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Predictors of the gender gap in household educational spending among school and college-going children in India

Rashmi Rashmi ¹✉, Bijay Kumar Malik², Sanjay K. Mohanty¹, Udaya Shankar Mishra¹ & S. V. Subramanian ^{3,4}

Though India has achieved near-universal primary school attendance and bridged the gender gap, secondary and technical education schooling remains low. Household ability to pay for education and gender norms at the household and societal levels are possible reasons for variations in school attendance and quality of schooling. Although various studies have examined the gender gap in enrolment and school discontinuation, there are limited studies on gender differentials in educational spending in Indian households. Using data from 174,810 school and college-going children aged 6–22 years from the 75th round of the National Sample Survey Organization, this paper explored the gender gap in household educational spending in India. Descriptive statistics, relative gap, and the Blinder-Oaxaca decomposition method were used in the analysis. The results suggests that school attendance was 82.7% (95% CI 82.0–83.3) among boys and 78.9% (95% CI 78.1–79.7) among girls aged 16–17 years and 63.1% (95% CI 62.6–63.6) among boys and 51.3% (95% CI 50.7–51.9) among girls aged 18–22 years. The difference in the average per capita educational spending between boys and girls was ₹828 at the primary level (ages 6–10), ₹935 at the middle/secondary level (ages 11–15), ₹3189 at the higher secondary level (ages 16–17), and ₹3813 in higher education (age 18–22). The results obtained from the Blinder-Oaxaca Decomposition analysis show that type of educational institution (public or private) contributed more than half of the variation in household educational spending among 6–10- and 11–15-year-old children and was the strongest contributor at every age. The education of the household head considerably reduced the gender gap in higher education. Locational disadvantage and the uniformity in the gender gap across all levels of the economic hierarchy suggest a behavioural bias in the intra-household allocation of educational resources across the states of India.

¹International Institute for Population Sciences, Mumbai, India. ²National Council of Educational Research and Training, New Delhi, India. ³Harvard Center for Population and Development Studies, Cambridge, MA, USA. ⁴Harvard University T.H. Chan School of Public Health, Boston, MA, USA.
✉email: rashmir635@gmail.com

Introduction

Educational attainment offers greater dividends in the form of increased labour participation, higher wages, and improvements in children's health, nutritional status, and cognitive outcomes (Bertocchi and Bozzano, 2020; King and Hill, 1993; Schultz, 2002). The global progress on two key sustainable development goals (SDGs)—improving educational levels and reducing gender disparity in educational opportunities—has been uneven across and within countries. For instance, while most countries have achieved near-universal primary attendance, large disparities remain in secondary and higher levels of education (Friedman et al., 2020). The variations in educational attainment across and within countries may be attributed to public policies on education, the standard of living, family background, and genetic and environmental factors (Arora, 2012; Ferguson et al., 2007; Graetz et al., 2020; Li and Qiu, 2018; Monserud and Elder, 2011; Silventoinen et al., 2020). Female children are disadvantaged and often neglected in education, nutrition, and health services compared to male children in many low-resource settings. Socio-cultural factors also adversely affect the educational attainment of a female child in the household (Bertocchi and Bozzano, 2020; Hendrick et al., 2016) and are largely responsible for the discrimination manifested at the household level (Sperling and Winthrop, 2015).

The last three decades have witnessed substantial progress toward gender equality in primary education, consistent with the global commitment to education for all (UNICEF, 2019). However, the gender gap in educational attainment (disadvantageous to the girl child) beyond the primary level is pervasive and will remain so in sub-Saharan Africa, Southeast Asia, East Asia, and Oceania until 2030 (Baten et al., 2021; Friedman et al., 2020). The bias manifests in the early years of life, such as in not sending girls to school or withdrawing them early from school, and is deeply rooted in the son preference and the fear of low return on investment in girls' schooling (Gandhi Kingdon, 2002; Pande and Astone, 2007). Lower spending on girls' education than on boys is common, which may lead to variations in educational outcomes.

India, the second-most populous country in the world with a 1211 million population and 426 million population aged 6–22 years, has made significant progress in school and technical education (Chandramouli and General, 2011). The overall literacy level had increased from 52.21% in 1991 to 74.04% by 2011. The educational enrolment has increased at all levels: primary (ages 6–10 years), middle and secondary (ages 11–15 years), and higher secondary (ages 16–17 years). The Government of India has initiated various programmes, such as the *Sarva Shiksha Abhiyan* and the *Mid-day Meal Scheme*, to provide universal elementary education (Bajpai and Goyal, 2004; Kingdon, 2007). The gender parity index (GPI) (ratio of girls' to boys' enrolment) for children 6–10 years and 11–13 years increased from 0.41 and 0.22 in 1950–51 to 1.01 and 0.99 in 2011–12 (MHRD, 2014). In the case of higher education, the GPI increased from 0.92 in 2014–15 to 1 in 2018–19 (MHRD, 2017). However, compared to the proportion of girls aged 18–22 in the population, their participation in education is much lower. Moreover, beyond enrolment, the pro-male bias in educational spending adds to the deprivation of educational opportunities for girls (Drèze and Kingdon, 2001; Kingdon, 2005; Saha, 2013).

The evidence derived from the developing countries links the rising bias against girl children with increasing age, rural residence, regions, and gender of household head (Arora, 2012; Aslam and Kingdon, 2008; Azam and Kingdon, 2013; Bhatkal, 2012; Delelegn, 2007; Jenkins et al., 2019; Saikia, 2022). Educational spending is largely shaped by the expected return on educating girls and boys in poor households (Kambhampati, 2008). Using the National Sample Survey data of 1983,

Subramanian and Deaton (1991) found the intra-household allocation of educational spending to favour boys aged 10–14 years in the rural areas of Maharashtra. Studies have found a pro-male bias among children aged 10–16 years in four Indian states of Bihar, Uttar Pradesh, Kerala, and Maharashtra (Lancaster et al., 2008). In addition, the educational spending differences are conditioned by the caste and religion of rural households in the Indian setting (Tilak, 2002). This bias is further noted in private school enrolment (Sahoo, 2017).

Public and household investment in education play a pivotal role in educational attainment in developing countries (Buchmann and Hannum, 2001). The male child's household preference for quality education and higher education is evident in many Asian countries (Buchmann and Hannum, 2001; Sahoo, 2017). While the government primarily funded school education in the past, there has been an increase in private schooling in India lately, which is perceived to impart quality education (Desai et al., 2008; Sahoo, 2017).

