



Broadcasting Change: India's Community Radio Policy and Women's Empowerment

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Motivation

Motivation:

- many development outcomes can (only) be affected by changing **beliefs, collective beliefs, and information**
- esp. women's life opportunities are constrained by societal attitudes (Duflo, 2012)
- media has been found to affect attitudes if consumer can relate to stories and characters (La Ferrara, 2016)
- but can media be used as a policy instrument beyond singular government campaigns that may be perceived as slanted or sectarian?

Research Question:

Can grassroots media be used as a policy to affect development outcomes?

In this paper, I...

- explore India's 2006 community radio policy
- show that radios strongly focus on women's empowerment and education
- for identification exploit topographic features between radios and individuals in combination with a **novel approach to reduce attenuation bias** in geographically jittered survey data
- show that radios increase **girls' education**, decrease **fertility**, and delay **marriage**

- Media and development: unintended effects of entertainment media and experiments (Banerjee et al., 2019; Enikolopov and Petrova, 2017; La Ferrara, 2016; DellaVigna and La Ferrara, 2015)
 - existing research on field experiments or unintended effects of entertainment media
 - evidence on **media as a policy** for development
- Media as a Policy for Development (Okuyama, 2023; Glennerster et al., 2021)
 - evidence **large-scale use of community media as a policy by a developing country with the purpose of fostering local development**
- Large literature using DHS/MISC data
 - 6.5% of studies in JDE and WD and 117 articles in 'Top 5' cite DHS surveys
 - **previous research ignores spatial jittering**: measurement error & bias (Michler et al., 2022)
 - suggest a novel approach to **reduce attenuation bias**

Community Radio (in India)

- idea: provide marginalized communities with a forum for discussion of local issues
- India may be particularly well-suited for CRS:
 - radio: cheapest and most accessible mass medium
 - India: 122 languages and more local dialects (Pop. Census, 2001)
 - 25% illiterate (UNESCO, 2018)
 - 15% of men and 25% of women not exposed to mass media (NFHS 2015-16)

Background: 2006 Policy [▶ Details](#)

NGOs and educational institutions can obtain a CRS license. (Some) requirements:

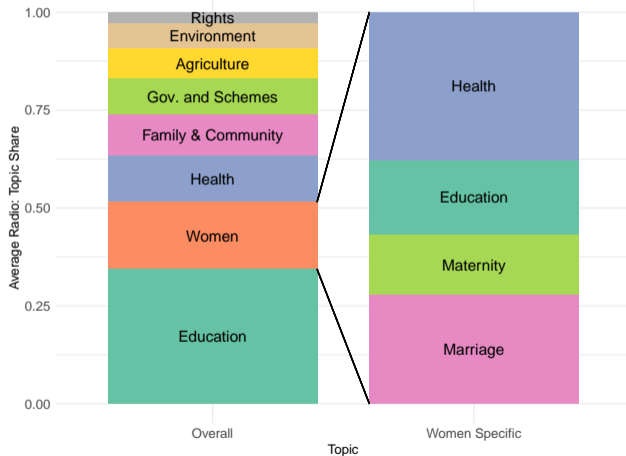
- “the **emphasis should be on developmental**, agricultural, health, educational, environmental, social welfare, community development and cultural programmes”

(Govt. of India, 2006, p. 5)

- majority of content **locally produced**
- not allowed to air (national) news
- **non-profit**
- technological restrictions: **coverage area effectively restricted to 15-30km**



Topic shares of >5k transcribed and translated radio recordings (LDA model)



Slant: What do radios say on women's empowerment?

Employ GPT to see how radios talk about child marriage, girls' education, family planning, and violence against women:

1. restore grammatical structure using GPT-3.5
2. use keywords and GPT-4o to identify shows discussing the topics above
3. for each identified transcript and topic ask GPT-4o: is this show in favor/neutral/against [topic]

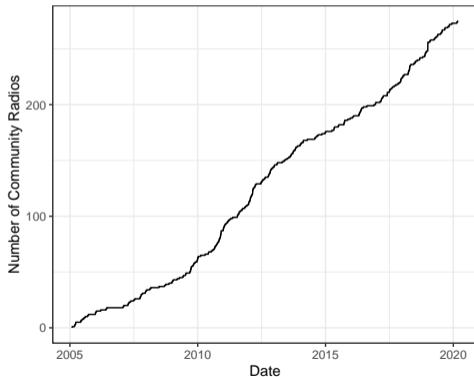
→ 387 shows are identified to discuss the topics

→ express 432 'progressive', 18 neutral, and 2 'conservative' viewpoints

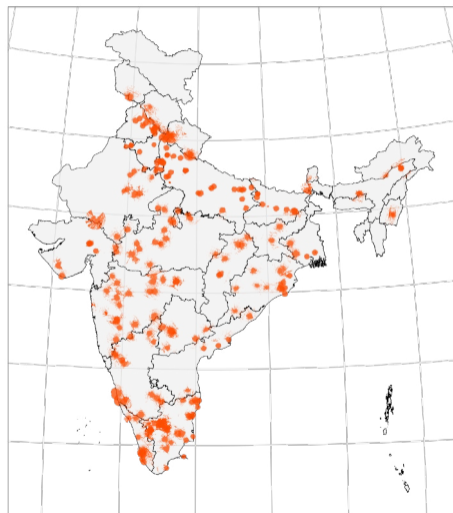
Data

Community Radio Stations

hand-collected data on locations and technical details
→ estimation of coverage areas using irregular terrain
model (Hufford, 2002)



