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# Socioeconomic and Demographic Factors Associated With Birth and Death Registration in India: A Secondary Analysis of the National Family Health Survey-5 (2019-21)

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## Abstract

Background: Complete registration of births and deaths underpins legal identity, demographic analysis, and health planning. Despite a legal mandate in India, under-registration persists, particularly among socioeconomically disadvantaged groups. This study examines socioeconomic and demographic factors associated with reported birth and death registration in India, with particular attention to absolute poverty.

Methods: This is a secondary cross-sectional analysis of the National Family Health Survey-5 (NFHS-5, 2019-21). The birth-registration sample comprised de jure children under five years (N = 224,226). The death-registration sample comprised (N = 79,449) deaths occurring in the three years preceding the survey. Individuals were ranked by the continuous NFHS asset-based wealth score, and World Bank poverty headcount ratios for India (2021 purchasing-power parity, PPP) were used to assign households to four mutually exclusive categories: extremely poor (<$3.00 per person per day), poor ($3.00 to <$4.20), middle ($4.20 to <$8.30), and non-poor (≥$8.30). Associations were estimated with multivariable logistic regression. All estimates were weighted with the NFHS-5 household sampling weight.

Results: Reported birth registration was 89.1%, and reported death registration was 70.6%. Registration was lower in poorer categories for both outcomes. Compared with the extremely poor, the adjusted odds of birth registration were higher among the poor (adjusted odds ratio (AOR) 1.44, 95% confidence interval (CI) 1.38-1.51), middle (AOR 2.48, 95% CI 2.37-2.60), and non-poor (AOR 4.36, 95% CI 4.01-4.73) categories. For death registration, the corresponding AORs were 1.36 (95% CI 1.28-1.46), 2.64 (95% CI 2.47-2.82), and 5.28 (95% CI 4.82-5.78). Rural residence was associated with lower adjusted odds of birth (AOR 0.82, 95% CI 0.78-0.86) and death (AOR 0.67, 95% CI 0.64-0.70) registration, and higher education was associated with higher odds of both.

Conclusions: In this secondary analysis of NFHS-5, reported birth and death registration varied by household economic position, education, and residence. Lower economic position and rural residence were associated with lower registration after covariate adjustment. These are associations, not causal effects, and should be interpreted in light of the cross-sectional design, self-reported outcomes, and uncertainty in translating an asset index into absolute poverty categories.

**Categories:** Other, Public Health, Epidemiology/Public Health
**Keywords:** birth registration, death registration, india, nfhs-5, poverty

## Introduction

Accurate and complete registration of births and deaths underpins a functional civil registration and vital statistics (CRVS) system. It generates continuous, legally valid data for demographic analysis, health planning, welfare targeting, and monitoring of the Sustainable Development Goals, and it secures individual identity and access to entitlements [1]. In India, the Registration of Births and Deaths Act, 1969, mandates registration of all births and deaths. The Registration of Births and Deaths (Amendment) Act, 2023, further provides for digital registration and for the birth certificate to serve as proof of date of birth for a range of services [2]. Under-registration nevertheless persists, particularly among socioeconomically disadvantaged, rural, and marginalised populations [3-5].

CRVS systems are widely recognised as foundational public institutions. AbouZahr et al. [1] argue that they are central to the data revolution because they combine legal documentation with routine population statistics, yet remain incomplete where births and deaths are most likely to go uncounted. Later reviews reaffirm that strengthening CRVS is as much a governance and service-delivery priority as a technical data exercise [6,7], and that reforms work best when legal change, administrative simplification, incentives, and awareness campaigns are combined [8].

Empirical work on birth registration consistently finds stratification by wealth, parental education, and rural residence. Bhatia et al. [9] showed that although birth registration has improved globally, large inequities persist among poorer households, and Rahman et al. [10] found that registration lags behind immunisation coverage and maternal health service use, pointing to missed opportunities within health systems. Comparable patterns are reported from sub-Saharan Africa [11], Ghana [12], and Ethiopia [13]. Within India, Kumar and Saikia [3] found that maternal education, institutional delivery, and wealth are associated with birth registration, and Bhatia et al. [4] showed that wealth-based inequalities in birth registration have narrowed but remain substantial in several states. Death registration shows similar patterns. Saikia et al. [5] estimated that 70.8% of deaths were registered nationally in 2019-21, with lower registration among females, rural households, and poorer populations, and Basu and Adair [14] documented improving completeness alongside persistent inter-state disparities. International evidence points to sex differences in completeness [15], and studies from Uganda and Nigeria show that awareness, administrative access, and perceived benefits shape registration [16,17].

