# ECMA 35530: Information Frictions and Institutional Delivery: Evidence from Rural Bihar

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# Context

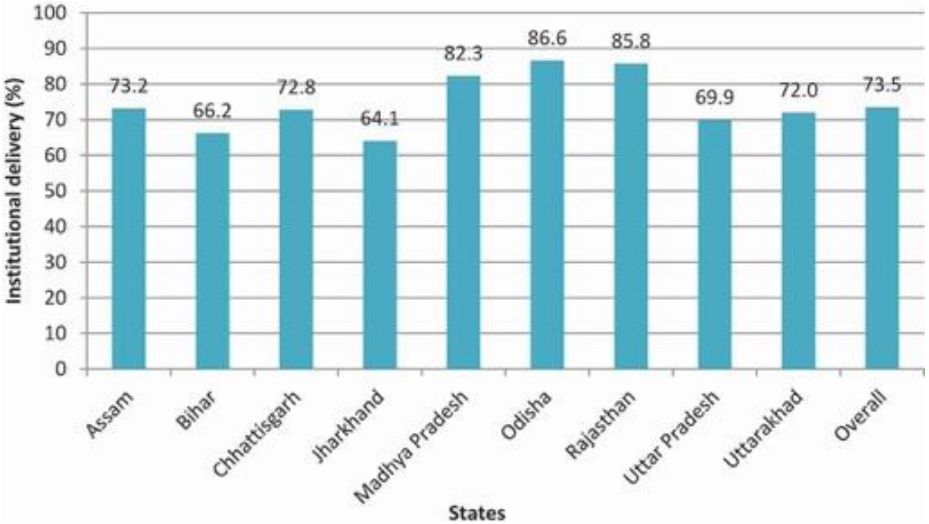


**Figure 2 (a)** : Institutional Delivery Percentage Statewise
Source: *Authors Calculation using NFHS 3 Data*

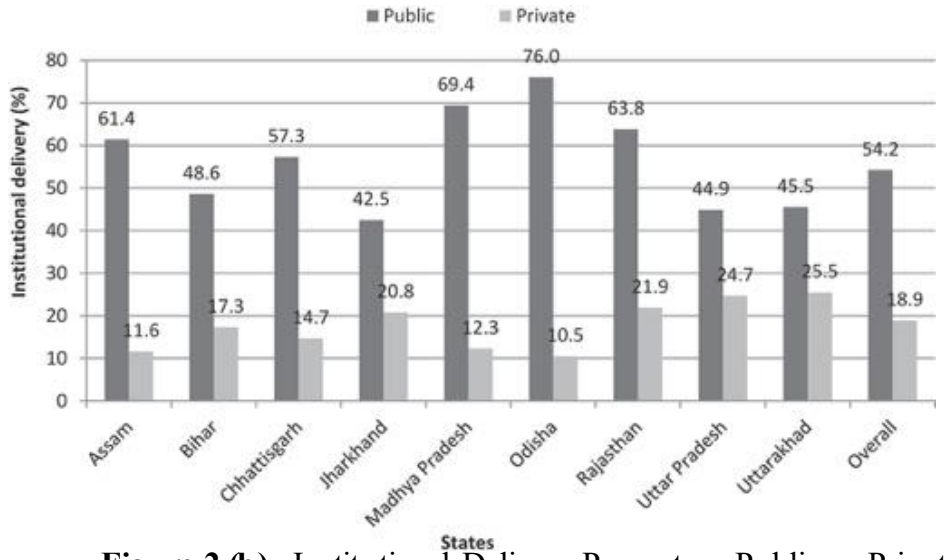


**Figure 2 (b)** : Institutional Delivery Percentage Public vs Private
Source: *Authors Calculation using NFHS 3 Data*

- Despite nationwide progress in maternal healthcare, institutional delivery in rural Bihar remains dangerously low.
- IHDS-II (2011–12):
  ~*52%* of rural women in Bihar still delivered at home
  *National rural average*: ~73% institutional deliveries (IHDS-II)
  Maternal Mortality Rate (MMR): 97 per 100,000 (India)
- Neonatal Mortality (Bihar): ~30 per 1,000 live births *(among the highest in India)*
- Lancet Public Health (2019): Institutional delivery is a critical determinant of maternal mortality