Coverage Areas



Data

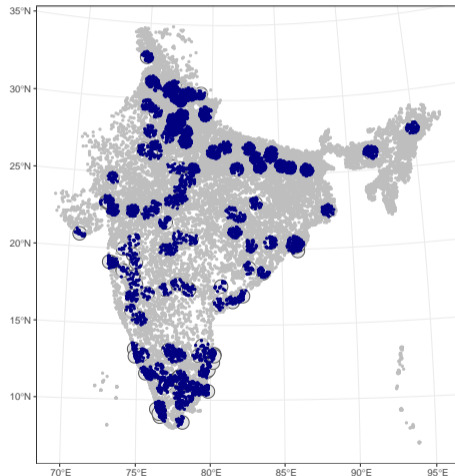
Outcomes & Controls

- Combination with 2015-16 NFHS (/DHS) data
- Main data: people in vicinity of radio that launched pre-2016 (placebo: post-2016)
- Outcomes on radio consumption
- Outcomes on women empowerment
 - main outcomes: **marriage, fertility, and education**
 - 'softer' outcomes: autonomy and attitudes towards domestic violence

► Covg. by Distance

► Map: Placebo Group

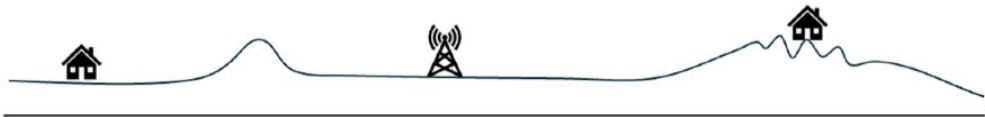
Sample Selection



Empirical Strategy

$$y_i = \beta Exposure_{c(i)} +$$

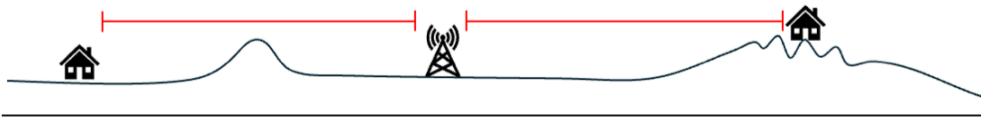
- y_i outcome for individual i
- $Exposure_{c(i)}$: exposure of cluster c of individual i to radio signal
-
-
-



Empirical Strategy

$$y_i = \beta \text{Exposure}_{c(i)} + \text{Distance}_{c(i)} \omega +$$

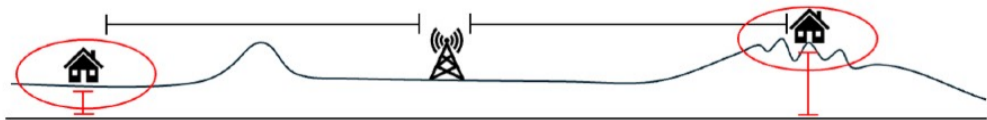
- y_i outcome for individual i
- $\text{Exposure}_{c(i)}$: exposure of cluster c of individual i to radio signal
- $\text{Distance}_{c(i)}$: distance to radio towers, travel time
-
-



Empirical Strategy

$$y_i = \beta Exposure_{c(i)} + Distance_{c(i)}\omega + Geography_{c(i)}\sigma +$$

- y_i outcome for individual i
- $Exposure_{c(i)}$: exposure of cluster c of individual i to radio signal
- $Distance_{c(i)}$: distance to radio towers, travel time
- $Geography_{c(i)}$: altitude & ruggedness
-

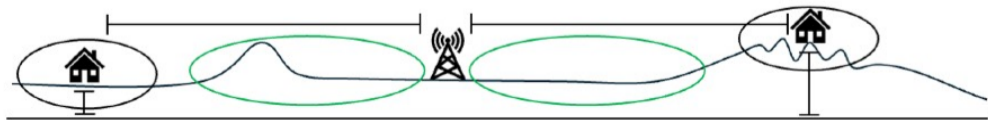


Empirical Strategy

$$y_i = \beta \text{Exposure}_{c(i)} + \text{Distance}_{c(i)}\omega + \text{Geography}_{c(i)}\sigma + X_i\lambda + \gamma_{r(i)} + \epsilon_{i,c(i),r(i)}$$

- y_i outcome for individual i
- $\text{Exposure}_{c(i)}$: exposure of cluster c of individual i to radio signal
- $\text{Distance}_{c(i)}$: distance to radio towers, travel time
- $\text{Geography}_{c(i)}$: altitude & ruggedness
- $\gamma_{r(i)}$ and X_i : CRS fixed effects and other controls (caste, religion, age dummies, gender, urbanity, pop. density, travel time to city etc.)

→ **identification assumption**: remaining variation in exposure is driven by the topography between the transmitter and the receiver and independent of outcome variables in absence of radio



Spatial Jittering

Using reported NFHS/DHS locations?

Problem: NFHS/DHS locations are randomly jittered by up to 5km

→ introduces substantial measurement error and (attenuation) bias

Spatial Jittering

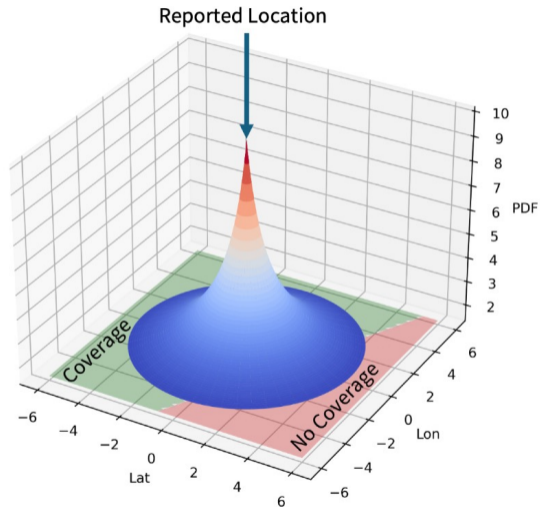
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Problem: NFHS/DHS locations are randomly jittered by up to 5km