Two theoretical perspectives are commonly invoked to explain lower service uptake among poor households. The ‘culture of poverty’ thesis, introduced by Lewis [18], attributed persistent poverty and disengagement from institutions to values and behaviours transmitted within poor communities. This framework has been widely criticised as stigmatising and as neglecting the structural constraints that poor households face [19]. A structural perspective instead emphasises financial, geographic, administrative, and informational barriers to accessing state services. The present study does not measure behavioural or cultural constructs and therefore does not test either perspective directly. We refer to them only to frame the interpretation of observed socioeconomic gradients.

Most studies of registration measure economic position with the National Family Health Survey (NFHS) or Demographic and Health Survey (DHS) wealth index. This is an asset-based score derived by principal component analysis of household durable goods and housing characteristics. It should be distinguished from three related constructs. Income is the flow of earnings to a household, consumption is the value of goods and services a household uses, and poverty is a status defined by whether income or consumption falls below a specified line. The wealth index measures none of these directly. It ranks households relative to one another, so wealth quintiles describe relative position within a population but not whether a household falls below an absolute poverty line. Bellows et al. [20] and Geldsetzer et al. [21] proposed approaches that combine the wealth index ranking with World Bank poverty headcount ratios to approximate absolute poverty categories in surveys that lack income or consumption data.

To our knowledge, no previous study of civil registration in India has applied such an absolute-poverty classification to NFHS data, and few studies have examined birth and death registration together in the same survey round and analytic framework. This study applies an existing method [21] to NFHS-5. It does not attempt to develop or validate a new conversion method.

# Materials And Methods

## Study design and data source

This is a secondary cross-sectional analysis of the fifth round of the NFHS-5, 2019-21 [22]. NFHS-5 was conducted under the stewardship of the Ministry of Health and Family Welfare, Government of India, with the International Institute for Population Sciences (IIPS), Mumbai, as the nodal agency and technical assistance from ICF. Fieldwork was carried out in two phases: from June 17, 2019, to January 30, 2020, and from January 2, 2020, to April 30, 2021. The survey provides estimates at the national, state/union territory, and district levels for 28 states, eight union territories, and 707 districts. Interviews were completed in 636,699 households (household response rate 98%), with 724,115 women aged 15-49 years and 101,839 men aged 15-54 years. We used the India Household Member Recode for the birth-registration and death-registration analysis.

## Sampling design and sample size

NFHS-5 used a stratified two-stage sample with the 2011 Census as the sampling frame. Each district was stratified into urban and rural areas. In rural areas, villages were selected as primary sampling units (PSUs) with probability proportional to size, after stratification by village size and the percentage of the population belonging to Scheduled Castes and Scheduled Tribes, and implicit stratification by female literacy. In urban areas, Census Enumeration Blocks were selected as PSUs. In the second stage, 22 households were selected in each PSU by systematic sampling from a fresh household listing. In all, 30,456 PSUs were selected, and fieldwork was completed in 30,198.

The NFHS-5 sample size was determined by the survey designers to provide reliable indicators at the district level [22]. No separate sample size calculation was performed for the present secondary analysis. All records in NFHS-5 that met the eligibility criteria below were included, so the analytic samples are as large as the survey allows.

## Study populations

*Birth-Registration Sample*

The unit of analysis is the de jure (usual resident) child aged under five years listed in the household roster. All such children were eligible, whether or not their birth was registered. The sample comprised 224,226 children.

*Death-Registration Sample*

The unit of analysis is a death of a usual household member that occurred in the three years preceding the survey and was reported by the household respondent. The sample comprised 79,449 deaths, of which a weighted 56,063 were reported as registered and 23,386 as not registered.

## Outcome variables

*Birth Registration*

Following the NFHS-5 definition, a child's birth was coded as registered (1) if the household respondent reported that the child had a birth certificate, or that the child did not have a certificate but the birth was registered with the civil authority. Otherwise, it was coded as not registered (0). The outcome is based on the respondent's report; registration was not verified against documents.

*Death Registration*

For each reported death, the household respondent was asked whether the death was registered with the civil authority. A death was coded as registered (1) if the answer was yes and not registered (0) otherwise.