# Context

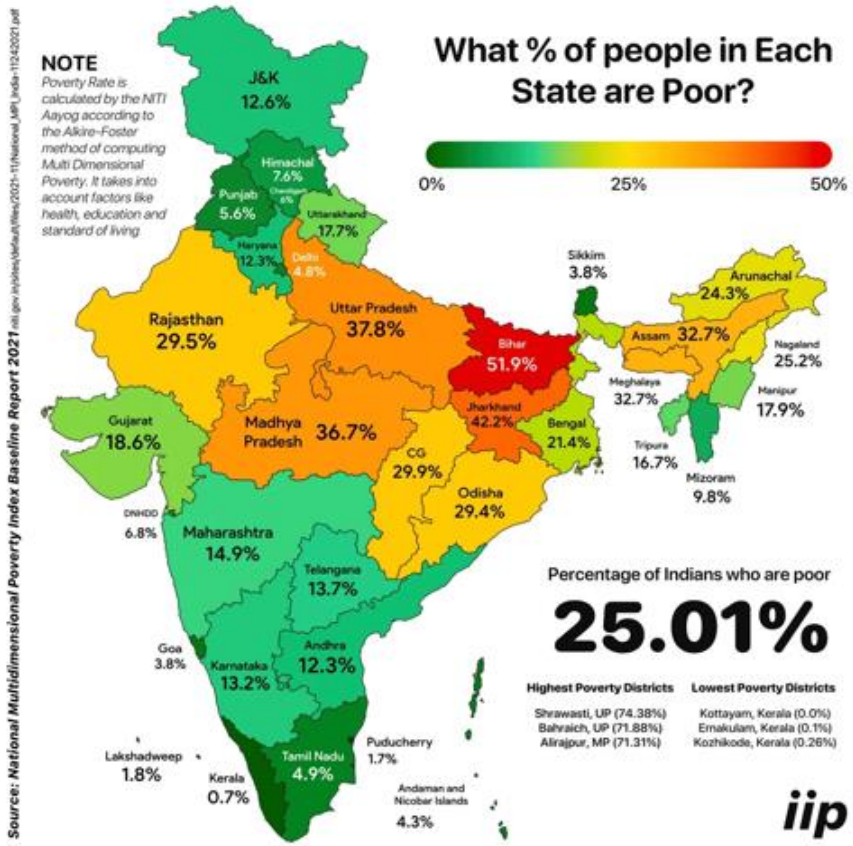


**Figure 1 (a)** : Statewise poverty population percentage
Source: *Niti Aayog Report*

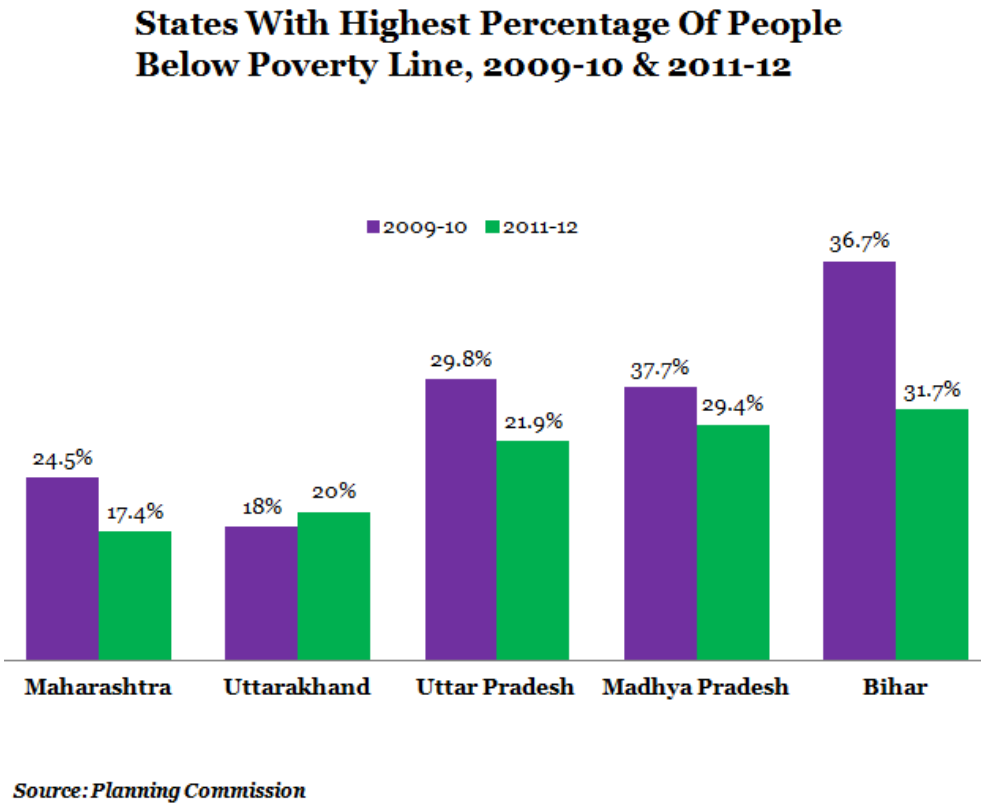


**Figure 1 (b)** : Percentage of people below Poverty Line
Source: *Planning Commission Report on Poverty*

- Bihar is among the worst performing states on most Human Development Indices among India.

# Market Overview

- •**Public Sector:**
  •Primary Health Centers (PHCs) and Community Health Centers (CHCs) provide free or subsidized maternal health services.
  •Challenges include understaffing, inadequate infrastructure, and limited accessibility in remote areas.
- •**Private Sector:**
  •Comprises clinics and hospitals offering maternal health services, often at higher costs.
  •Predominantly located in urban or semi-urban areas, making access difficult for rural populations.
- **Utilization Patterns:**
  •Despite the availability of services, a significant proportion of women in rural Bihar opt for home deliveries.
  •Factors influencing this choice include cultural practices, perceived quality of care, and financial constraints.

