effect” on our key measures of ultrasound use and sex selection. However, in our analytical sample, births that took place after the pandemic lockdown account for only a small share (5%) of the total number of births in the five years preceding the survey.

## Son preference

Researchers follow the conventional approach of inferring son preference based on the survey respondents' reported "ideal" gender composition of their children: Son preference is identified when the ideal (i.e., desired) number of boys is greater than that of girls.<sup>43</sup> We constructed a categorical measure to indicate the level of son preference: wanting more sons, wanting more daughters, and wanting equal numbers of sons and daughters.<sup>44</sup>

## Want to have another child

We also constructed a measure to explore gender bias in fertility planning among currently married women. The NFHS asked women whether they wanted more children, and we recoded those who answered that they prefer to have a/another child as 1 (= want more children), otherwise 0. To examine gender bias, we compared the share of women who want more children among those with no living *sons* with those with no living *daughters*.

## Ultrasound use and sex selection

The women's data from the NFHS provides detailed information on all pregnancies reported in the five years before the survey, including ultrasound use during each pregnancy and outcomes including the sex of the child at birth.<sup>45</sup>

Each round of the NFHS final report includes the analysis of son preference, desire for another child, ultrasound use, and pregnancy outcomes (of ultrasound pregnancies) by religion, education, wealth, caste, and place of residence.<sup>46</sup> See the [NFHS site](#) for more details.

## Estimating "missing" female births

Pew Research Center draws on data from three waves of the National Family Health Survey, collected in 2005-06, 2015-16, and 2019-21, to analyze the number of "missing" female births over

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<sup>43</sup> This measure of son preference may suffer from what social scientists call "rationalization bias." For example, see Pande, Rohini P., and Nan Marie Astone. 2007. "[Explaining Son Preference in Rural India: The Independent Role of Structural versus Individual Factors](#)." Population Research and Policy Review.

<sup>44</sup> The analytic sample used to analyze son preference differs slightly across surveys. While most waves of the NFHS (2005-21) interviewed *all* women ages 15 to 49 about their fertility preferences, the 1998 survey included *ever-married* women ages 15 to 49. However, this issue does not affect son preference patterns across religious groups.

<sup>45</sup> [The 1998 NFHS](#) is an exception, as the ultrasound use question asked about births in the three years preceding the survey. Due to the small number of ultrasound births in the survey, we excluded it from the analysis of sex selection.

<sup>46</sup> Note that the 1998 NFHS is the earliest wave with ultrasound use information, which was collected for births in the preceding three years. See the [1998-99 NFHS-2 report](#) for more. The 2005-06 NFHS is the first wave with information on the share of male versus female births among ultrasound pregnancies.

the past two decades (2000-19). As discussed above, the NFHS is a well-established source that provides measures of India's sex ratio at birth, second only to the Indian census in reliability.

We took several steps to ensure the reliability of our “missing birth” estimates. First, we adjusted the original weights for each survey by its sample size, so that each wave has an equal total weight, with guidance from [Tom Pullum](#), Senior Advisor at the Demographic and Health Surveys program, which oversees the distribution of NFHS data. Second, we restricted our analysis to birth histories up to 15 years before the survey to minimize bias and reporting errors.<sup>47</sup> To reduce misreporting errors, we also excluded births by women who reported having children at age 13 or younger. Because births to women under 15 are [extremely rare](#), such cases (births before age 13) are likely due to an error in the woman's own birthdate. Lastly, our analysis focuses on births among all women in the past two decades, between 2000 and 2019.

The number of “missing” female births is derived by comparing the numbers of *observed* and *expected* female births. We calculated the number of expected female births by applying India's natural sex ratio at birth (105.3 boys per 100 girls, or the girl-to-boy ratio of 950 to 1,000) to observed male births, which is about the same as the estimated sex ratio at birth before the introduction of prenatal testing in the 1970s.<sup>48</sup> Our analysis focuses on “missing” female births in five-year cohorts between 2000 and 2019.

We calculated the sex ratio at birth for four religious groups in India: Hindus, Muslims, Christians and Sikhs. Smaller groups – including Jains, Buddhists and other religious communities – were combined into an “Others” category due to small sample sizes. We consider female-selective abortions evidenced when the sex ratio at birth is above 105.3 boys per 100 girls.