According to the Global Gender Gap Report (2021), the gender gap in India has widened, and the country ranked 140th among 156 countries in 2020. While the gender gap shows the extent of discrimination in participation, health, survival, and empowerment opportunities is no exception. Intra-household discrimination in education is manifested in two ways: first, in the enrolment of children; second, concerning education-related expenses among the enrolled children (Kingdon, 2005). In this context, this paper aims to examine the gender gaps in school attendance and household educational spending among school and college-going children (aged 6–22 years) in India. It also identifies the factors contributing to the gender gap in household educational spending.

The paper has been conceptualised with the following rationale. First, although substantial progress has been made in primary schooling, the dropout rate at the secondary level of schooling remains high. Second, girls are disadvantaged compared to boys, and this gender divide is sharper at the higher levels of education (Singh, 2007). Past studies have examined educational inequalities over time using different rounds of data; however, the studies were restricted to education participation and attainment (Asadullah and Yalonzky, 2012; Niaz Asadullah et al., 2014; Varughese and Bairagya, 2020). The scenario of household educational spending concerning children of different age groups in the Indian context is still unclear. Besides, regional disparities in educational attainment are large and remain a key concern. Third, with the rising cost of schooling, there is every possibility of differential spending on education between boys and girls at the household level based on the returns expected from such spending. This is particularly in the case of higher education, where private education providers are growing fast, which may result in the greatest divide in educational spending in households between the two genders. Fourth, the disparity in children's educational opportunities due to the different pace of progress and development across the states of India necessitates exploring the variation in schooling and educational spending across different age groups and genders using the latest available dataset.

Data and methods

Data. We used the unit data from the 75th round of the National Sample Survey (NSS) on social consumption relating to education (Schedule 25.2). It used multistage stratified sampling and covered 513,366 individuals from 113,757 households between July 2017 and June 2018. The survey provides household information

such as caste, religion, household amenities, and monthly per capita consumption spending (MPCE), a measure of the living standard. It offers detailed information on the educational attainment and spending (total and item-wise) of 286,456 persons aged 3 to 35 years who were receiving education. The details of the sampling procedure, questionnaire, and preliminary findings are available publicly in the survey report (NSSO, 2020).

For this study, we focused on children aged 6–22 years, i.e., school and college-going children, with a sub-sample of 174,810 individuals. To understand the educational spending, we limited our analysis to 126,564 school and college-going children attending a basic course education during the current academic year (2017–18).

Outcome variables. Our main outcome variables were school attendance and educational spending on the basic course during the academic year (2017–18) among children aged 6–22 years. We analysed these outcome variables by male and female children (or boys and girls) and five age groups, i.e., 6–10, 11–15, 16–17, and 18–22. While the age group 6–10 refers to the primary level, 11–15 refers to middle and secondary levels, and 16–17 broadly correspond to higher secondary schooling. We also included the 18–22 age-group children to understand household educational spending among children receiving higher education (college/technical education).

Independent variables. We chose the independent variables based on their availability in the dataset and their inclusion in prior literature (Azam and Kingdon, 2013; Kingdon, 2005; Saha, 2013). Accordingly, we included a set of household characteristics and a child-related characteristic. Among the former were variables such as place of residence (rural, urban), religion (Hindu, Muslim, others), caste [SC/ST (Scheduled Caste/Scheduled Tribe), OBC (Other Backward Caste), Others], gender of household head (male, female), education of household head (illiterate, primary, middle, secondary, higher secondary and above), household gender ratio [only son(s) or only daughter(s), equal number of sons and daughters, more sons than daughters, more daughters than sons], household type (self-employed, regular salary, casual labour, others), household size (less than 3, 4–5, 6–7, equal to or greater than 8), and monthly per capita consumption spending (MPCE) quintile (poorest, poorer, middle, richer and richest). The child-related characteristic was the institution in which the child was currently studying (public, private).

Statistical models. Descriptive statistics were used to examine the distribution of school attendance, household educational spending, and background characteristics for the full and gender-disaggregated samples. Bivariate analyses were carried out to understand the percentage differences between the school attendance of boys and girls. To estimate the gender gap in educational expenses, we used the percentage relative gap (PRG) in the average annual educational spending, which is a crude measure of the gender gap and is defined as:

$$PRG = \frac{\bar{X}_{EEM} - \bar{X}_{EEF}}{\bar{X}_{EEM}} \times 100$$

Here, \bar{X}_{EEM} and \bar{X}_{EEF} are average annual spending for boys and girls respectively. A positive value of PRG shows gender bias in favour of boys, whereas a negative value suggests discrimination among children favouring females.

The Oaxaca-Blinder decomposition analysis was performed to examine how much the background characteristics contributed to the gender gap in educational spending (Jann, 2008). Following

the decomposition analysis, two separate equations of the semi-log functional form for educational spending on males and females were estimated based on ordinary least squares (OLS):

$$e_{mi} = \ln(y_{mi}) = \beta_m X_{mi} + \varepsilon_i \tag{1}$$

$$e_{fi} = \ln(y_{fi}) = \beta_f X_{fi} + \varepsilon_i \tag{2}$$

where y_{ji} is the educational spending for the j^{th} type [$j = (m, f)$, m denotes a male child (or boy), and f denotes a female child (or girl)] of the i^{th} member, X_i consists of background characteristics such as place of residence, religion, caste, gender of household head, education of household head, gender ratio, household type, household size, monthly per capita consumption spending, and current institution of child corresponding to i^{th} member. β is the estimated regression coefficient.

The average gender gap in the educational spending of males and females ($\bar{e}_m - \bar{e}_f$) can be divided into explained and unexplained components as:

$$\bar{e}_m - \bar{e}_f = (\bar{X}_m - \bar{X}_f)\hat{\beta}_m + \bar{X}_f(\hat{\beta}_m - \hat{\beta}_f) = E + D$$

such as $\bar{e}_m - \bar{e}_f = (\text{Sector}_m - \text{Sector}_f)\hat{\beta}_m + \text{Sector}_f(\hat{\beta}_m - \hat{\beta}_f)$, and so on for all the variables.

Here, the first component (E) measures the spending inequality due to the differences between the observed characteristics of the male and female children (characteristics effect); in other words, the expected difference in educational spending if the females were given the male distribution of characteristics. The second component (D) measures the inequality due to the effects of the observed characteristics on males and females (coefficients effect).