# Market Overview

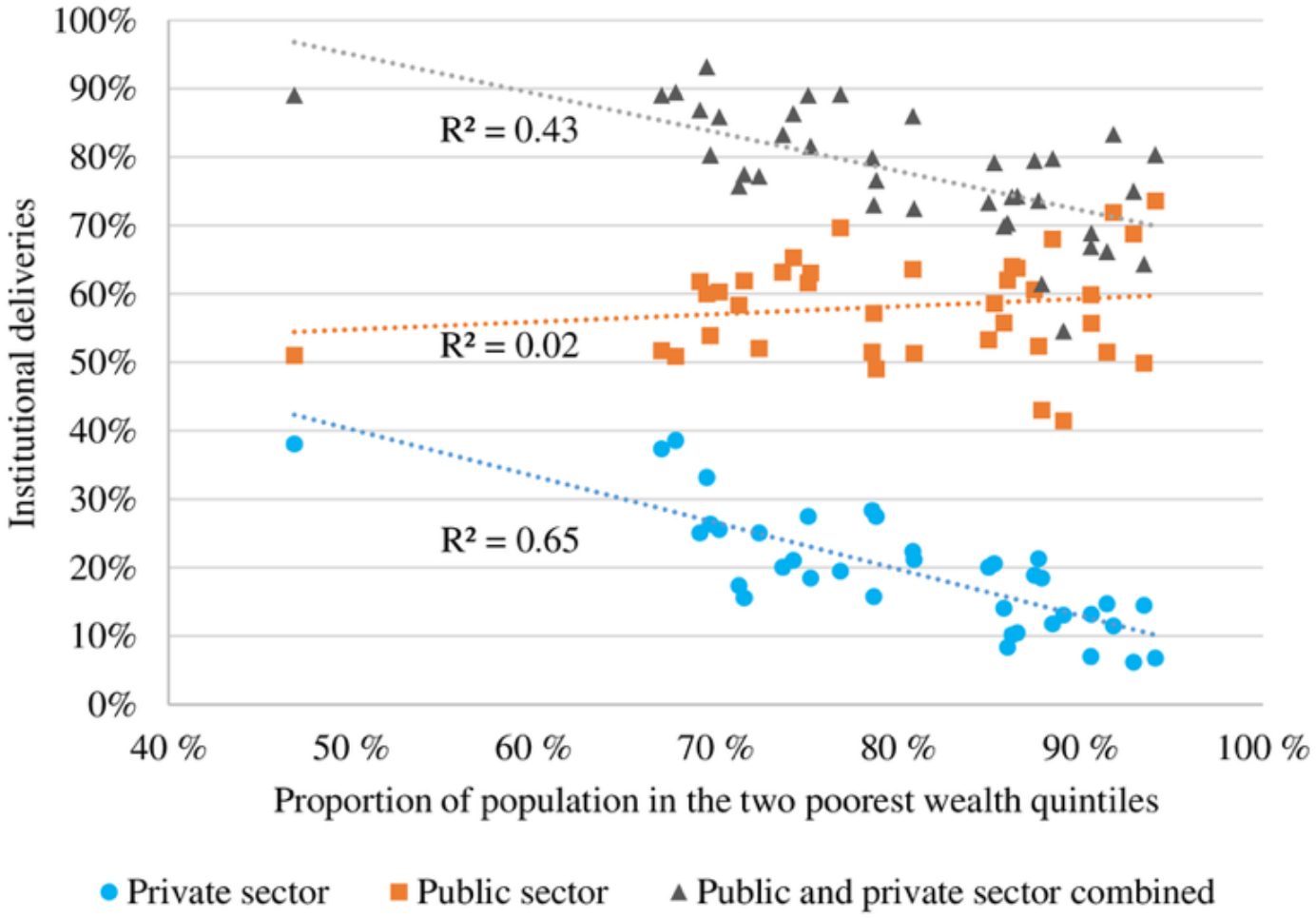


**Figure 3** : Institutional delivery among poorest wealth quartiles
Source: https://www.researchgate.net/publication/357642306

# Market Failure

- **1. Information Frictions**
  - **Lack of Awareness:** Many rural women are unaware of the benefits of institutional deliveries and the services available at healthcare facilities.
  - **Misinformation:** Prevailing myths and misconceptions about institutional deliveries deter women from seeking facility-based care.
  - **Limited Health Literacy:** Low levels of education contribute to difficulties in understanding health information and navigating the healthcare system.
- **Supporting Evidence:**
  - A study by Ghosh (2011) highlights that inadequate dissemination of information significantly impacts the utilization of maternal healthcare services in rural Bihar.
  - The National Family Health Survey (NFHS-3) indicates that only 58% of women in Bihar received information on the benefits of institutional delivery during antenatal visits.

# Market Failure

- **2. Trust Deficit**
  - **Perceived Poor Quality of Care:** Negative past experiences and reports of inadequate care lead to skepticism about the effectiveness of healthcare facilities.
  - **Cultural and Social Barriers:** Traditional beliefs and societal norms favor home births, undermining trust in institutional care.
  - **Lack of Community Engagement:** Minimal involvement of community members in healthcare planning and decision-making processes erodes trust.
- **Supporting Evidence:**
  - Research by Mohanan et al. (2014) found that trust in healthcare providers is a critical determinant of institutional delivery in rural India.
  - The Economic Times (2019) reported that 63% of patients cited poor hospital responsiveness as a key factor contributing to the trust deficit in Indian healthcare.