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Solution: draw on knowledge of jittering algorithm to answer:

- “Provided location x is observed, what is the probability mass of original locations on the treatment area?” [▶ Covg. by Distance](#)



Spatial Jittering

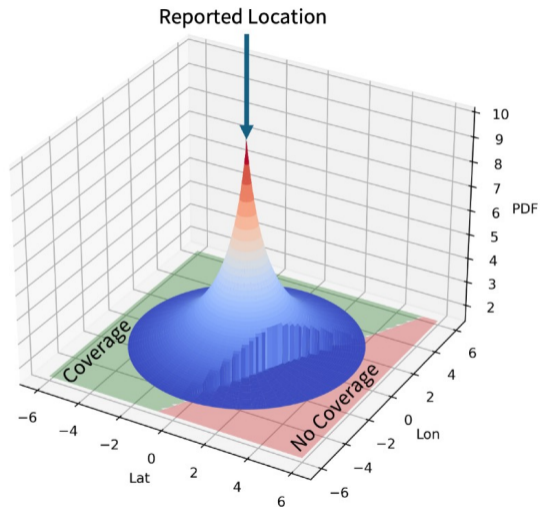
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Solution: draw on knowledge of jittering algorithm to answer:

- “Provided location x is observed, what is the probability mass of original locations on the treatment area?” [▶ Covg. by Distance](#)



$$y_i = \beta \text{Exposure}_{c(i)} + \text{Distance}_{c(i)}\omega + \text{Geography}_{c(i)}\sigma + X_i\lambda + \gamma_{r(i)} + \epsilon_{i,c(i),r(i)}$$

where

$$\text{Exposure}_{c(i)} = \text{CoverageProbability}_{c(i)} \times f(\text{Timeshare}_{c(i)})$$

Radio Consumption

People more strongly consume radio and family planning messages on radio...

| | Radio Owner | Radio Consumer | Radio Familyplanning | Radio HIV/AIDS |
|----------|-------------------|-------------------|----------------------|--------------------|
| exposure | -0.010 (0.018) | 0.033* (0.019) | 0.053** (0.025) | 0.065** (0.026) |
| Num.Obs. | 190157 | 228289 | 228289 | 55508 |
| R2 Adj. | 0.065 | 0.073 | 0.098 | 0.092 |
| Mean Y | 0.095 | 0.184 | 0.197 | 0.164 |

Note: Standard errors are adjusted for spatial correlation (Conley, 1999, 2010): 100km, spherical kernel

Extensive and intensive margin ▶

Stronger for women ▶

No effects on other media ▶

Results of point locations suggest substantial improvement on attenuation bias ▶

Education

Years of Education

Girls obtain additional education:

| | Lower Primary (5-10) | Upper Primary (11-14) | Lower Secondary (15-16) | Higher Secondary (17-19) | Higher Education (19-30) | All (5-30) |
|--------------------------|----------------------|-----------------------|-------------------------|--------------------------|--------------------------|--------------------|
| is female = 1 x exposure | 0.070 (0.064) | 0.245*** (0.094) | 0.392** (0.164) | 0.282 (0.190) | 0.493** (0.219) | 0.309** (0.122) |
| is female = 0 x exposure | 0.051 (0.059) | 0.223*** (0.082) | 0.139 (0.116) | 0.121 (0.187) | 0.195 (0.197) | 0.178 (0.120) |
| Num.Obs. | 91341 | 62587 | 31705 | 45395 | 174402 | 392353 |
| R2 Adj. | 0.637 | 0.345 | 0.195 | 0.186 | 0.233 | 0.534 |
| Mean Y | 1.68 | 5.941 | 8.345 | 9.66 | 9.458 | 6.996 |

Note: Standard errors are adjusted for spatial correlation (Conley, 1999, 2010): 100km, spherical kernel

- Effects also on degree completed  and school attendance 

Marriage

Ever Been Married

Marriage is delayed; lagged effect for men due to age gap (avg: 5 yrs)

| | Married (13-18) | Married (19-24) | Married (25-29) | Married (30-34) | Married (35-39) |
|--------------------------|---------------------|---------------------|---------------------|-------------------|-------------------|
| is female = 1 x exposure | -0.015** (0.007) | -0.051** (0.020) | -0.025 (0.026) | 0.009 (0.012) | 0.005 (0.008) |
| is female = 0 x exposure | 0.009 (0.006) | -0.015 (0.017) | -0.042** (0.021) | -0.017 (0.012) | -0.004 (0.009) |
| Num.Obs. | 95359 | 87467 | 68256 | 57081 | 46469 |
| R2 Adj. | 0.060 | 0.284 | 0.193 | 0.069 | 0.019 |
| Mean Y | 0.038 | 0.388 | 0.76 | 0.924 | 0.968 |

Fertility

Number of Children

Young women have fewer children

| | # Children (15-18) | # Children (19-25) | # Children (26-30) | # Children (31-35) | # Children (36-40) | # Children (41-49) |
|----------|--------------------|---------------------|---------------------|---------------------|--------------------|--------------------|
| exposure | -0.001 (0.003) | -0.079** (0.034) | -0.138** (0.069) | -0.210** (0.098) | -0.033 (0.073) | -0.012 (0.104) |
| Num.Obs. | 20747 | 56848 | 32510 | 26469 | 24899 | 35064 |
| R2 Adj. | 0.011 | 0.306 | 0.198 | 0.232 | 0.254 | 0.282 |
| Mean Y | 0.006 | 0.624 | 1.882 | 2.429 | 2.735 | 2.993 |

Note: Standard errors are adjusted for spatial correlation (Conley, 1999, 2010): 100km, spherical kernel