The decomposition analysis was carried out separately for all four age groups, i.e., 6–10, 11–15, 16–17, 18–22 and 6–22. We also checked multicollinearity to examine the correlation among the independent variables using the mean-variance inflation factor (VIF) and found that the values for all the models were less than 1.28, suggesting reasonable independence among the explanatory variables (Cameron and Trivedi, 2005).

Results

Sample description. Table 1 presents the sampling profile of the school and college-going children aged 6–22 years in India. Out of the total sampled population ($N = 513,366$), about 34.05% ($N = 174,810$) were in the 6–22 age group and formed our analytical sample. A total of 72.41% ($N = 126,564$) of children in this age group attended a basic course. Among those attending school, 54.63% were boys, 45.37% were girls, and 73.47% resided in rural areas. A majority (79.83%) belonged to the Hindu religion. The caste composition showed 45.92% OBCs and 30.44% SCs/STs. Most households were headed by a male member (90.43%), and primary-level education was common among the heads (50.29%). More than half of the households were self-employed (53.78%); only 15.19% had regular salaries. The average monthly per capita consumption spending (MPCE) was Rs. 2024, with the urban MPCE (Rs. 3239) being twice the rural MPCE (Rs. 1585), showing a distinct urban-rural divide. The average household size was 5.56.

We present the school attendance by the gender of the children in segregated ages and different age groups (see Table 2). School attendance was above 95% until eleven, declining to 68% by age 17. On average, the school attendance at the primary level was 95%, 91% at the middle and secondary levels, 71% in higher secondary, and 32% in higher education. At each age, school attendance among girls was lower than among boys. The bias intensified at age 16 and above and remained high at advanced ages. The gender gap in schooling was visible from age 16 onwards when children received college and technical education.

Table 1 Sampling profile of individuals aged 6–22 years in India, 2017–18.

	N	%
Number of households Surveyed	1,13,757	100
Number of Individuals Surveyed	5,13,366	100
Number of Individuals aged 6–22 years as a share of total individuals surveyed	1,74,810	34.05
Number of Individuals currently schooling in a basic course as a share of individuals aged 6–22 years	1,26,564	72.41
Age		
Less than or equal to 3	21,956	4.28
3–5	25,405	4.95
6–10	47,831	9.32
11–15	47,719	9.30
16–17	18,136	3.53
18–22	47,196	9.19
23–35	1,02,903	20.05
35+	2,02,187	39.39
Characteristics of individuals aged 6–22 years		
Gender		
Boys	95,489	54.63
Girls	79,305	45.37
Residence		
Rural	1,28,425	73.47
Urban	46,369	26.53
Religion		
Hindu	1,39,534	79.83
Muslim	27,558	15.77
Others	7703	4.41
Caste		
SC/ST	53,205	30.44
OBC	80,260	45.92
Others	41,328	23.64
Household Headship		
Male headed	1,58,064	90.43
Female headed	16,730	9.57
Education of household head		
Illiterate/Primary	96,936	55.46
Middle/Secondary	53,605	30.67
Higher Secondary and above	24,254	13.88
Household occupation type		
Self-employed	94,005	53.78
Regular salary	26,556	15.19
Casual labour	46,112	26.38
Others	8122	4.65
Monthly per capita consumption spending (in Rupees)	2024	
MPCE (rural)	1585	
MPCE (urban)	3239	
Average household size	5.56	

For instance, 28% of girls attended school compared to 36% of boys in the 18–22 age group.

School attendance and the gender gap. Figure 1 presents the adjusted proportion of school attendance (in the segregated form) among 6–22-year-old children. Adjusting for household and child correlates, girls showed lower school attendance at every age, and the gender gap widened at 14, 15, 16, and 17. The attendance was better and less gender gap was observed among 7-, 8-, 9-, and 11-year-old children. Regarding higher education, the adjusted school attendance was lower for both boys and girls from age 18 onwards.

Table S1 presents the gender gap in the school attendance of children aged 6–22 years across the Indian states. Most states were disadvantaged to girls’ education, but a few were advantageous. The gender gap in schooling in the primary-level

age group (6–10 years) was high in the states where educational progress was relatively poor. Among children between 11 and 15 years of age, the highest gender gap was observed in the state of West Bengal (–9.38%), followed by the states of Uttaranchal, Haryana, Odisha, Tamil Nadu, and Kerala. While the gender gap was lower in the younger ages, older groups showed wider gender gaps in many states/UTs of India. States like Andhra Pradesh, Punjab, and Gujarat, which showed a minimal gender gap till 15 years of age, became disadvantageous to girls aged 16–17 years. The north-eastern states of Manipur (–14.48%), Meghalaya (–10.10%), and Tripura (–10.04%), along with the southern states of Kerala (–4.48%), Karnataka (–4.40%), and Tamil Nadu (–4.14%), had a higher proportion of girls attending school than boys.

Figure 2 presents the school attendance of boys and girls in the 16–22 age group among the states of India. Bihar, Telangana, Maharashtra, Andhra Pradesh, Arunachal Pradesh, and Rajasthan were more advantageous to boys than girls. In states like Manipur, West Bengal, and Uttarakhand, school attendance was higher among girls than boys. Madhya Pradesh, Gujarat, Orissa, and Uttar Pradesh showed lower school attendance rates for both genders.

Household educational spending and the gender gap. Figure 3 presents the unadjusted per capita educational spending on children aged 6–22 years by sex. With increasing age, per capita, educational spending increased. After 15 years of age, a substantial increase in educational spending could be seen, which remained high until age 22. However, the per capita spending on female children was low at every age. The incidence of gender bias in conditional educational spending (i.e., among school-attending children) was high in each age group.

The mean educational spending on children 6–10 years of age was ₹6516 for boys and ₹5688 for girls. Among 16–17-year-old children, both the spending and the gender gap increased (₹14,725 for boys and ₹11,536 for girls) (Table S2). Examining the PRG across the age segments and the socio-economic attributes demonstrates how these attributes affect differential spending between boys and girls.