# Market Failure

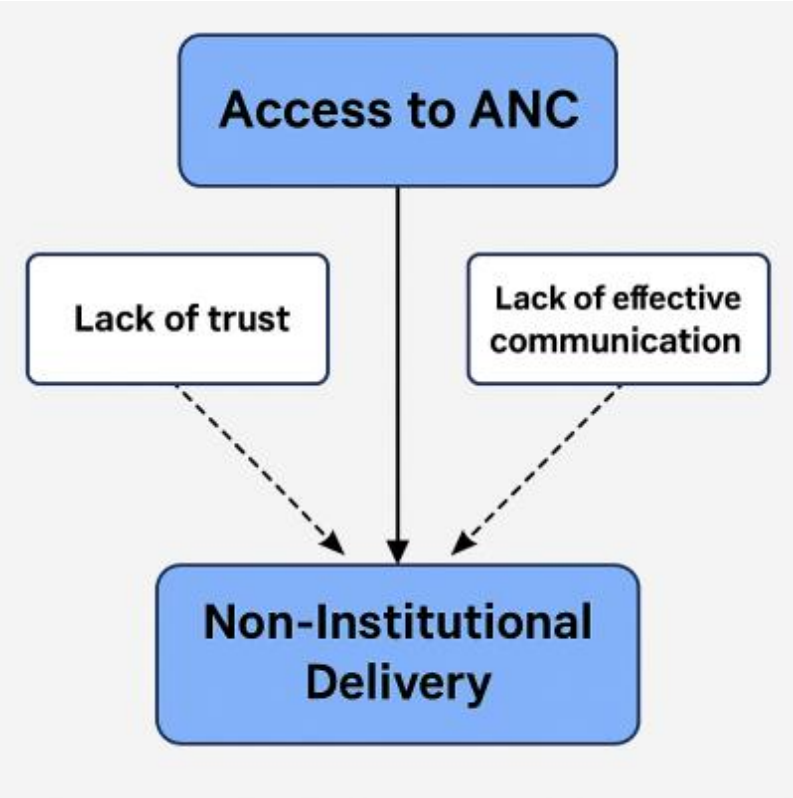


**Figure 4** : Factors influencing non institutional delivery
Source*: Authors Calculation*

- Despite increasing access to Antenatal Care (ANC) in rural Bihar, a significant share of women continue to opt for non-institutional deliveries. This disconnect points to deeper, underlying **market failures**

# Data Analysis

- **About IHDS-II (2011–12)**
  - Jointly conducted by the **University of Maryland** and **NCAER (New Delhi)**
  - **Nationally representative** panel survey covering households across India
  - Rich socio-economic, health, education, and demographic indicators
  - Designed to capture intra-household dynamics and access to public services

**Modules Used for This Study**

- **Individual Questionnaire**: Demographics, employment, income
- **Eligible Women Questionnaire**: Maternal health, education, reproductive history
- **Birth History Module**: Delivery type, ANC visits, child health
- **Household Module**: Wealth, media exposure, healthcare confidence

# Data Analysis

- Regression Equation

$$\text{InstitutionalDelivery}_i \sim \beta_0 \cdot + \beta_1 \cdot \text{ANCVisits}_i + \beta_2 \cdot \text{Educated}_i + \beta_3 \cdot \text{Media}_i + \beta_4 \cdot \text{ConfidenceHealth}_i + \beta_5 \cdot \text{Age}_i + \varepsilon_i$$

- $\textbf{InstitutionalDelivery}_i$: 1 if woman $i$ delivered at a health facility; 0 otherwise
- $\textbf{ANCVisits}_i$: Number of antenatal care visits
- $\textbf{Educated}_i$: 1 if woman has completed secondary school or higher
- $\textbf{Media}_i$: 1 if household owns a TV
- $\textbf{TrustGovHealth}_i$: Level of confidence in government health services
- $\textbf{Age}_i$: Age of the woman
- $\varepsilon_i$: Error term