Women's Autonomy

Share of **decisions** a woman participates in / **places** she can visit on her own

| | Autonomy | Autonomy (15-25) | Autonomy (26-35) | Autonomy (36-45) | Autonomy (45-49) |
|----------|-------------------|---------------------|------------------|-------------------|------------------|
| exposure | 0.037* (0.021) | 0.120*** (0.034) | 0.009 (0.024) | -0.001 (0.028) | 0.068 (0.064) |
| Num.Obs. | 24411 | 5484 | 9572 | 7212 | 2143 |
| R2 Adj. | 0.147 | 0.138 | 0.097 | 0.091 | 0.106 |
| Mean Y | 0.635 | 0.505 | 0.639 | 0.704 | 0.718 |

Men's Attitudes Towards Women's Autonomy

| | Autonomy | Autonomy (15-25) | Autonomy (26-35) | Autonomy (36-45) | Autonomy (45-54) |
|----------|------------------|-------------------|------------------|-------------------|-------------------|
| exposure | 0.048 (0.031) | 0.058* (0.030) | 0.040 (0.039) | 0.083* (0.042) | -0.027 (0.041) |
| Num.Obs. | 30580 | 10766 | 8571 | 6862 | 4381 |
| R2 Adj. | 0.079 | 0.078 | 0.086 | 0.079 | 0.087 |
| Mean Y | 0.816 | 0.816 | 0.816 | 0.818 | 0.812 |
| SD Y | 0.285 | 0.284 | 0.282 | 0.287 | 0.292 |

Note: Standard errors are adjusted for spatial correlation (Conley, 1999, 2010): 100km, spherical kernel

Robustness

Specification

- functional form: higher significance levels with quadratic effects
- varying the distance cutoff
- outcomes: vary definition of, e.g., degree completed/attends school

Exogeneity of Treatment

- OVB: treatment unrelated to other measures of development (e.g. density, caste) ▶
- pre-trends in main data: regressions on age groups not affected by treatment (e.g. education of people aged 30+) ▶
- placebo (OVB/selection/pre-trends): placebo regressions for individuals in vicinity of radio launched post 2015 ▶

Conclusion

Strong evidence on **grassroots radios' effects on role of women:**

- increased educational investments, decreased fertility, delayed marriage
- increased autonomy regarding decisions and mobility

Methodological: using jittered data with small treatment areas



Thank you!

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Feedback:

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- Ferrara, Eliana La**, “Mass Media and Social Change: Can We Use Television to Fight Poverty?,” *Journal of the European Economic Association*, August 2016, 14 (4), 791–827.

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- Glennerster, R., J. Murray, and V. Pouliquen**, “The Media or the Message? Experimental Evidence on Mass Media and Modern Contraception Uptake in Burkina Faso,” 2021.
- Hufford, George A.**, “The ITS Irregular Terrain Model, Version 1.2. 2, the Algorithm,” Technical Report 2002.
- Michler, Jeffrey D., Anna Josephson, Talip Kilic, and Siobhan Murray**, “Privacy Protection, Measurement Error, and the Integration of Remote Sensing and Socioeconomic Survey Data,” *Journal of Development Economics*, September 2022, 158, 102927.
- Okuyama, Yoko**, “Empowering Women Through Radio: Evidence from Occupied Japan,” 2023.

Most closely related:

- Okuyama (2023): shows that radio programs of the US occupying force in Japan increased women's political engagement
- Glennerster et al. (2021): two-level RCT with Community Radios in Burkina Faso
 - 8/16 radios air a message produced by a British NGO on contraception use → contraception use ↑
 - provide some women with a radio across all radios → contraception use in control treatment areas ↓

CRS Content: Categories [▶ back](#)

| Category | Subcategory | Num. Shows | Num. Radios |
|-----------------------------|----------------------------------|------------|-------------|
| Cultural Development | Total | 1825 | 75 |
| | Culture | 54 | 9 |
| | Folk art, Music, Literature | 799 | 56 |
| | Food | 27 | 10 |
| | Heritage | 311 | 36 |
| Education | Local talent | 634 | 32 |
| | Total | 6667 | 56 |
| | Education for All | 6272 | 51 |
| | Educational Resources | 198 | 25 |
| Environment and Development | Vocational Education | 197 | 8 |
| | Total | 179 | 42 |
| | Animal Protection and Rights | 12 | 1 |
| | Biodiversity | 9 | 5 |
| | Climate Change | 69 | 23 |
| | Conservation | 67 | 23 |
| | Waste Management | 4 | 1 |
| Governance | Water | 18 | 13 |
| | Total | 316 | 36 |
| | Government Schemes and Policies | 45 | 10 |
| | Local Governance | 108 | 16 |
| | Rights and entitlements | 133 | 18 |
| | Service Delivery | 25 | 16 |
| | Urbanization | 5 | 3 |
| Health | Total | 3354 | 63 |
| | Adolescent Health | 56 | 6 |
| | Diseases and Conditions | 1022 | 39 |
| | Healthy Living | 2226 | 52 |
| | Science and Traditional Medicine | 50 | 16 |
| Inclusion and Equity | Total | 152 | 40 |
| | Child Rights | 16 | 1 |
| | Disabled | 6 | 2 |
| | HIV/AIDS | 26 | 9 |
| | LGBT | 1 | 1 |
| | Minorities | 2 | 2 |
| | Tribals | 1 | 1 |
| | Women | 100 | 32 |
| Legal Awareness | Total | 8 | 4 |
| | Access to Justice | 5 | 3 |
| | Free Legal Aid | 3 | 1 |
| Media and Communication | Total | 204 | 24 |
| | ICT4D | 40 | 13 |
| | Media skills and Tools | 164 | 16 |
| Poverty and Livelihood | Total | 1401 | 41 |
| | Agriculture | 353 | 24 |
| | Livelihood | 187 | 23 |
| | Migration | 19 | 6 |
| | Rural Development | 842 | 18 |
| Responsible Business | Total | 14 | 7 |
| | Corporate Social Responsibility | 11 | 5 |
| | Social Justice Philanthropy | 3 | 2 |
| Risk Reduction | Total | 11 | 6 |
| | Disaster Risk Reduction | 11 | 6 |
| Thematic Campaigns | Total | 48 | 8 |
| | HIV/AIDS Campaign by CRA | 48 | 8 |