The socio-economic and demographic differentials in the average household educational spending on children attending school by age group are presented in Table 3. The per capita household educational spending on girls was substantially lower in all age groups. Urban residents reported higher per capita spending than those residing in rural areas. The gender gap in educational spending widened in the 16–17 years age group across rural (₹9736 for boys and ₹7681 for girls; Gap: 21%) and urban (₹25,540 for boys and ₹20,216 for girls; Gap: 21%) areas. The male advantage in spending was higher in urban areas for children 18–22 years of age. In the 16–17 years age group, girls in Muslim households (₹9669; Gap: 25%) were more disadvantaged than those in Hindu households (₹11,594; Gap: 22%), and this trend persisted till higher education. Though the gender gap was prevalent in all caste categories across all age groups, the largest educational spending gap (Gap: 26%) was found in children 16–17 years of age from the Other Backward Caste households. In each age group, households headed by female members showed a smaller gender gap than the male-headed households. Households headed by an illiterate member or a member with higher secondary and above education showed a higher gender gap in children 16–17 years of age. In the 11–17 years age group, households with a higher proportion of girls than boys showed less spending on girls. While regular salaried households spent twice as much as self-employed households, the female disadvantage in educational spending intensified with increasing

Table 2 Percentage of children attending school by sex and age (2017-18), India.

Age of children (years)	Boys		Girls		Persons		% Point gap
	N	%	N	%	N	%	
6	5251	89.8	4121	87.2	9372	88.6	2.6
7	5278	96.4	4154	95.8	9433	96.1	0.6
8	6454	96.7	4734	96.2	11,178	96.5	0.5
9	4546	98.1	3303	96.5	7840	97.4	1.6
10	6769	96.9	4692	94.4	11,441	95.8	2.6
11	4754	97.2	3392	95.9	8135	96.6	1.3
12	6732	95.0	5077	93.2	11,802	94.2	1.8
13	4615	93.2	3853	92.2	8475	92.7	1.0
14	5512	89.9	4372	88.0	9885	89.0	2.0
15	5002	81.1	3640	81.1	8633	81.1	0.0
16	4448	75.7	3150	72.4	7587	74.2	3.3
17	3634	69.0	2793	66.3	6425	67.8	2.8
18	3622	50.8	2463	46.5	6072	48.9	4.3
19	2156	48.7	1349	38.8	3494	44.2	9.9
20	2124	33.1	1340	24.9	3454	29.2	8.2
21	1035	26.5	731	20.1	1763	23.3	6.3
22	1007	16.7	573	10.4	1573	13.6	6.4
6-10	28,298	95.55	21,004	93.86	49,264	94.8	1.7
11-15	26,614	91.06	20,335	89.87	46,931	90.52	1.2
16-17	8081	72.54	5943	69.35	14,012	71.11	3.2
18-22	9943	35.63	6456	27.68	16,357	31.9	8.0
6-22	72,937	74.5	53,738	69.88	1,26,564	72.41	4.6

% gap is the difference in the percentages of male and female school attendance.
 Bold values represent total attendance status across age groups and gender in India. Earlier the values were provided in single ages.

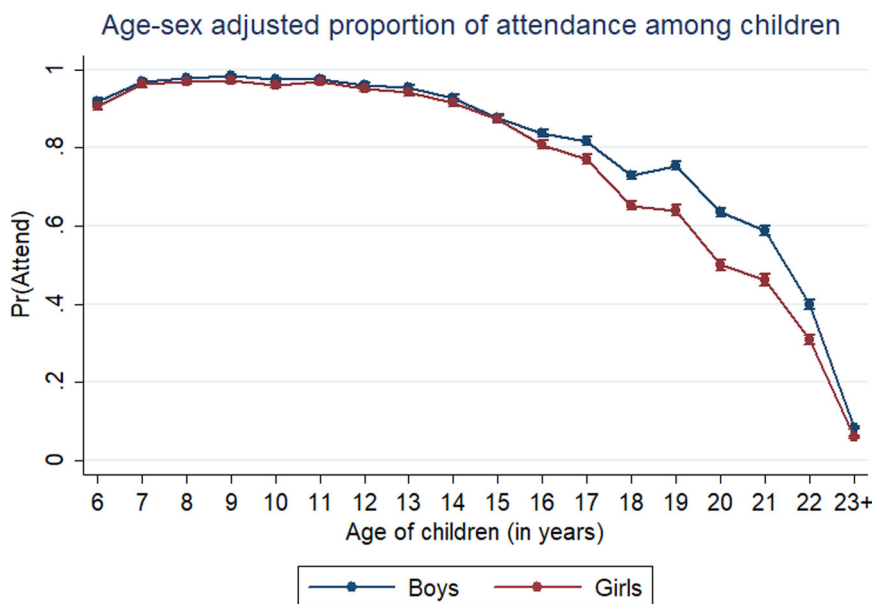


Fig. 1 Age-sex adjusted proportion of school attendance among children aged 6-22 and 23-35 years in India, (2017-18).

household size. The results show that educational spending was lower in larger households, adversely affecting girls. Among 6–10-year-old children, the spending in private institutions (₹14,415 for boys and ₹13,819 for girls) was almost ten times higher than in government institutions (₹1412 for boys and ₹1239 for girls). The per capita educational spending remained higher in private institutions in the 11–15- and 16–17-years age groups and persisted till the 18–22 years age group (₹35,807 for boys and ₹29,717 for girls). Among 16–17 years of age children, the gender gap in the average educational spending was much higher in private institutions (₹23,857 for boys and ₹18,659 for girls; Gap: 22%) than in government institutions (₹6841 for boys and ₹6298

for girls; Gap: 8%). As expected, the educational spending aligned with the economic hierarchy (MPCE quintiles of households), suggesting higher spending among those who could pay. Despite this trend, gender bias prevailed across all MPCE quintiles, with a slight moderation among the rich. The bias seemed to intensify when the spending scale was greater, as evident from the situation among the 16–17-year-old children.