# Data Analysis

- Heterogeneity Analysis

To explore heterogeneity in health-seeking behavior, we run separate regressions for:

**Educated Women (10+ years of schooling)**

**Uneducated Women (less than 10 years of schooling)**

Each subgroup uses the same model, **excluding 'Educated'** as a regressor since stratification absorbs this.

$$\text{InstitutionalDelivery}_i \sim \beta_0 \cdot + \beta_1 \cdot \text{ANCVisits}_i + \beta_2 \cdot \text{Educated}_i + \beta_3 \cdot \text{Media}_i + \beta_4 \cdot \text{ConfidenceHealth}_i + \beta_5 \cdot \text{Age}_i + \varepsilon_i$$

**InstitutionalDelivery**$_i$: 1 if woman $i$ delivered at a health facility; 0 otherwise

**ANCVisits**$_i$: Number of antenatal care visits

**Educated**$_i$: 1 if woman has completed secondary school or higher

**Media**$_i$: 1 if household owns a TV

**TrustGovHealth**$_i$: Level of confidence in government health services

**Age**$_i$: Age of the woman

$\varepsilon_i$: Error term

# Data Analysis (Results)

- **ANC Visits**: Not statistically significant in any group, but effect is positive for educated women (Model 2). Suggests possible interaction with health literacy.
- **Education**: Strongly associated with higher institutional delivery in the baseline sample ($p < 0.01$), reinforcing role of women's schooling.
- **Media Exposure**: Significant and positive for uneducated women ($p < 0.01$) indicates mass media may substitute for formal education in spreading health awareness.
- **Confidence in Public Health**: Strong, significant positive effect in all models; **largest marginal effect** seen in uneducated women (Model 3).
- **Age**: Negative and significant, particularly for uneducated women older women may prefer traditional birth settings.

**Table 1** : Regression Table for Baseline vs educated vs uneducated

| | *Dependent variable:* | | |
|---|---|---|---|
| | institutional_delivery | | |
| | (1) | (2) | (3) |
| anc_visits | -0.026 | 0.352 | -0.189 |
| | (0.281) | (0.587) | (0.336) |
| educated | 1.030*** | | |
| | (0.214) | | |
| media | 0.809*** | 0.630 | 0.626*** |
| | (0.172) | (0.434) | (0.165) |
| confidence_health | 1.800*** | | |
| | (0.102) | | |
| age | -0.115*** | -0.287*** | -0.083*** |
| | (0.010) | (0.066) | (0.008) |
| Constant | -0.937** | 7.909*** | 1.791*** |
| | (0.452) | (2.056) | (0.441) |
| Observations | 1,996 | 130 | 1,866 |
| Log Likelihood | -922.388 | -68.042 | -1,053.213 |
| Akaike Inf. Crit. | 1,856.775 | 144.083 | 2,114.426 |
| *Note:* | *p<0.1; **p<0.05; ***p<0.01 | | |

Source: *Authors calculation using IHDS- II*

# Data Analysis (Income Group)

- Socioeconomic status is a critical determinant of maternal health outcomes. Rural women with lower income may face compounded constraints including affordability, access to information, and systemic neglect that reduce their likelihood of institutional delivery.
- **Data Strategy:**
  •Rural women in Bihar stratified into **Low** and **High** income groups using **median per capita income**(INCOMEPC).
  •Controlled for education, ANC visits, media exposure, age, and confidence in government healthcare.