## Classification of absolute poverty

NFHS-5 does not collect household income or consumption. It provides a continuous wealth score (hv271), derived by principal component analysis of household ownership of consumer durables and housing characteristics, and national wealth quintiles (hv270). The score ranks households relative to one another. We used it to approximate absolute poverty categories following the approach of Geldsetzer et al. [21], who applied it to 105 nationally representative household surveys, 51 of them DHS surveys that measure economic status only through an asset index. A related approach was described by Bellows et al. [20], who mapped each household's percentile on the DHS wealth index onto the corresponding percentile of the national income or consumption distribution estimated by the World Bank.

The method does not convert the wealth score into rupees or dollars, and no income or consumption value is imputed for any household. Instead, it combines (i) the national ranking of individuals by wealth score and (ii) the World Bank's estimate of the proportion of India's population living below each international poverty line (the poverty headcount ratio). If a given percentage of India's population lives below a poverty line, the same percentage of the weighted NFHS-5 population with the lowest wealth scores is classified as living below that line. Currency conversion, purchasing-power-parity (PPP) adjustment, price-year adjustment, and the World Bank's own treatment of urban-rural price differences are therefore contained in the headcount ratios and are not separate steps in our calculation. The World Bank lines are defined per person, without adult-equivalence scales. We ranked persons rather than households, so the shares are population shares on the same per-person basis, and no further household-size adjustment was applied.

We used the World Bank international poverty lines expressed in 2021 PPP dollars per person per day: $3.00 (extreme poverty), $4.20, and $8.30 [23]. The World Bank publishes headcount ratios for each survey year in 2021 PPP terms, deflating each year's consumption to 2021 prices. Applying 2021 PPP lines to NFHS-5 data collected in 2019-21 is therefore consistent. The four categories are mutually exclusive and exhaustive. Each category includes its lower bound and excludes its upper bound. The classification itself used the $3.00, $4.20, and $8.30 lines.

The classification proceeded in four steps. First, each de jure household member was given the household's continuous wealth score (hv271). Second, persons were sorted from lowest to highest score, and the weighted cumulative population share was calculated with the household sampling weight. Third, persons whose cumulative share fell at or below the headcount ratio for $3.00 were classified as extremely poor, those above it but at or below the ratio for $4.20 as poor, those above that but at or below the ratio for $8.30 as middle, and the remainder as non-poor. All members of a household share one score, so whole households fall into one category. Fourth, the household category was attached to each child and each death in the analytic samples. For deaths, the category therefore describes the household's assets at the time of the survey, after the death occurred.

## Covariates

Covariates were selected a priori on the basis of the literature on civil registration [3-5,9-17] and the

variables available in NFHS-5 for each sample. They were not selected by statistical significance, and no directed acyclic graph was used. Reference categories are shown in parentheses: Birth model: poverty category (extremely poor), sex of the child (male), age of the child (<2 years), place of residence (urban), mother's educational attainment (illiterate), caste (Scheduled Caste), and religion (Hindu). Maternal education was used because the mother is usually the person responsible for registering a young child's birth. Death model: poverty category (extremely poor), sex of the deceased (male), place of residence (urban), educational attainment of the deceased (illiterate), caste (Scheduled Caste), and religion (Hindu). The education of the deceased was used because the mother's education is not applicable to adult deaths.

Children reported as transgender (a weighted count of 13) are shown in the descriptive table but were excluded from the regression model because the group is too small for stable estimation. Several potential confounders suggested in the literature, including state, district, household-head characteristics, institutional delivery, place of death, household size and media exposure, and age at death in the death model, were not included in the models.

## Statistical analysis

We first described the distribution of each sample and the percentage of births registered by background characteristics. We then fitted separate multivariable logistic regression models for birth and death registration, with all covariates entered simultaneously. Results are reported as adjusted odds ratios (AORs) with 95% confidence intervals (CIs). An odds ratio describes the ratio of odds, not of probabilities. Because both outcomes are common (89% and 71%), odds ratios are further from 1 than the corresponding prevalence ratios would be, and they should not be read as relative probabilities.