The present study shows that the gender gap is associated with the sex and education of the household head (Table 4). The gender gap in education spending was higher in male-headed households than in female-headed households. Children aged 11–15 years in male-headed households, where the head was

a) 16-22 years age male school attendance %

b) 16-22 years age female school attendance %

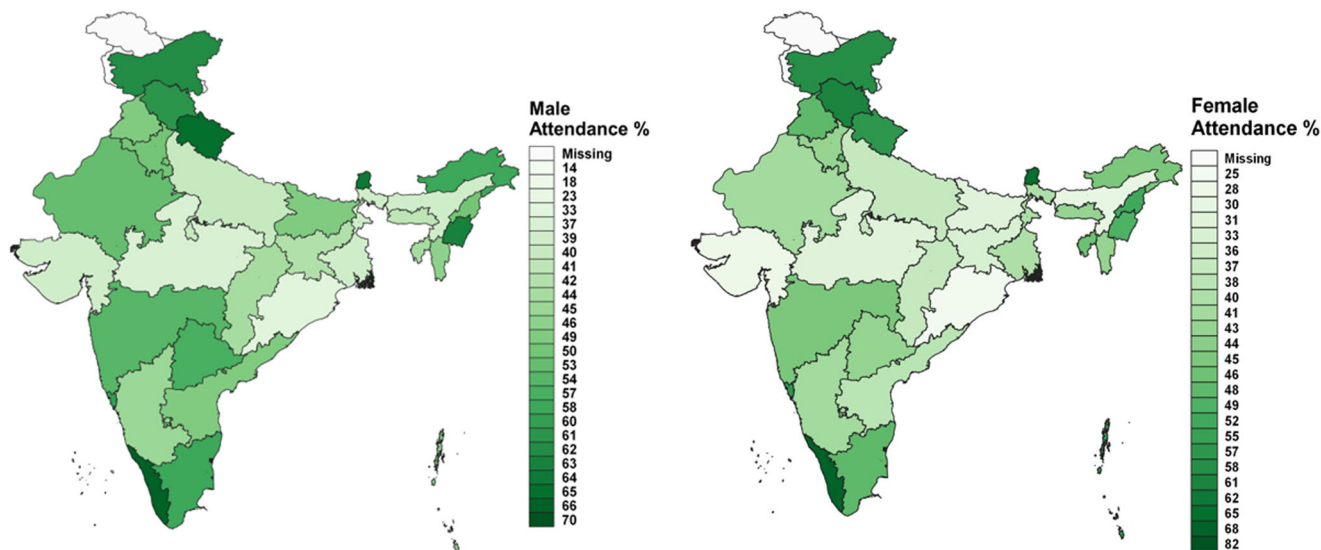


Fig. 2 Percentage of children attending school in 16-22 age group by gender and states of India, 2017-18. a 16-22 years age male school attendance % b 16-22 years age female school attendance %.

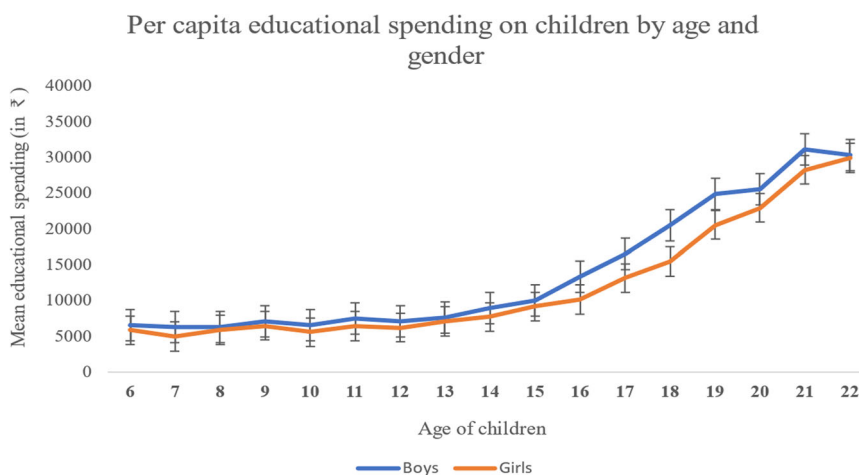


Fig. 3 Unadjusted household per capita education spending of 6-22 years age children by gender (2017-18), India.

either illiterate or had received higher secondary and above education, had a higher gender gap (advantageous to the boy child). In comparison, the girl child had more advantage in households headed by females who had received higher secondary and above education. In the 16-22 years age group, the gender gap was the highest in households headed by illiterate males. Households headed by females who had received primary education were more favourable towards educational spending on girls aged 16-17 years.

Table S2 presents the gender differentials in children’s per capita household spending across the Indian states. The highest per capita educational spending was in Delhi for children aged 6-10 years (₹20,827 for boys and ₹21,824 for girls) and 11-15 years (₹30,009 for boys and ₹24,789 for girls). Among children aged 16-17, the average educational spending on boys was the highest in Delhi (₹35,931), and the per capita spending on girls was 34% lower (₹23,866). On average, states like Bihar, Uttar Pradesh, and Jharkhand spent less on children’s education than the other states, and the gender gap was also high in these states. In Bihar, the per capita educational spending on children aged

16-17 years was twice as high among boys (₹10,662) as girls (₹5814). The gender bias in educational spending was the lowest in the north-eastern states of Manipur, Tripura, and Meghalaya in the 6-10 years age group. In the high literacy state of Kerala, the gender bias in the average educational spending was nearly negligible among children aged 6-10 years (₹10,191 for boys and ₹10,293 for girls). However, beyond that, the average educational spending on boys was higher (₹15,438) than on girls (₹11,262) and decreased only in the 18-22 years age group. Even though school attendance was higher among girls aged 11-15 and 16-17 years in West Bengal, boys had more advantage in terms of the average educational spending, which trend persisted among children receiving higher education. Figure 4 provides the scenario of household educational spending among children receiving higher secondary and higher education (i.e., aged 16-22 years).

Figure 4 shows the differentials in the educational spending on boys and girls aged 16-22 years by household across India. The gender gap was higher in states like West Bengal, Uttarakhand, and Manipur, which had a minimal gap in school attendance.

Table 3 Per capita educational spending (in Indian Rupees.) during the current academic year of basic courses by gender and background characteristics in 6–22 age groups of India, 2017–18.