CRS Content: Languages [▶ back](#)

| Language | Num. Shows | Num. Radios |
|------------|------------|-------------|
| Assamese | 469 | 3 |
| Bangala | 187 | 6 |
| Bhojpuri | 871 | 2 |
| Bundeli | 35 | 4 |
| English | 228 | 20 |
| Garhwali | 2 | 1 |
| Gujarati | 64 | 3 |
| Hindi | 5359 | 63 |
| Kannada | 216 | 11 |
| Khasi | 3 | 1 |
| Kumaoni | 1 | 1 |
| Maithili | 2 | 2 |
| Malayalam | 4811 | 8 |
| Marathi | 233 | 12 |
| Mev | 32 | 2 |
| Oriya | 353 | 4 |
| Punjabi | 4 | 3 |
| Rajasthani | 36 | 3 |
| Surgujiha | 2 | 1 |
| Tamil | 1224 | 22 |
| Telugu | 17 | 5 |
| Urdu | 30 | 3 |

CRS Content: Formats [▶ back](#)

| Format | Num. Shows | Num. Radios |
|--------------|------------|-------------|
| Discussion | 832 | 46 |
| Documentry | 1135 | 28 |
| Drama | 761 | 46 |
| Feature | 636 | 47 |
| Interview | 1702 | 61 |
| Jingle | 420 | 30 |
| Magazine | 2236 | 60 |
| Music | 805 | 49 |
| News | 13 | 9 |
| Phone in/out | 1482 | 18 |
| Radio Spot | 247 | 28 |
| Talk | 3747 | 58 |
| Vox-Populi | 163 | 13 |

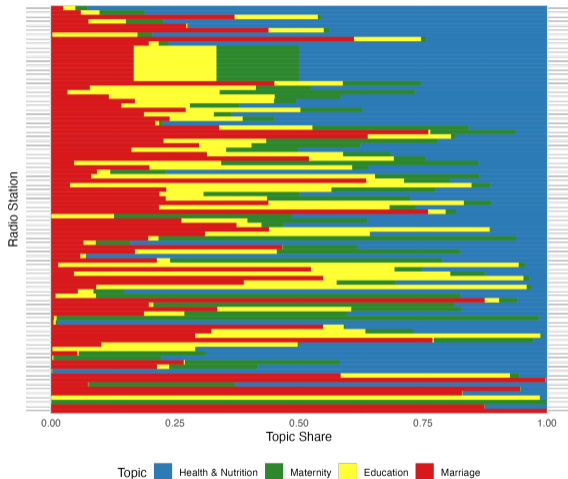
- based on a dictionary analysis of radio descriptions

| Topic | # Radios |
|-----------------------|------------|
| women | 151 |
| health | 190 |
| sanitation / hygiene | 57 |
| governance / rights | 227 |
| education | 198 |
| culture | 214 |
| economic | 91 |
| environment | 69 |
| agriculture / fishing | 131 |
| total | 248 |

Shows have a variety of formats and are produced in local dialects and languages

Radio Show Transcripts: Details

[▶ Back](#)



Example 1: Marriage [▶ Back](#)

” I appeal to Neeraj Pathak RPS Probationer SHO Aburod City Police Station that child marriage is a social evil. Due to this, the society has spread as an evil. Together, it affects the mental development of children. Physically, if we marry children early, then the body of the girl does not mature to become a mother at a young age. In such a situation, the mother dies during pregnancy. So we have to wake up about this. Whatever we are educated people. Whatever people around them are, obviously there is evil in society. People have to awaken all this and tell us that we will be childless. Along with this, the Child Marriage Prohibition Act has been enacted by the government in which if a boy under 21 and a girl under the age of 18 will be married, then she is legally crime. Social evil is there. Now legal jama has been worn. If anyone marries a boy below 21 years of age and a girl under the age of 18, then he may have to be punished with imprisonment of 2 years and a fine of 100000. Therefore, once from all of you, you have my appeal to stop it is evil. The mental physical development of the child is private from a social evil. Whatever the deputy are educated people are we. Take a pledge to take us that if any child marriage is taking place in our knowledge in our kinship in our area, then we stop it.”

Example 2: Maternity [▶ Back](#)

GPT-4 Summary. Prompt: The following is a transcribed and translated radio show from an Indian community radio. Through this, the transcript's quality is relatively low. Please shortly summarize what the original radio show was about.

Result:

The radio show "Health Time" on Radio Rimjhim, hosted by Imam, focuses on maternal and child health care before and after childbirth. The episode features experts such as Dr. Anil Kumar Verma and a senior bone pathologist, discussing the importance of prenatal and postnatal care to ensure the health of both the mother and the newborn. The program emphasizes the government's role in providing health services and guidelines that pregnant women should follow. Key points include the necessity of regular health check-ups, the administration of vaccines like tetanus, and the importance of supplements such as calcium and folic acid. Additionally, the show advocates for institutional deliveries to safeguard the health of the mother and baby, highlighting a comprehensive approach to maternal health that spans the life cycle from pregnancy to postnatal care.