All percentages and regression estimates were weighted with the NFHS-5 household sampling weight (hv005/1,000,000). This is the appropriate weight for both analyses, because birth registration of children under five and deaths of household members are both recorded in the Household Questionnaire. In the regression models, the weight was applied as a probability weight, which gives heteroskedasticity-robust standard errors. Because the NFHS-5 weights are normalised, weighted totals are close to, but not the same as, the unweighted numbers of cases.

Observations with missing values on any covariate were excluded from the regression models (complete-case analysis). The analytic sample of each model is reported in Tables *1*, *2*. p-values below 0.001 are reported as $p < 0.001$. Because the samples are very large, we emphasise the size and precision of associations rather than statistical significance. Analyses were performed in Stata/SE 16 (StataCorp, College Station, TX, USA).

| Characteristic | % | N |
|---|---|---|
| Death registered with the civil authority | | |
| No | 29.4 | 23,386 |
| Yes | 70.6 | 56,063 |
| Sex of the deceased | | |
| Male | 73.3 | 58,256 |
| Female | 26.7 | 21,193 |
| Place of residence | | |
| Urban | 28.5 | 22,647 |
| Rural | 71.5 | 56,802 |
| Educational attainment of the deceased | | |
| No education | 30.5 | 24,232 |
| Primary | 18.3 | 14,572 |
| Secondary | 41.6 | 33,084 |
| Higher | 9.5 | 7,561 |
| Caste | | |
| Scheduled Caste | 23.9 | 18,168 |
| Scheduled Tribe | 9.2 | 6,964 |
| Other Backward Class | 44.1 | 33,590 |
| None of these | 22.0 | 16,751 |
| Don't know | 0.9 | 655 |
| Religion | | |
| Hindu | 83.2 | 66,125 |
| Muslim | 11.3 | 8,977 |
| Other | 5.5 | 4,347 |
| Poverty category (2021 PPP, per person per day) | | |
| Extremely poor (<$3.00) | 5.9 | 4,655 |
| Poor ($3.00 to <$4.20) | 19.2 | 15,271 |
| Middle ($4.20 to <$8.30) | 58.7 | 46,600 |
| Non-poor (≥$8.30) | 16.3 | 12,923 |

**TABLE 1: Characteristics of the death-registration sample, NFHS-5, India, 2019-21**

PPP: purchasing-power parity; NFHS-5: National Family Health Survey-5

| Characteristic | Birth registered (%) | N |
|---|---|---|
| All children | | |
| Not registered | 10.9 | 24,484 |
| Registered | 89.1 | 199,742 |

| | | |
|---|---|---|
| Poverty category (2021 PPP, per person per day) | | |
| Extremely poor (<$3.00) | 75.1 | 14,778 |
| Poor ($3.00 to <$4.20) | 83.3 | 46,879 |
| Middle ($4.20 to <$8.30) | 91.1 | 127,559 |
| Non-poor (≥$8.30) | 95.5 | 35,009 |
| Sex of the child | | |
| Male | 88.8 | 115,985 |
| Female | 89.4 | 108,228 |
| Transgender | 83.6 | 13 |
| Age of the child | | |
| <2 years | 88.6 | 86,003 |
| 2-4 years | 89.4 | 138,223 |
| Place of residence | | |
| Urban | 93.3 | 60,133 |
| Rural | 87.5 | 164,093 |
| Mother's educational attainment | | |
| No education | 78.5 | 43,690 |
| Primary | 87.1 | 25,283 |
| Secondary | 92.8 | 105,132 |
| Higher | 94.6 | 32,238 |
| Caste | | |
| Scheduled Caste | 87.8 | 52,392 |
| Scheduled Tribe | 87.9 | 23,533 |
| Other Backward Class | 88.1 | 94,802 |
| None of these | 91.9 | 41,086 |
| Don't know | 86.2 | 2,247 |
| Religion | | |
| Hindu | 88.9 | 176,374 |
| Muslim | 88.8 | 37,698 |
| Other | 92.6 | 10,154 |

**TABLE 2: Registration of children under age five by background characteristics, NFHS-5, India, 2019-21**

N = 224,226 (mother's education is missing for 17,883 children, and caste for 10,166 children)

PPP: purchasing-power parity; NFHS-5: National Family Health Survey-5

## Results

Reported birth registration among children under five was 89.1% (Table *2*). Registration was lower in poorer categories: 75.1% among the extremely poor, 83.3% among the poor, 91.1% in the middle category, and 95.5% among the non-poor. It was also lower among children of mothers with no education (78.5%) than among children of mothers with higher education (94.6%), and lower in rural (87.5%) than in urban (93.3%)

areas. Differences by sex, age, caste, and religion were smaller, within about four percentage points of one another. The full breakdown by category, with sample sizes, is presented in Table 2.