Characteristics	6–10			11–15			16–17			18–22			6–22		
	Boys	Girls	PRG	Boys	Girls	PRG	Boys	Girls	PRG	Boys	Girls	PRG	Boys	Girls	PRG
Residence															
Rural	3855	3315	14	4896	4285	12	9736	7681	21	15,052	13,799	8	6192	5155	17
Urban	14,226	13,015	9	17,217	15,419	10	25,540	20,216	21	40,379	30,042	26	21402	17866	17
Religion															
Hindu	6552	5605	14	8114	7180	12	14,907	11,594	22	24,812	20,756	16	10667	8737	18
Muslim	5232	4786	9	6519	6200	5	12,815	9669	25	21,628	15,992	26	8013	6872	14
Others	10,599	10,071	5	13,757	10,957	20	15,709	15,883	−1	26,973	29,638	−10	14810	13954	6
Caste															
SC/ST	3402	3128	8	4770	4211	12	8720	7836	10	15,322	14,572	5	5868	5113	13
OBC	5820	4950	15	7134	6567	8	13,885	10,225	26	22,125	19,964	10	9299	7873	15
Others	11,880	10,772	9	14,238	12,180	14	21,438	18,087	16	35,499	25,998	27	17,860	14,604	18
HH Headship															
Male headed	6526	5713	12	8134	7196	12	14,755	11,492	22	24,846	19,721	21	10,519	8520	19
Female headed	6411	5439	15	8412	7450	11	14,421	11,883	18	21,673	27,095	−25	10,143	10,507	−4
Education of HH head															
Illiterate/primary	6518	5682	13	7075	6151	13	4046	3980	2	4234	6004	−42	6713	5850	13
Middle/secondary	—	—	—	10,059	9040	10	14,337	11,037	23	13,728	11,089	19	12,138	9984	18
Higher secondary and above	—	—	—	—	—	—	23,271	18,746	19	28,507	23,706	17	28,102	23,199	17
HH gender ratio															
Only sons/daughters	7110	6786	5	8636	7846	9	15,979	12,455	22	27,456	23,949	13	11746	10137	14
Equal	7016	5823	17	9378	8729	7	15,490	13,615	12	22,337	19,600	12	10831	9463	13
Sons > daughters	4055	3388	16	5766	5632	2	9831	8737	11	16,354	14,457	12	6732	5862	13
Daughters > Sons	4801	3235	33	6696	5005	25	12,012	8729	27	14,637	14,245	3	7117	5799	19
HH type															
Self-employed	6079	5413	11	7881	6991	11	13,513	11,247	17	19,533	18,211	7	9378	8181	13
Regular salary	13,998	12,121	13	15,803	13,996	11	24,210	16,782	31	32,122	28,132	12	18867	15898	16
Casual labour	2706	2471	9	3601	3263	9	7424	6825	8	13,866	13,074	6	4540	4037	11
Others	9478	6543	31	9731	8669	11	21,542	15,896	26	54,369	31,193	43	22680	13656	40
HH size															
≤3	11,119	9661	13	11,384	9970	12	19,218	15,095	21	40,245	30,999	23	20265	15979	21
4–5	6881	6719	2	8666	8214	5	15,915	12,785	20	23,021	21,401	7	10730	9797	9
6–7	5210	4305	17	6652	5579	16	10,352	9255	11	16,516	15,311	7	7491	6403	15
≥8	5575	4282	23	6667	5846	12	11,266	9343	17	16,421	13,951	15	7491	6110	18
Type of institution															
Government	1412	1239	12	2873	2852	1	6841	6298	8	12,340	11,662	5	3734	3388	9
Private	14,415	13,819	4	17,236	15,896	8	23,857	18,659	22	35,807	29,717	17	20247	17723	12
MPCE quintile															
Poorest	2456	2046	17	3727	3323	11	6771	5763	15	9979	10,766	−8	3972	3495	12
Poorer	4330	3651	16	5198	4870	6	9343	7485	20	12,212	10,859	11	5946	5240	12
Middle	5370	4700	12	6425	5747	11	11,701	10,194	13	17,089	15,950	7	7772	6888	11
Richer	7343	6153	16	8480	7581	11	11,830	11,309	4	19,129	17,864	7	10044	8755	13
Richest	14,811	14,239	4	16,757	14,657	13	26,722	20,272	24	42,412	33,075	22	23069	18921	18
Total	6516	5688	13	8157	7222	11	14,725	11,536	22	24,587	20,774	16	10,488	8728	17

PRG percentage relative gap, defined as $\frac{\bar{X}_{male} - \bar{X}_{female}}{\bar{X}_{male}} \times 100$; —denotes sample size less than 30. Bold values represent values for all over India.

Despite the highest educational spending on children in Delhi, the gap in the spending between male and female children widened in the age group of 16–22 years (Boys: ₹51,180; Girls: ₹48,652).

Blinder-Oaxaca decomposition analysis. Given that the educational spending on girl children was systematically lower compared to boys in every age group, we decomposed the educational spending between boys and girls and present the results in Table 5. The attributes considered for this decomposition exercise were residence, religion, caste, sex and education of household head, household gender ratio, household size, institution type, and monthly per capita consumption spending. These predictors in the model explain a reasonable share of the observed difference in

spending between boys and girls. The results indicate that the mean educational spending on boys was ₹2078 (95% CI 2022 to 2136) in the 6–10 years age group, while that on girls was ₹1760 (95% CI 1709 to 1812), yielding a difference of 18% in the mean educational spending between them. Adjusting the girls’ endowment levels to the levels of the boys would have increased educational spending by 15%, while a 3% gap remained unexplained. Of the 15% explained share of such difference, type of institution (49.46%), household gender ratio (18.51%), place of residence (4.25%), MPCE quintile (3.34%), and caste (3.02%) were the main drivers contributing to the inequality in the educational spending on children aged 6–10 years.

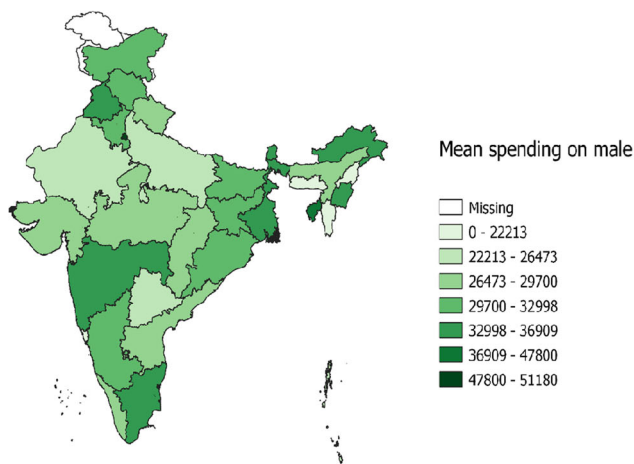
Among children 11–15 years of age, the mean educational spending on boys was ₹3301 (95% CI 3219 to 3385) compared to

Table 4 Gender gap in per capita educational spending (in Rs.) during the current academic year of basic course by gender and education of household head in 6-22 age groups of India, 2017-18.