Example 3: Health & Nutrition [▶ Back](#)

GPT-4 Summary. Prompt: The following is a transcribed and translated radio show from an Indian community radio. Through this, the transcript's quality is relatively low. Please shortly summarize what the original radio show was about.
Result:

The radio show centers around health and nutrition education, specifically focusing on the importance of iron in the diet and managing menstrual health issues among schoolgirls. The host discusses how incorporating certain foods like lemons, tomatoes, and spinach can enhance iron absorption in the body, vital for overall health and preventing anemia. Additionally, the program addresses common menstrual problems faced by students and encourages open discussions with experienced women or healthcare professionals to find solutions and promote better health practices. The program is supported by the National Science and Technology Communications Council and emphasizes the empowerment of women through health education.

Details on Licensing Process [▶ back](#)

Application process:

1. Hand in a complete application
2. Ministries clear the application: Home Office and Defence Ministry: security clearance; Communication Ministry: availability of frequencies
3. Screening committee: screens and interviews applicants: purpose of radio, prior engagement in community, available funds
4. Interministerial committee approves the application
5. MOIB sends materials to stations to be filled out and stations apply for frequency
6. Equipment is bought (partially from official vendors) and station is set up

Bottlenecks:

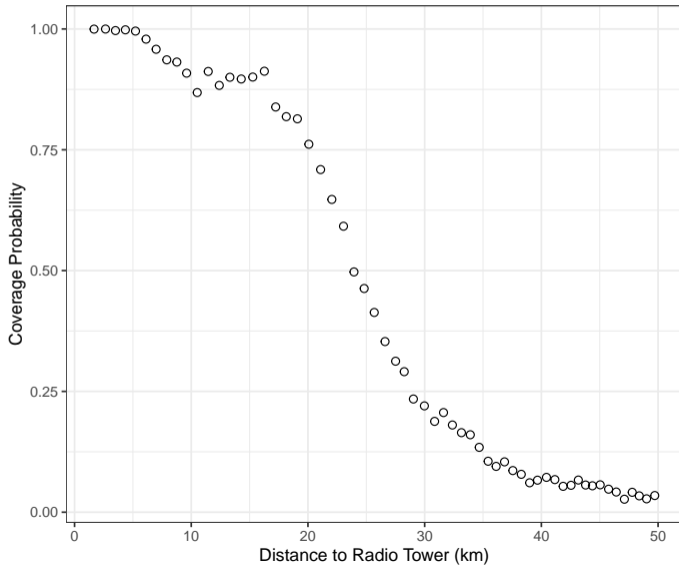
- Step (3): organization does not have sufficient funds or has no history with community
- Step (5/6): Missing know-how on how to finally setup station

Coverage Probability by Distance

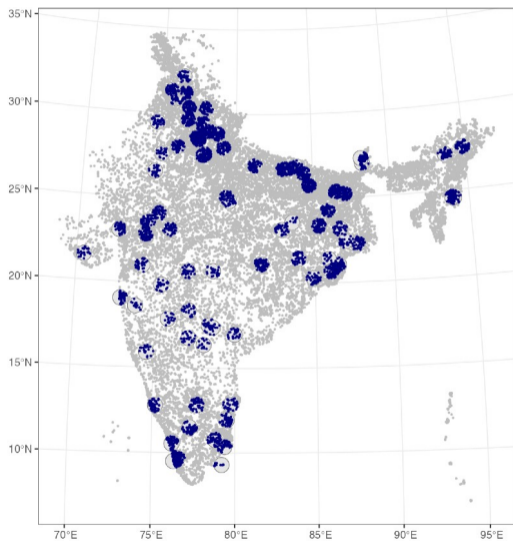
▶ [back: data](#)

▶ [Covg. by Distance](#)

back: jittering



DHS Data: Placebo Group



▶ [back: data](#)

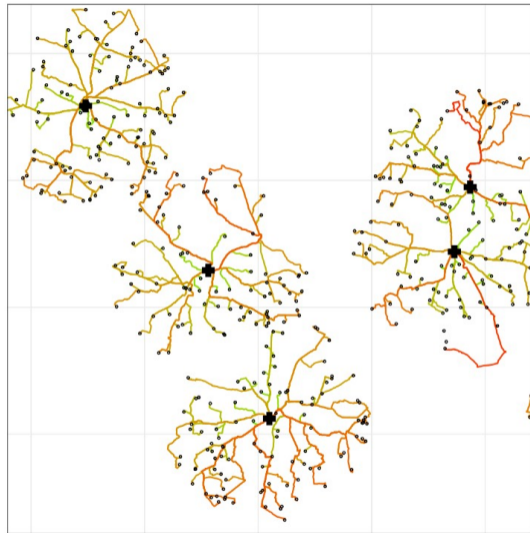
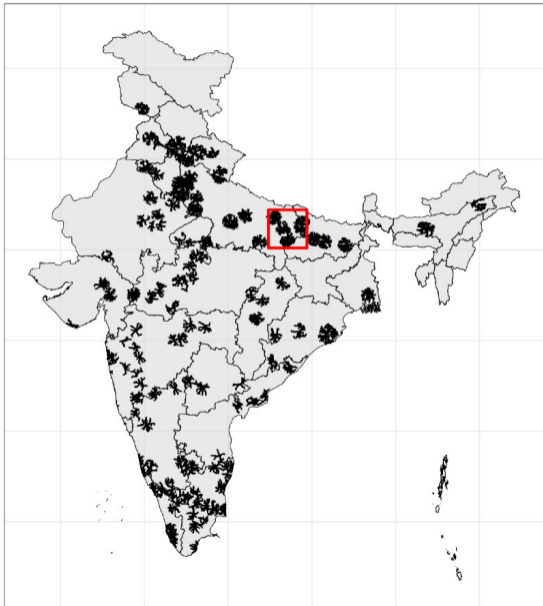
Summary Statistics [▶ back](#)