Information on the number of births over the three decades comes from the [Sample Registration System](#) (SRS), a large-scale survey that provides statistics on births and deaths in India. The

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<sup>47</sup> Some scholars argue that women may not report births of daughters who were already married by the time of the survey, and hence they advise against using birth information going back more than 10 years. See Kulkarni, Purushottam M. 2020. “[Sex Ratio at Birth in India](#).” United Nations Population Fund. However, weighing the benefit of a large number of births and the low likelihood of Indian girls marrying before age 15, we rely on birth histories of 15 years for sex ratios at birth between 2000 and 2019, as do many other scholars who study “missing” girls. See Saikia, Nandita, Catherine Meh, Usha Ram, Jayanta Kumar Bora, Bhaskar Mishra, Shailaja Chandra, and Prabhat Jha. 2021. “[Trends in Missing Females at Birth in India from 1981 to 2016: Analyses of 2.1 Million Birth Histories in Nationally Representative Surveys](#).” Lancet Global Health.

<sup>48</sup> For more on discussions about the natural ratio, see Saikia, Nandita, Catherine Meh, Usha Ram, Jayanta Kumar Bora, Bhaskar Mishra, Shailaja Chandra, and Prabhat Jha. 2021. “[Trends in Missing Females at Birth in India from 1981 to 2016: Analyses of 2.1 Million Birth Histories in Nationally Representative Surveys](#).” Lancet Global Health. See also Chao, Fengqing, Patrick Gerland, Alex R. Cook, and Leontine Alkema. 2019. “[Systematic Assessment of the Sex Ratio at Birth for All Countries and Estimation of National Imbalances and Regional Reference Levels](#).” Proceedings of the National Academy of Sciences.



annual number of births in India between 2000 and 2019 is estimated to be around 26 million (2.6 crore).

Our analysis finds that about 9.0 million (0.9 crore) Indian girls went “missing” due to female selective abortions between 2000 and 2019.<sup>49</sup> As India’s largest religious group, Hindus make up 79.8% of India’s total population and account for a disproportionate share (86.7%) of the “missing” female births – the estimated number of females babies who were never born but would have been if there were no female-selective abortions. In the past two decades, Hindus “lost” about 7.8 million (0.8 crore) girls to sex-selective abortions, according to our estimates.

The share of female births “lost” among Muslims (6.6%) and Christians (0.6%) during this period is considerably smaller than these groups’ shares of the Indian population (14.2% and 2.3%, respectively). Muslims were “missing” an estimated 590,000 (5.9 lakh) female births, and Christians were “missing” an estimated 53,000 (0.5 lakh), during the period studied.

Sikhs account for an outsized number of “missing” female births – an estimated 440,000 (4.4 lakh). Though Sikhs make up 1.7% of India’s population, they are responsible for approximately 4.9% of the “missing” girls during the period studied.

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<sup>49</sup> As discussed above, the Center’s estimate is based on the NFHS, which tends to produce less male-biased sex ratio at birth estimates than the SRS. Thus, our estimate of 9.0 million (0.9 crore) “missing” girls due to sex-selective abortions is smaller than estimates published by some other scholars. For example, some researchers estimate that there were about 20.7 million (2.1 crore) female-selective abortions in India between 1970 and 2017, including about 10.6 million (1.1 crore) “missing” female births between 2000 and 2017, using data from multiple sources, including the SRS, NFHS, and the Indian census. While these researchers draw birth information from multiple data sources, their final sex ratio at birth estimates are close to results from the SRS. See Chao, Fengqing, Patrick Gerland, Alex R. Cook, and Leontine Alkema. 2019. [“Systematic Assessment of the Sex Ratio at Birth for All Countries and Estimation of National Imbalances and Regional Reference Levels.”](#) Proceedings of the National Academy of Sciences.

## Appendix

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### International versus Indian convention of sex ratio at birth

International convention sex ratio	Indian convention sex ratio
100 boys per 100 girls	1,000 girls per 1,000 boys
101 boys per 100 girls	990 girls per 1,000 boys
102 boys per 100 girls	980 girls per 1,000 boys
103 boys per 100 girls	970 girls per 1,000 boys
104 boys per 100 girls	961 girls per 1,000 boys
105 boys per 100 girls	952 girls per 1,000 boys
106 boys per 100 girls	943 girls per 1,000 boys
107 boys per 100 girls	934 girls per 1,000 boys
108 boys per 100 girls	925 girls per 1,000 boys
109 boys per 100 girls	917 girls per 1,000 boys
110 boys per 100 girls	909 girls per 1,000 boys
111 boys per 100 girls	900 girls per 1,000 boys
112 boys per 100 girls	892 girls per 1,000 boys
113 boys per 100 girls	884 girls per 1,000 boys
114 boys per 100 girls	877 girls per 1,000 boys
115 boys per 100 girls	869 girls per 1,000 boys
116 boys per 100 girls	862 girls per 1,000 boys
117 boys per 100 girls	854 girls per 1,000 boys
118 boys per 100 girls	847 girls per 1,000 boys
119 boys per 100 girls	840 girls per 1,000 boys
120 boys per 100 girls	833 girls per 1,000 boys
121 boys per 100 girls	826 girls per 1,000 boys
122 boys per 100 girls	819 girls per 1,000 boys
123 boys per 100 girls	813 girls per 1,000 boys
124 boys per 100 girls	806 girls per 1,000 boys
125 boys per 100 girls	800 girls per 1,000 boys
126 boys per 100 girls	793 girls per 1,000 boys
127 boys per 100 girls	787 girls per 1,000 boys
128 boys per 100 girls	781 girls per 1,000 boys
129 boys per 100 girls	775 girls per 1,000 boys
130 boys per 100 girls	769 girls per 1,000 boys