	6-10			11-15			16-17			18-22			6-22		
	Boys	Girls	PRG	Boys	Girls	PRG	Boys	Girls	PRG	Boys	Girls	PRG	Boys	Girls	PRG
Education of Male-Headed-household															
Illiterate/primary	6528	5707	13	7026	6079	13	4248	4015	5	4262	6309	-48	6701	5838	13
Middle/secondary	—	—	—	10,067	9101	10	14,363	11,020	23	13,767	10,656	23	12,144	9964	18
Higher secondary and above	—	—	—	—	—	—	23,134	18,374	21	28,871	22,648	22	28,431	22,193	22
Education of Female-Headed-household															
Illiterate/primary	6410	5439	15	7601	6798	11	—	—	—	3677	2318	37	6845	5954	13
Middle/secondary	—	—	—	9966	8514	15	14,082	11,176	21	13,257	15,007	-13	12,066	10,157	16
Higher secondary and above	—	—	—	—	—	—	25,060	21,507	14	24,479	29,432	-20	24,439	28,806	-18
Total	6516	5688	13	8157	7222	11	14,725	11,536	22	24,587	20,774	16	10,488	8728	17

PRG percentage relative gap, defined as $\frac{\bar{X}_{female} - \bar{X}_{male}}{\bar{X}_{male}} \times 100$; —denotes sample size less than 30. Bold values represent values for all over India.

a) Male educational expenditure



b) Female educational expenditure

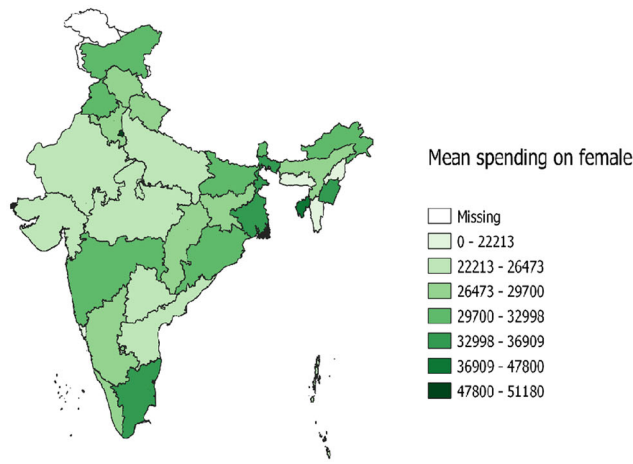


Fig. 4 Adjusted per capita household educational spending (in Rs.) in 16-22 years age group during the current academic year of basic course by gender in states of India, 2017-18. a Male educational expenditure b Female educational expenditure.

₹2987 (95% CI 2909 to 3066) for girls, yielding an 11% difference in the mean educational spending. If girls were given boys' characteristics, then the educational spending on girls would have increased by 8%; however, a 2% gap remains unexplained by the considered determinants. For the 8% explained gap, the type of institution children attended emerged as the strongest contributor (48.60%) to the differential spending between the two genders. The gender gap in spending decreased with an increase in the educational level of the household head.

Discussion

Education is one of the key determinants of human capital formation. In India, differential treatment of sons and daughters has cultural underpinnings, which translates into discrimination against the girl child in numerous spheres during the entire life course (Gandhi Kingdon, 2002; Pande and Astone, 2007). Differential treatment in providing educational opportunities (school attendance and spending) is no exception. Although several Indian studies have examined the gender differentials in school enrolment and their associated factors. The bias in sending children to school after enrolling them and household spending among school and college-going children (aged 6-22 years) is still unclear. Our analysis of individual-level data on attendance and

educational spending across the states of India brings out the following salient findings:

First, the present study confirms that attendance was high among children aged 6-12 years; however, it did not continue beyond age 13. Attendance declined continuously from age 13 onwards and was the lowest at age 22. Comparing the attendance between the two genders found that boys had more advantage in each age group. In fact, in line with a prior study, the present study found that the pro-male bias intensified with advancing age (Banerji and Mathur, 2021). Second, the gender gap in school attendance was evident in all age groups across India. However, in children aged 16-17, we found convincing evidence of the pro-male bias even in economically well-to-do states such as Gujarat and Delhi. Such findings are consistent with an Indian study which found that the pro-male bias in the age group of 15-19 years was higher in Gujarat (Azam and Kingdon, 2013). In states like Madhya Pradesh, Gujarat, Odisha, and Uttar Pradesh, boys and girls between 16 and 22 years of age were disadvantaged in school attendance.

Third, while the past literature found little evidence of bias in the educational spending among the enrolled children (Iddrisu et al., 2018; Kingdon, 2005), the present study found a significantly higher educational spending on boys compared to girls.

Table 5 Blinder-Oaxaca Decomposition analysis depicting the contribution of characteristics in gender gap of household educational spending across ages (2017-18), India.

	6-10	11-15	16-17	18-22	6-22					
Predictive average educational spending for boys (Rs. [95% CI])	2078 [2022, 2136]	3301 [3219, 3385]	7747 [7391, 8121]	13,153 [12,784, 13,532]	3661 [3603, 3720]					
Predictive average educational spending for girls (Rs. [95% CI])	1760 [1709, 1812]	2987 [2909, 3066]	6447 [6194, 6711]	12,018 [11,627, 12,423]	3128 [3073, 3183]					
Difference in educational spending [95% CI]	1.18 [1.13, 1.23]	1.11 [1.07, 1.15]	1.2 [1.13, 1.28]	1.09 [1.05, 1.14]	1.17 [1.14, 1.2]					
Difference that is explained by the determinants [95% CI]	1.15 [1.12, 1.18]	1.08 [1.06, 1.11]	1.09 [1.05, 1.12]	0.99 [0.96, 1.01]	1.11 [1.09, 1.12]					
Difference that is not explained by the determinants [95% CI]	1.03 [1, 1.06]	1.02 [0.99, 1.06]	1.1 [1.04, 1.17]	1.11 [1.06, 1.16]	1.06 [1.03, 1.08]					
Explained contribution	Contribution									
	Exp(β)	%	Exp(β)	%	Exp(β)	%	Exp(β)	%	Exp(β)	%
Sector	1.007***	4.25	1.001	0.7	1.004	2.29	0.974***	-29.09	1.001	0.61
Religion	1.000	0.01	1.000	0	1.000	0.03	0.999**	-1.27	1.000	0
Caste	1.005***	3.02	1.001	0.95	1.015***	7.85	0.995***	-5.9	1.003***	2.2
Gender of Household Head	1.0000	0.28	1.000	0.31	1.001	0.43	1.002	2.52	1.001	0.35
Education of Household Head	1.001**	0.86	0.996	-3.54	0.99***	-5.35	0.977***	-25.76	1.011***	6.72
Household Gender ratio	1.031***	18.51	1.025***	24.88	1.015	8.27	1.02**	22.4	1.018***	11.06
Household type	1.001*	0.33	1.001*	1.28	0.999	-0.49	1.000	0.02	1.001**	0.4
Household size	1.003***	2.08	1.005***	4.83	1.003	1.59	1.001	1.61	1.005***	3.02
Institution	1.086***	49.46	1.05***	48.6	1.033***	17.85	1.014***	15.34	1.058***	35.59
MPCE quintile	1.006*	3.34	1.001	0.9	1.026***	13.99	1.004	3.97	1.008***	5.08
Total Explained contribution	1.146	82.14	1.082	78.9	1.089	46.45	0.986	-16.15	1.108	65.04
Total unexplained contribution	1.030	17.86	1.021	21.1	1.103	53.55	1.110	116.15	1.057	34.96