| Variable | cluster | n | mean | sd | median | min | max |
|--|---------|---------|------------|------------|------------|-------|------------|
| RADIO VARIABLES | | | | | | | |
| Exposure | 8,211 | 821,243 | 0.23 | 0.27 | 0.10 | 0 | 0.99 |
| Coverage Probability | 8,211 | 821,243 | 0.47 | 0.44 | 0.33 | 0 | 1 |
| Coverage Probability: Closest Radio | 8,211 | 821,243 | 0.44 | 0.44 | 0.26 | 0 | 1 |
| Radio Owner | 8,207 | 195,584 | 0.09 | 0.29 | 0 | 0 | 1 |
| Radio Consumer | 8,208 | 234,550 | 0.19 | 0.39 | 0 | 0 | 1 |
| Radio Familyplanning | 8,208 | 234,550 | 0.20 | 0.40 | 0 | 0 | 1 |
| Radio HIV/AIDS | 2,844 | 56,782 | 0.16 | 0.37 | 0 | 0 | 1 |
| OUTCOMES | | | | | | | |
| Years of Edu. | 8,210 | 819,532 | 5.90 | 5.25 | 5 | 0 | 20 |
| Completed Primary | 8,210 | 819,532 | 0.50 | 0.50 | 0 | 0 | 1 |
| Completed Secondary | 8,210 | 819,532 | 0.18 | 0.38 | 0 | 0 | 1 |
| Higher than Secondary | 8,210 | 819,532 | 0.11 | 0.31 | 0 | 0 | 1 |
| Ever Married | 8,210 | 620,620 | 0.72 | 0.45 | 1 | 0 | 1 |
| Num. Children | 8,207 | 202,106 | 1.70 | 1.61 | 2 | 0 | 15 |
| Autonomy of Women (Female Respondent) | 2,842 | 24,983 | 0.64 | 0.33 | 0.67 | 0 | 1 |
| Autonomy of Women (Male Respondent) | 2,843 | 31,231 | 0.82 | 0.29 | 1 | 0 | 1 |
| Attitude (Count) | 2,842 | 34,188 | 1.10 | 1.61 | 0 | 0 | 5 |
| Attitude (Any) | 2,842 | 34,188 | 0.41 | 0.49 | 0 | 0 | 1 |
| Attitude (Count) - Male Respondent | 2,842 | 31,628 | 0.70 | 1.28 | 0 | 0 | 5 |
| Attitude (Any) - Male Respondent | 2,842 | 31,628 | 0.30 | 0.46 | 0 | 0 | 1 |
| Experienced Violence by Partner (Ever) | 2,839 | 18,825 | 0.33 | 0.47 | 0 | 0 | 1 |
| Experienced Violence by Partner (Past 12m) | 2,839 | 18,825 | 0.27 | 0.44 | 0 | 0 | 1 |
| CONTROLS: DEMOGRAPHY | | | | | | | |
| Age | 8,210 | 821,138 | 29.33 | 20.11 | 26 | 0 | 95 |
| Female | 8,210 | 821,242 | 0.49 | 0.50 | 0 | 0 | 1 |
| Caste ST | 8,192 | 799,207 | 0.22 | 0.42 | 0 | 0 | 1 |
| Caste: SC | 8,192 | 799,207 | 0.07 | 0.25 | 0 | 0 | 1 |
| Caste: OBC | 8,192 | 799,207 | 0.46 | 0.50 | 0 | 0 | 1 |
| Caste: Other | 8,192 | 799,207 | 0.25 | 0.43 | 0 | 0 | 1 |
| Religion: Hindu | 8,210 | 821,242 | 0.81 | 0.39 | 1 | 0 | 1 |
| Religion: Muslim | 8,210 | 821,242 | 0.14 | 0.34 | 0 | 0 | 1 |
| Religion: Other | 8,210 | 821,242 | 0.06 | 0.23 | 0 | 0 | 1 |
| CONTROLS: PROPAGATION | | | | | | | |
| Travel Time to Radio Tower (min) | 8,194 | 819,525 | 57.28 | 33.89 | 55.18 | 0.75 | 329.83 |
| Distance to Radio Tower (km) | 8,211 | 821,243 | 26.00 | 14.71 | 26.86 | 0.91 | 49.99 |
| Distance to 2nd closest Tower (km) | 8,211 | 821,243 | 67.99 | 58.09 | 53.23 | 1.35 | 433.91 |
| Mean Altitude | 8,211 | 821,243 | 274.85 | 300.71 | 209.30 | -0.06 | 2,471.05 |
| Mean Ruggedness | 8,211 | 821,243 | 10.95 | 17.66 | 5.70 | 2.24 | 156.25 |
| CONTROLS: GEOGRAPHIC | | | | | | | |
| Urban | 8,210 | 821,242 | 0.39 | 0.49 | 0 | 0 | 1 |
| Pop. Density (2015) | 8,211 | 821,243 | 2,509.62 | 5,915.53 | 857.46 | 23.24 | 63,807.06 |
| Travel Time to Nearest City (min) | 8,211 | 821,243 | 14.58 | 17.38 | 11.24 | 0 | 275.48 |
| Proximity: Water (m) | 8,211 | 821,243 | 177,990.70 | 118,651.60 | 174,432.00 | 1.96 | 511,661.20 |
| Proximity: National Borders (m) | 8,211 | 821,243 | 180,751.90 | 130,304.30 | 159,207.20 | 10.38 | 583,496.30 |