In the multivariable model (Table 3), the adjusted odds of birth registration were higher in each less-poor category than among the extremely poor: AOR 1.44 (95% CI 1.38-1.51) for the poor, 2.48 (95% CI 2.37-2.60) for the middle category, and 4.36 (95% CI 4.01-4.73) for the non-poor. Female children had slightly higher adjusted odds of registration than male children (AOR 1.06, 95% CI 1.03-1.09); this association is statistically significant but small. Children aged 2-4 years had higher adjusted odds than those under two years (AOR 1.21, 95% CI 1.18-1.25), consistent with registration that takes place after the first years of life. Rural residence was associated with 18% lower odds of registration (AOR 0.82, 95% CI 0.78-0.86). The odds of registration were higher with each level of maternal education: AOR 1.52 (95% CI 1.45-1.58) for primary, 2.25 (95% CI 2.17-2.33) for secondary, and 2.41 (95% CI 2.26-2.56) for higher education, compared with no education. Relative to Scheduled Castes, the adjusted odds were higher among Scheduled Tribes (AOR 1.24, 95% CI 1.19-1.30) and among those in none of these groups (AOR 1.12, 95% CI 1.07-1.19), and slightly lower among Other Backward Classes (AOR 0.92, 95% CI 0.89-0.96). Compared with Hindu households, the odds were lower among Muslim households (AOR 0.86, 95% CI 0.82-0.90) and households of other religions (AOR 0.73, 95% CI 0.70-0.77). Because the covariates have different numbers and widths of categories, the size of odds ratios cannot be used to rank the relative importance of these factors.

| Characteristic | AOR (95% CI) | p-value |
|---|---|---|
| Poverty category (2021 PPP, per person per day) | | |
| Extremely poor (<$3.00) | 1.00 (reference) | |
| Poor ($3.00 to <$4.20) | 1.44 (1.38-1.51) | <0.001 |
| Middle ($4.20 to <$8.30) | 2.48 (2.37-2.60) | <0.001 |
| Non-poor (≥$8.30) | 4.36 (4.01-4.73) | <0.001 |
| Sex of the child | | |
| Male | 1.00 (reference) | |
| Female | 1.06 (1.03-1.09) | <0.001 |
| Age of the child | | |
| <2 years | 1.00 (reference) | |
| 2-4 years | 1.21 (1.18-1.25) | <0.001 |
| Place of residence | | |
| Urban | 1.00 (reference) | |
| Rural | 0.82 (0.78-0.86) | <0.001 |
| Mother's educational attainment | | |
| No education | 1.00 (reference) | |
| Primary | 1.52 (1.45-1.58) | <0.001 |
| Secondary | 2.25 (2.17-2.33) | <0.001 |
| Higher | 2.41 (2.26-2.56) | <0.001 |
| Caste | | |
| Scheduled Caste | 1.00 (reference) | |
| Scheduled Tribe | 1.24 (1.19-1.30) | <0.001 |
| Other Backward Class | 0.92 (0.89-0.96) | <0.001 |
| None of these | 1.12 (1.07-1.19) | <0.001 |
| Religion | | |
| Hindu | 1.00 (reference) | |
| Muslim | 0.86 (0.82-0.90) | <0.001 |
| Other | 0.73 (0.70-0.77) | <0.001 |

**TABLE 3: Factors affecting birth registration by demographic and socioeconomic characteristics, India, 2019-21: multivariate logistic regression estimates**

AOR: adjusted odds ratio; CI: confidence interval; PPP: purchasing-power parity

Table *1* describes the composition of the death sample used in this analysis (N = 79,449), of which 70.6% (n = 56,063) were registered with civil authorities and 29.4% (n = 23,386) were not. The sample skews male (73.3%; n = 58,256) and rural (71.5%; n = 56,802), is concentrated in the middle adult years (the largest share, 26.55%, n = 21,092, falls in the 45-54 age group), and is predominantly Hindu (83.23%; n = 66,125). By household economic status, the majority of deaths occurred among middle-income households (58.65%; n = 46,600), with the extremely poor accounting for the smallest share (5.86%; n = 4,655). Full percentages and sample sizes for each category are reported in Table *1*.