Notes: Due to rounding, each international convention sex ratio is equivalent to a range of the Indian convention. For example, the natural ratio of 105 boys per 100 girls, in statistical sense, equals between 948 to 956 girls per 1,000 boys. "India's Sex Ratio at Birth Begins To Normalize"

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**Accordion box: What is India's National Family Health Survey?**

The NFHS is a large-scale survey of Indian households that has been conducted five times since 1992-93. It is sponsored by the Indian government with additional funding from a variety of sources, including the U.S. Agency for International Development, the Bill and Melinda Gates Foundation, and UNICEF.

The NFHS is designed to provide India's Ministry of Health and Family Welfare with reliable data on fertility, maternal and child health, family planning and related topics. But because it interviews a random sample of the population, estimates from the NFHS are less precise than those from the census, the amount of sampling error being larger for estimates among smaller religious groups. For example, the NFHS's estimate of the national sex ratio at birth (108 boys per 100 girls) has a margin of sampling error of plus or minus 1 boy per 100 girls. Among Sikhs, the smallest religious group in this study, the estimate (110 boys per 100 girls) has a wider margin of error of plus or minus 8 boys per 100 girls.

There will be more certainty about India's current sex ratio at birth after results from the 2021 Indian census – which was delayed by the coronavirus pandemic – are released. (For more about estimating sex ratios at birth and confidence intervals, see the [Methodology](#).)

**Accordion box: How did we count “missing” girls?**

“Missing” is a term demographers and economists use to describe the deficit in a population caused by discriminatory family planning practices, largely female-selective abortions and female infanticide. Nobel Prize-winning economist [Amartya Sen in 1990 was the first](#) to draw international attention to the concept of “missing” women in a groundbreaking article in [The New York Review of Books](#).

To approximate the number of “missing” girls due to sex-selective abortions (excluding post-birth infanticide or femicide), scholars generally compare the actual number of newborn girls with the number that would be expected if there were no selection. Without sex selection in India, the sex ratio at birth would be roughly 105 boys per 100 girls.<sup>50</sup> This natural sex ratio at birth was the balance for decades before prenatal sex detection technology was introduced in the 1970s.

When the natural sex ratio at birth prevails, about 48.8% of all children born are girls. In India, on average, about 47.9% of children born between 2000 and 2019 were girls. The gap between these statistics represents “missing” girls – those who were not born, due to sex-selective abortions.

Using three waves of data from the National Family Health Survey (NFHS), Pew Research Center estimates there were 9.0 million (0.9 crore) “missing” girls between 2000 and 2019 in India.

The Center’s estimate of “missing” girls due to sex-selective abortions is smaller than estimates published by some other scholars.<sup>51</sup> This discrepancy is partly because other studies often cover earlier time periods, and partly because the survey data Pew Research Center researchers relied on – the NFHS – seems to produce relatively conservative, less male-biased sex ratios at birth in India than some other sources. (See this report’s [Methodology](#) for discussion of differing estimates of the number of “missing” girls.)

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<sup>50</sup> See Chao, Fengqing, Patrick Gerland, Alex R. Cook, and Leontine Alkema. 2019. “[Systematic Assessment of the Sex Ratio at Birth for All Countries and Estimation of National Imbalances and Regional Reference Levels](#).” Proceedings of the National Academy of Sciences.

<sup>51</sup> For example, some researchers estimate that there were about 20.7 million (2.1 crore) female-selective abortions in India between 1970 and 2017, including about 10.6 million (1.1 crore) “missing” female births between 2000 and 2017. See Chao, Fengqing, Patrick Gerland, Alex R. Cook, and Leontine Alkema. 2019. “[Systematic Assessment of the Sex Ratio at Birth for All Countries and Estimation of National Imbalances and Regional Reference Levels](#).” Proceedings of the National Academy of Sciences.