***p < 0.001, **p < 0.05, *p < 0.01 significance.

Bias in educational spending was higher in all age groups and intensified among rural residents and large-sized households. Consistent with our study, the existing evidence suggests that the cost differential between private and government schools is quite apparent, with higher spending on private schooling (Sahoo, 2017); however, our findings reveal that expensive private schools also drive the gender gap. Consistent with past evidence, the present study found that Muslim girls were more disadvantaged in education than Hindu girls (Sengupta and Rooj, 2018). Higher educational spending could be seen among households who could pay (i.e., in higher MPCE quintile households). However, even on this front, the educational spending of girls was lower compared to boys across all MPCE quintile households.

Fourth, there was a large variation in educational spending across the states, particularly among children aged 16–22 years. An explicit female disadvantage was observed even in an economically better-off state like Delhi. The gender bias intensified with rising levels of educational spending. Our decomposition exercise revealed that type of institution and household economic status were the two main predictors explaining sex differentials in educational spending at the household level. The findings of this exercise differ from the existing evidence of girls’ disadvantage being prominent among poor households and rural residents (Agrawal, 2014; Azam and Kingdon, 2013; Tilak, 2002). The present study found that pro-male child bias in household educational spending was uniform across all levels of the economic hierarchy.

We put forward the following explanations in support of our results. At the primary level of schooling, there seems to be a decline in the gender gap, which may be attributed to numerous schemes of incentivization, like mid-day meals, free books, uniforms, bicycle schemes, etc., offered by different states and the Government of India. Although the introduction of educational policies like *Sarva Shiksha Abhiyan* and the *Mid-day Meal Scheme* has helped realise near-universal elementary schooling for both boys and girls, such success has not been replicated in secondary and higher secondary education. The average

expenditure on primary schooling was not high compared to higher secondary and technical education.

The greater dropout rate and lower spending on girls at the middle, secondary and higher levels of education may be associated with the household decision not to send girls to school (Iddrisu et al., 2018). Such a decision bias may be rooted in the expected returns on investment in boys’ education but not that of girls, given the cultural dependence on boys. While such preferences should play out more in the case of constrained circumstances of households (limited means of affordability) (Choudhury, 2020), our study observed the contrary, with a greater gender differential showing in the economically better-off states. The public-private divide in education provision, coupled with the differential quality of education, aggravates the bias. Furthermore, the lower enrolment rate and spending on Muslim girls’ education in lower- and upper-income households may indicate the impact of social norms still prevalent in the community (Sengupta and Rooj, 2018). However, more research is required to investigate the reasons for such discrimination based on religion in India.

Despite the potential to land lucrative jobs, enrolment in higher education at 18–22 years of age is abysmally low and is characterised by a larger gender gap. The average educational spending per student was much higher for those acquiring higher education. Well-to-do states like Tamil Nadu, Delhi, and Maharashtra spend more on higher education than other states. This may be due to the greater availability of technical and vocational unaided institutions in these areas, with active participation of the private sector and higher course fees. Moreover, with a greater proportion of higher-income individuals in these states, spending on children enrolled in higher education increases (Choudhury and Kumar, 2021). On the other hand, economically weaker states like Uttar Pradesh and Bihar spend less on higher education for their children and have a larger gap between the genders. Such biases may be rooted in the limited ability of the individuals to afford higher education and fewer technical and vocational institutions in those states.

The present study has the following limitations. The analysis was limited to the 6–22 years age group only. Beyond these age groups, the sample size was insufficient for many states of India. Second, the determinants of educational spending were limited to the variables available in the dataset. Third, the cross-sectional nature of the data did not allow for causal inferences. A more detailed enquiry could be made considering the household dynamics to explore such biases. Information on such biases can help assess the efficiency loss of potential educational attainment and its returns to human capital.

Conclusion

Low attendance and spending on school and college-going girls suggest India's prevalent intra-household gender disparity. The increasing gender gap (disadvantageous to the girl child) with growing age can be mainly attributed to the type of institution a child attends and the household socio-economic status. The education of the household head seems to be an important contributor in reducing the gender gap in higher education. The uniformity of the gender gap across the economic hierarchy and the locational disadvantage suggests that the gender gap is shaped by the expected returns on investment in education. Privatisation of schooling has dug the gender bias deeper. Most of the policies in India are constrained in bringing children to school. So far, limited plans have focused on reducing the dropout rates in secondary and higher education, keeping in mind the familial vulnerability in paying for a child's education. This may be a reason for the high gender disparity across households. So, the present study urges policymakers to focus on the policies related to education spending in India.

Data availability

The dataset analysed in the current study is freely available in the MOSPI website and can be accessed from their data repository at <http://mospi.nic.in/unit-level-data-report-nss-75th-round-schedule-252july-2017-june-2018social-consumption-education>.

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Competing interests

The authors declare no competing interests.

Ethical approval

This study does not contain any studies with human participants performed by any of the authors.

Informed consent

The survey has been conducted taking informed consent from the respondents with no information available on their identity.

Additional information

Supplementary information The online version contains supplementary material available at <https://doi.org/10.1057/s41599-022-01350-x>.

Correspondence and requests for materials should be addressed to Rashmi Rashmi.

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