Table *4* presents the multivariable logistic regression for death registration. After controlling for other

covariates, the odds of registration rose steadily across poverty categories. Compared with deaths in extremely poor households, the adjusted odds of registration were 36% higher in poor households (AOR 1.36, 95% CI 1.28-1.46), more than twice as high in middle-category households (AOR 2.64, 95% CI 2.47-2.82) and about five times as high in non-poor households (AOR 5.28, 95% CI 4.82-5.78).

| Characteristic | AOR (95% CI) | p-value |
|---|---|---|
| Poverty category (2021 PPP, per person per day) | | |
| Extremely poor (<$3.00) | 1.00 (reference) | |
| Poor ($3.00 to <$4.20) | 1.36 (1.28-1.46) | <0.001 |
| Middle ($4.20 to <$8.30) | 2.64 (2.47-2.82) | <0.001 |
| Non-poor (≥$8.30) | 5.28 (4.82-5.78) | <0.001 |
| Sex of the deceased | | |
| Male | 1.00 (reference) | |
| Female | 1.69 (1.63-1.76) | <0.001 |
| Place of residence | | |
| Urban | 1.00 (reference) | |
| Rural | 0.67 (0.64-0.70) | <0.001 |
| Educational attainment of the deceased | | |
| No education | 1.00 (reference) | |
| Primary | 1.37 (1.30-1.43) | <0.001 |
| Secondary | 1.45 (1.38-1.51) | <0.001 |
| Higher | 1.51 (1.40-1.63) | <0.001 |
| Caste | | |
| Scheduled Caste | 1.00 (reference) | |
| Scheduled Tribe | 1.00 (0.95-1.05) | 0.979 |
| Other Backward Class | 0.94 (0.90-0.99) | 0.009 |
| None of these | 1.08 (1.03-1.14) | 0.004 |
| Don't know | 0.94 (0.77-1.13) | 0.493 |
| Religion | | |
| Hindu | 1.00 (reference) | |
| Muslim | 0.67 (0.63-0.71) | <0.001 |
| Other | 0.74 (0.69-0.78) | <0.001 |

**TABLE 4: Factors associated with death registration of household members: multivariable logistic regression, NFHS-5, India, 2019-21**

AOR: adjusted odds ratio; NFHS-5: National Family Health Survey-5; CI: confidence interval; PPP: purchasing-power parity

Deaths of females had higher adjusted odds of registration than deaths of males (AOR 1.69, 95% CI 1.63-1.76). In the unadjusted data, female deaths were less often registered than male deaths, so the direction of the association changed after adjustment for age, education, residence, and poverty. This indicates confounding or suppression by these covariates. Deaths in rural areas had 33% lower adjusted odds of registration than deaths in urban areas (AOR 0.67, 95% CI 0.64-0.70). The odds of registration were higher with the education of the deceased: 37% higher with primary (AOR 1.37, 95% CI 1.30-1.43), 45% higher with secondary (AOR 1.45, 95% CI 1.38-1.51), and 51% higher with higher education (AOR 1.51, 95% CI 1.40-

1.63), compared with no education.

Associations with caste were small. Relative to Scheduled Castes, the adjusted odds of registration were slightly lower for Other Backward Classes (AOR 0.94, 95% CI 0.90-0.99) and slightly higher for those in none of these groups (AOR 1.08, 95% CI 1.03-1.14), with no difference for Scheduled Tribes (AOR 1.00, 95% CI 0.95-1.05) or for respondents who did not know their caste (AOR 0.94, 95% CI 0.77-1.13). Compared with deaths in Hindu households, deaths in Muslim households (AOR 0.67, 95% CI 0.63-0.71) and in households of other religions (AOR 0.74, 95% CI 0.69-0.78) had lower adjusted odds of registration. Because the covariates have different numbers and widths of categories, the size of the odds ratios cannot be used to rank the relative importance of these factors.

The odds ratios for poverty category are numerically larger in the death model than in the birth model. The two models use different populations, covariates, and baseline prevalence, and no formal test of the difference was performed, so this comparison does not show that poverty is more strongly associated with death registration than with birth registration.