# Data Analysis (Income Group)

**Table 2** : Regression Table for Institutional Delivery by Income Group

**Logistic Regression Results: Institutional Delivery by Income Group**

| | *Dependent variable:* | | |
|---|---|---|---|
| | Institutional Delivery (Binary) | | |
| | Baseline: All Rural Women | Low-Income Group | High-Income Group |
| | (1) | (2) | (3) |
| ANC Visits | -0.026 | -1.375* | -0.371 |
| | (0.281) | (0.713) | (0.362) |
| Educated | 1.030*** | 0.732** | 1.827*** |
| | (0.214) | (0.295) | (0.362) |
| Media Exposure | 0.809*** | 17.617 | 0.297 |
| | (0.172) | (424.911) | (0.214) |
| Confidence in Gov Health | 1.800*** | 1.790*** | 1.843*** |
| | (0.102) | (0.176) | (0.136) |
| Age | -0.115*** | -0.128*** | -0.109*** |
| | (0.010) | (0.014) | (0.016) |
| Constant | -0.937** | 0.953 | -0.883 |
| | (0.452) | (0.921) | (0.613) |
| Observations | 1,996 | 1,038 | 958 |
| *Note:* | | | *p<0.1; **p<0.05; ***p<0.01 |

Source*: Authors Calculation using IHDS- II*

- For the poor, information campaigns, trust-building with frontline health workers, and better ANC quality are key. For wealthier women, educational improvements and reinforcing confidence in services yield higher institutional uptake.

# Policy Solutions

- **1.ASHA + Nudge Program (Community Trust Agent)**
  1. Leverage Accredited Social Health Activists (ASHAs) to conduct **home-based behavioral nudges** targeting older and less educated women.
  2. Equip ASHAs with visual tools, testimonials, and **decision-support flipbooks** to explain the risks of home births and build trust in local PHCs.
  3. Reference: *J-PAL South Asia (2019)* behavioral nudges in Odisha increased uptake of iron supplements and institutional delivery.
- **2.Media Campaign for Uneducated Households**
  1. **Local language radio/TV spots** promoting maternal health services.
  2. Use **real success stories** from similar communities (same caste/religion/region).
  3. Reference: *La Ferrara, Chong & Duryea (2012)* exposure to soap operas in Brazil increased women's health-seeking behavior and contraceptive use.

# Policy Solutions

- **3. Trust-Building Through Public Recognition of Government Facilities**

  **Why?**

  Trust in government healthcare (CI9) was a strong positive predictor across all groups. This suggests that visible, **low-cost signaling** of facility quality can reinforce positive behaviors.

  **What?**

  •**Certify and publicly rank PHCs** using citizen satisfaction and delivery rates.

  •Display certificates of success stories and **"safe birth" awards** in visible village locations.

  •Involve **community leaders** in ribbon-cutting/recognition ceremonies.

- **Evidence Base:**

  Banerjee et al. (2010) – Community-led ranking of school performance increased parental involvement and demand for better services.

  *Ref: Banerjee et al., "Pitfalls of Participatory Programs: Evidence from a Randomized Evaluation in Education," AER, 2010.*

# Limitations

- **Measurement Limitations**
  - •Self-reported data from IHDS-II may be subject to recall bias, especially for birth history and ANC visit count.
  - •Media exposure is measured as ownership/viewing, not intensity or content recall.
  - •Trust in government health (CI9) is a single-item perception variable, lacking nuance.
- **Limited Time Scope**
  - •The IHDS-II (2011–12) dataset is over a decade old. The maternal health ecosystem in Bihar has evolved since then (e.g., Mission Indradhanush, Janani Shishu Suraksha Karyakram).
  - •Recent policy interventions (e.g., Ayushman Bharat) are not captured.
- **External Validity & Generalizability**
  - •Findings are restricted to rural Bihar one of India's poorest states. Results may not generalize to:
    - Urban settings, where private care is more prevalent.
    - Other states with different caste dynamics or healthcare