**Accordion box: Is it son preference or daughter aversion?**

Rather than attributing the imbalance in sex ratios at birth to “son preference,” some scholars ascribe it to “daughter aversion.”<sup>52</sup> Both perspectives are valuable, and they may be subtly, but importantly, different. For example, if a woman has an unplanned pregnancy and chooses to have an abortion after learning that the fetus is female – though she would have continued the pregnancy if it had been male – her choice would be better understood as an actual aversion to bearing a daughter, rather than as a hypothetical preference for bearing a son.

Moreover, son preference and daughter aversion may affect fertility differently: Parents desiring sons may want to continue having children until they reach an ideal number of sons, while those avoiding daughters may only allow male births, resulting in fewer children overall.

Mathematically, too, sex ratios at birth can be presented in either of two directions: as the number of boys per 100 girls, or as the number of girls per 100 boys. For example, India’s current overall ratio of 108 boys per 100 girls is the same as 93 girls per 100 boys (after rounding to the nearest integer).

The Indian government typically expresses sex ratios as the number of female births per 1,000 male births, reversing the ratio used in most other countries and increasing the base by a factor of 10. By this convention, the current sex ratio at birth in India is 925 girls per 1,000 boys, according to the 2019-21 NFHS.<sup>53</sup>

Although both ratios are correct, it could be confusing to provide statistics in two different formats. It would also be difficult to disentangle whether large-scale childbearing patterns result primarily from son preference or daughter aversion. For these practical reasons, this report follows the international convention of presenting the ratio of boys per 100 girls and uses “son preference” more or less interchangeably with “daughter aversion.”

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<sup>52</sup> Iyer, Sriya, and Shareen Joshi. 2013. “[Missing Women and India’s Religious Demography](#).” *Journal of South Asian Development*.

<sup>53</sup> The ratio of 108 boys per 100 girls equals between 925 and 929 girls per 1,000 boys due to rounding.

### Accordion box: Laws, norms and traditions

Laws and cultural norms tied to inheritance and marriage may help explain differences in attitudes toward sons, daughters and abortion. This sidebar offers a very elementary glance at Indian laws, norms and traditions that might be tied to sex selection.

**Inheritance:** Inheritance traditions are among the barriers that Indian women face, even though laws in most cases grant equal inheritance rights to sons and daughters.

India's major religious groups are subject to [different inheritance laws](#).

- Hindus, Jains, Buddhists and Sikhs are governed by the [Hindu Succession Act of 1956](#), which originally excluded daughters from [inheriting ancestral property](#) held jointly by the extended family. Although it was [amended in 2005](#) to treat genders more equally, the new law does not seem to have completely brought about the desired change. Some families circumvent the law by [pressuring daughters to give up their share of inheritance](#), and daughters may forfeit their rights to avoid straining family ties.<sup>54</sup>
- Muslims are governed by the [Muslim Personal Law](#), which follows the principles of Shariah, granting sons [twice as large an inheritance](#) as daughters. This makes Islam the only religion in India that legally favors sons in this way.
- Most Christians are subject to the [Indian Succession Act of 1925](#), which treats sons and daughters equally, although state governments have the power to exempt tribes and sects, and some small Christian groups may follow their own customs.<sup>55</sup> (For example, [the Khasi community](#), a majority Christian group in the Northeastern state of Meghalaya, passes ancestral property down through daughters.)

**Marriage:** [Most marriages in India are arranged](#), with parents typically making the choice (sometimes in consultation with the prospective brides and grooms) based on factors such as caste and religion.

Hindus discourage marriages within kinship groups. In addition, according to Hindu custom, it is generally unacceptable for married women to materially support their parents.<sup>56</sup>

Some scholars argue that Muslim marriage customs are less disadvantageous to women than those of Hindus.<sup>57</sup> For example, Muslims favor close-kin marriages, which means that Muslim daughters tend to live relatively close to their natal family after marriage.<sup>58</sup> Moreover, Muslim daughters are customarily allowed to help their natal family financially, and thus are less likely to be seen as an economic liability.

<sup>54</sup> Deininger, Klaus, Aparajita Goyal, and Hari Nagarajan. 2010. "[Inheritance Law Reform and Women's Access to Capital](#)." Policy Research Working Papers. See also Brulé, Rachel E. 2020. "[Reform, Representation, and Resistance: The Politics of Property Rights' Enforcement](#)." The Journal of Politics.

<sup>55</sup> Mishra, Archana. 2014-15. "[Breaking Silence - Christian Women's Inheritance Rights Under Indian Succession Act, 1925](#)." Chotanagpur Law Journal.