## Discussion

In this secondary analysis of NFHS-5, reported birth and death registration were lower in poorer households, in rural areas, and among those with less education, after adjustment for the other covariates. These gradients are consistent with earlier studies that measured economic position with wealth quintiles [3,4,9,12]. Using absolute poverty categories derived from the wealth ranking, the lowest registration was observed among households classified as extremely poor. Because the categories are derived from the same asset ranking as wealth quintiles, they re-express the wealth gradient on an absolute scale rather than providing an independent measure of deprivation.

Reported death registration (70.6%) was lower than birth registration (89.1%). Our death-registration estimate is close to the 70.8% reported by Saikia et al. [5] from the same survey. Official Civil Registration System (CRS) reports give higher levels of registration, but the CRS ‘level of registration’ compares registered events with events estimated from the Sample Registration System, whereas NFHS-5 measures registration status as reported by households for events in the household. The definitions and denominators differ, and the two sources are not directly comparable. Earlier studies have suggested that birth registration has benefited from its integration with institutional delivery and maternal and child health services, whilst death registration depends on separate administrative processes [10,24-26].

The rural disadvantage was present for both outcomes and was numerically larger for deaths. Studies from other low- and middle-income countries attribute rural disadvantage to distance, cost, and limited institutional presence [11,13]. These barriers were not measured in NFHS-5 and could not be examined here.

For birth registration, female children had slightly higher adjusted odds of registration than male children. The association is small, but it is not absent. For death registration, deaths of females had higher adjusted odds of registration than deaths of males. Because the unadjusted comparison favoured males, this reversal after adjustment indicates confounding or suppression by education, residence, or poverty. We did not perform a mediation analysis, and adjusted regression results cannot show whether direct discrimination is present or absent. Sex differences in death registration have also been reported internationally [15].

Associations with caste and religion were smaller in magnitude than those with poverty category and education, and their direction was not uniform: for birth registration, Scheduled Tribes had higher adjusted odds than Scheduled Castes, whilst Muslim households and households of other religions had lower odds than Hindu households for both outcomes. These patterns may reflect differences in social exclusion, geography, and state of residence, but state was not included in the models, and the reasons cannot be identified from these data.

The observed gradients are compatible with structural explanations of under-registration, such as cost, distance, administrative complexity, and limited integration with public services [6,7]. They are also compatible with other explanations, and because no behavioural, cultural, or administrative constructs were measured, the study cannot confirm or refute either structural or ‘culture of poverty’ accounts. Policy responses that reduce the cost and complexity of registration and link it to health and welfare services would be consistent with these findings, but their effectiveness would need to be tested directly.

### Limitations

The findings should be interpreted in light of several limitations. First, the design is cross-sectional, so the associations cannot be interpreted as causal effects, and their temporal order cannot be established. For deaths in particular, the poverty category describes the household's assets at the time of interview, after the death; a death may itself have reduced household assets, raising the possibility of reverse causation.

Second, the poverty classification is an approximation. It assumes that the ranking of households by assets

matches their ranking by consumption, and this was not tested against independent consumption data. Households near the cut-offs may be misclassified, and an asset index pooled across urban and rural areas may rank rural households differently from urban households with similar living standards. NFHS-5 fieldwork spanned 2019-21, including the COVID-19 period, whereas the headcount ratio for a single reference year was applied.

Third, both outcomes rely on household respondents' reports. Registration was not verified against documents, so reporting and recall errors are possible, and these errors may differ by education, poverty, or residence.

## Conclusions

In this secondary analysis of NFHS-5, reported birth registration (89.1%) was more common than reported death registration (70.6%). Reported registration differed across poverty categories, education, and residence. Lower economic position and rural residence were associated with lower adjusted odds of registration for both outcomes. These findings should be interpreted as associations because of the cross-sectional design, self-reported outcomes, partial adjustment for the survey design, and uncertainty in translating the NFHS asset index into absolute poverty categories. Analyses that fully account for the survey design and use a validated poverty-calibration method would strengthen the evidence before national policy conclusions are drawn. The findings nonetheless support continued efforts to make registration accessible to poorer and rural households.

## Additional Information

### Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

**Concept and design:** Ajay Pandey, Richa Sharma

**Acquisition, analysis, or interpretation of data:** Ajay Pandey, Richa Sharma

**Drafting of the manuscript:** Ajay Pandey, Richa Sharma

**Critical review of the manuscript for important intellectual content:** Ajay Pandey, Richa Sharma

### Disclosures

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