# Appendix

**Table 3** : Variable List

| Variable Name | IHDS Variable | Description | Use in Model |
|---|---|---|---|
| Institutional Delivery | LB2 | Place of last delivery (1=inst, 2=home) | Binary outcome variable |
| Education | EW8 | Years of formal education | Treated as binary (≥10 years) |
| Media Exposure | CGTV | TV ownership | Proxy for access to media |
| ANC Visits | LB28 | Total antenatal check-ups | Test access vs. behavior link |
| Trust in Govt Health | CI9 | Confidence in govt health services (Likert) | Direct measure of credibility |
| Age | EW6 | Age of respondent | Control variable |

Source: *IHDS- II Codebook*

# Appendix

**Table 4** : Regression Table for Robustness Check by Changing Education threshold

| **(Education â‰¥8 Years)** | |
|---|---|
| | *Dependent variable:* |
| | Institutional Delivery |
| ANC Visits | -0.003 |
| | (0.278) |
| Educated (â‰¥ 8 yrs) | 0.758*** |
| | (0.199) |
| Media Exposure | 0.860*** |
| | (0.171) |
| Confidence in Gov Health | 1.793*** |
| | (0.102) |
| Age | -0.113*** |
| | (0.010) |
| Constant | -0.977** |
| | (0.450) |
| Observations | 1,996 |
| *Note:* | *p<0.1; **p<0.05; ***p<0.01 |

Source*: Authors Calculation using IHDS- II*

**Education remains a strong and significant predictor** of institutional delivery even under a broader definition.

**Media exposure** and **confidence in public health facilities** continue to be powerful, significant predictors.

**ANC visits lose significance**, potentially due to overlapping informational effects of schooling and media.

# Appendix

**Table 5** : Regression Table for Rural SC Women in Bihar

| Scheduled Caste (SC) Women | |
|---|---|
| | *Dependent variable:* |
| | Institutional Delivery (Binary) |
| ANC Visits | -0.605 |
| | (1.460) |
| Educated | -0.602 |
| | (0.491) |
| Media Exposure | 3.392*** |
| | (0.829) |
| Confidence in Gov Health | 3.136*** |
| | (0.464) |
| Age | -0.319*** |
| | (0.042) |
| Constant | 3.141 |
| | (2.374) |
| Observations | 495 |
| *Note:* | *p<0.1; **p<0.05; ***p<0.01 |

Source*: Authors Calculation using IHDS- II*

The analysis highlights the multifaceted factors influencing institutional delivery among SC women in Bihar. Media exposure and trust in government health services emerge as significant predictors, while education and ANC visits show limited impact. These insights call for nuanced, culturally sensitive, and trust-building interventions to improve maternal health outcomes in this vulnerable population.

# Appendix

**Table 6**: Regression Table for firth regression

| Variable | Estimate | Std. Error | 95% CI | p-value |
|---|---|---|---|---|
| Intercept | 0.858 | 0.872 | [-0.849, 2.672] | 0.328 |
| ANC Visits | -1.276 | 0.655 | [-2.730, -0.017] | $0.047^{*}$ |
| Educated | 0.729 | 0.292 | [0.156, 1.305] | $0.013^{*}$ |
| Media Exposure | 5.113 | 1.454 | [2.985, 10.003] | $< 0.0001^{***}$ |
| Confidence in Health | 1.773 | 0.175 | [1.440, 2.128] | $< 0.0001^{***}$ |
| Age | -0.127 | 0.014 | [-0.155, -0.101] | $< 0.0001^{***}$ |

**Note:** Penalized maximum likelihood estimation (Firth method) used.
Likelihood Ratio Test = 309.32 on 5 df, $p < 0.0001$
Wald Test = 322.39 on 5 df, $p < 0.0001$
$^{*}$ $p < 0.05$, $^{***}$ $p < 0.001$

Source*: Authors Calculation using IHDS- II*

- The coefficient for media was **inflated with extremely large standard errors**, suggesting separation or rare positive outcomes in that subgroup.

**Solution: Firth's Penalized Likelihood Method**

- Firth logistic regression uses a **penalized likelihood approach** to reduce small-sample bias and provide **finite, stable estimates** even under separation.

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