<sup>56</sup> Robitaille, Marie-Claire. 2013. "[Determinants of Stated Son Preference in India: Are Men and Women Different?](#)" The Journal of Development Studies.

<sup>57</sup> Guillot, Michel, and Keera Allendorf. 2010. "[Hindu-Muslim Differentials in Child Mortality in India](#)." Genus.

<sup>58</sup> Narayan, Swati. 2018. "[Religion and Female-Male Ratios in India](#)." Indian Journal of Human Development.

Christians mostly reside in the South and Northeast, where marriage customs are widely viewed as less disadvantageous to women than customs in other regions.<sup>59</sup> Like Muslims, married Christian women are allowed to help their birth family financially.<sup>60</sup>

**Abortion:** As generally understood, India's major religions [do not broadly condone abortion](#). But it has been legal in India [since 1971](#).<sup>61</sup>

A major [Pew Research Center survey](#) conducted in 2019-20 among nearly 30,000 people across India finds that 55% of Indian adults say abortion should be illegal in all or most cases. Roughly half or more of adults surveyed in most of India's major religious groups say abortion should be illegal in all or most cases, including 60% of Sikhs, 57% of Muslims, 54% of Hindus and 49% of Christians.<sup>62</sup>

**Dowry:** Many researchers attribute India's widespread son preference and daughter aversion partly to the higher cost of raising daughters through the dowry tradition.<sup>63</sup>

Dowries, which were confined to a minority of Indians a century ago and were [outlawed in 1961](#), are now prevalent across regions, castes and religions.<sup>64</sup> (Gifts from the groom's family to the bride's family, known as "bridewealth" or "dower," are given less commonly and tend to be much smaller.) Although dowry is traditionally a voluntary gift by parents to their daughters and her new family at the time of marriage, in practice it is sometimes a "price" demanded by the groom's family.<sup>65</sup> [Not providing a sufficient dowry](#) at marriage, or failing to meet continued demands for dowry payments after marriage, has sometimes led to harassment and violence against brides [by husbands and their families](#), and, in some cases, to suicide.<sup>66</sup> Parents feel obliged to pay a large dowry to marry their daughter into a socially desirable family.<sup>67</sup>

<sup>59</sup> Fulford, Scott. 2013. "[The Puzzle of Marriage Migration in India](#)." Boston College Working Papers in Economics.

<sup>60</sup> Robitaille, Marie-Claire. 2013. "[Determinants of Stated Son Preference in India: Are Men and Women Different?](#)" The Journal of Development Studies.

<sup>61</sup> Damian, Constantin-Iulian. 2010. "[Abortion from the Perspective of Eastern Religions: Hinduism and Buddhist](#)." Romanian Journal of Bioethics. See also Coward, Harold and Tejinder Sidhu. 2000. "[Bioethics for clinicians: 19. Hinduism and Sikhism](#)." CMAJ: Canadian Medical Association journal. Also see Narayan, Swati. 2018. "[Religion and Female-Male Ratios in India](#)." Indian Journal of Human Development.

<sup>62</sup> In contrast, [the 2014 U.S. Religious Landscape Study](#) by Pew Research Center shows that Hindu Americans are more tolerant than Protestants, Catholics and Muslims toward abortion.

<sup>63</sup> Anukriti, S., Sungoh Kwon, and Nishith Prakash. 2022. "[Saving for Dowry: Evidence from Rural India](#)." Journal of Development Economics.

<sup>64</sup> Bhalotra, Sonia, Abhishek Chakravarty, and Selim Gulesci. 2020. "[The Price of Gold: Dowry and Death in India](#)." Journal of Development Economics. See also Chiplunkar, Gaurav and Jeffrey Weaver. 2017. "[Marriage Markets and the Rise of Dowry in India](#)."

<sup>65</sup> Makino, Momoe. 2019. "[Dowry in the Absence of the Legal Protection of Women's Inheritance Rights](#)." Review of Economics of the Household.

<sup>66</sup> Diamond-Smith, Nadia, Nancy Luke, and Stephen McGarvey. 2008. "['Too Many Girls, Too Much Dowry': Son Preference and Daughter Aversion in Rural Tamil Nadu, India](#)." Culture, Health & Sexuality.

<sup>67</sup> Jakimow, Tanya. 2012. "['Everyone Must Give': Explaining the Spread and Persistence of Bridegroom Price among the Poor in Rural Telangana, India](#)." Journal of Asian and African Studies. Also see Srinivasan, Sharada. 2005. "[Daughters or Dowries? The Changing Nature of Dowry Practices in South India](#)." World Development.