Summary Statistics: Placebo Group [▶ back](#)

| Variable | cluster | n | mean | sd | median | min | max |
|--|---------|----------|-------------|-------------|-------------|-------|-------------|
| RADIO VARIABLES | | | | | | | |
| Exposure | 6, 601 | 665, 741 | 0.24 | 0.28 | 0.10 | 0 | 0.99 |
| Coverage Probability | 6, 601 | 665, 741 | 0.41 | 0.42 | 0.20 | 0 | 1 |
| Coverage Probability: Closest Radio | 6, 601 | 665, 741 | 0.40 | 0.42 | 0.19 | 0 | 1 |
| Radio Owner | 6, 597 | 157, 689 | 0.10 | 0.30 | 0 | 0 | 1 |
| Radio Consumer | 6, 598 | 188, 300 | 0.21 | 0.41 | 0 | 0 | 1 |
| Radio Familyplanning | 6, 598 | 188, 300 | 0.19 | 0.39 | 0 | 0 | 1 |
| Radio HIV/AIDS | 2, 226 | 44, 439 | 0.18 | 0.39 | 0 | 0 | 1 |
| OUTCOMES | | | | | | | |
| Years of Edu. | 6, 600 | 664, 246 | 5.83 | 5.22 | 5 | 0 | 20 |
| Completed Primary | 6, 600 | 664, 246 | 0.49 | 0.50 | 0 | 0 | 1 |
| Completed Secondary | 6, 600 | 664, 246 | 0.17 | 0.38 | 0 | 0 | 1 |
| Higher than Secondary | 6, 600 | 664, 246 | 0.10 | 0.30 | 0 | 0 | 1 |
| Ever Married | 6, 600 | 500, 226 | 0.71 | 0.45 | 1 | 0 | 1 |
| Num. Children | 6, 597 | 163, 012 | 1.69 | 1.62 | 2 | 0 | 15 |
| Autonomy of Women (Female Respondent) | 2, 224 | 19, 547 | 0.64 | 0.32 | 0.67 | 0 | 1 |
| Autonomy of Women (Male Respondent) | 2, 224 | 24, 303 | 0.84 | 0.27 | 1 | 0 | 1 |
| Attitude (Count) | 2, 224 | 26, 806 | 1.04 | 1.57 | 0 | 0 | 5 |
| Attitude (Any) | 2, 224 | 26, 806 | 0.40 | 0.49 | 0 | 0 | 1 |
| Attitude (Count) - Male Respondent | 2, 224 | 24, 639 | 0.64 | 1.24 | 0 | 0 | 5 |
| Attitude (Any) - Male Respondent | 2, 224 | 24, 639 | 0.28 | 0.45 | 0 | 0 | 1 |
| Experienced Violence by Partner (Ever) | 2, 220 | 14, 826 | 0.33 | 0.47 | 0 | 0 | 1 |
| Experienced Violence by Partner (Past 12m) | 2, 220 | 14, 826 | 0.26 | 0.44 | 0 | 0 | 1 |
| CONTROLS: DEMOGRAPHY | | | | | | | |
| Age | 6, 600 | 665, 640 | 29.09 | 20.08 | 25 | 0 | 95 |
| Female | 6, 600 | 665, 740 | 0.49 | 0.50 | 0 | 0 | 1 |
| Caste ST | 6, 595 | 647, 780 | 0.19 | 0.40 | 0 | 0 | 1 |
| Caste: SC | 6, 595 | 647, 780 | 0.11 | 0.31 | 0 | 0 | 1 |
| Caste: OBC | 6, 595 | 647, 780 | 0.44 | 0.50 | 0 | 0 | 1 |
| Caste: Other | 6, 595 | 647, 780 | 0.26 | 0.44 | 0 | 0 | 1 |
| Religion: Hindu | 6, 600 | 665, 740 | 0.77 | 0.42 | 1 | 0 | 1 |
| Religion: Muslim | 6, 600 | 665, 740 | 0.13 | 0.34 | 0 | 0 | 1 |
| Religion: Other | 6, 600 | 665, 740 | 0.09 | 0.29 | 0 | 0 | 1 |
| CONTROLS: PROPAGATION | | | | | | | |
| Travel Time to Radio Tower (min) | 6, 588 | 664, 354 | 64.86 | 38.49 | 61.47 | 1.15 | 382.60 |
| Distance to Radio Tower (km) | 6, 601 | 665, 741 | 28.99 | 13.69 | 30.70 | 1.01 | 49.97 |
| Distance to 2nd closest Tower (km) | 6, 601 | 665, 741 | 93.36 | 60.75 | 79.02 | 1.42 | 344.04 |
| Mean Altitude | 6, 601 | 665, 741 | 314.65 | 321.81 | 218.47 | -0.39 | 3, 210.17 |
| Mean Ruggedness | 6, 601 | 665, 741 | 13.24 | 22.82 | 6.03 | 1.51 | 264.00 |
| CONTROLS: GEOGRAPHIC | | | | | | | |
| Urban | 6, 600 | 665, 740 | 0.37 | 0.48 | 0 | 0 | 1 |
| Pop. Density (2015) | 6, 601 | 665, 741 | 2, 449.86 | 5, 940.94 | 842.81 | 11.89 | 44, 941.72 |
| Travel Time to Nearest City (min) | 6, 601 | 665, 741 | 17.40 | 24.04 | 12.68 | 0 | 308.49 |
| Proximity: Water (m) | 6, 601 | 665, 741 | 175, 119.90 | 115, 996.00 | 166, 435.50 | 0 | 511, 661.20 |
| Proximity: National Borders (m) | 6, 601 | 665, 741 | 166, 807.70 | 113, 424.80 | 142, 379.00 | 5.65 | 583, 496.30 |

Travel Times to Radio Tower [▶ Back](#)



Exogeneity Check

| | Caste SC/ST | Caste SC/ST | Muslim | Muslim | Urban | Urban | Log. Pop. Density | Log. Pop. Density | Travel Time (min) | Travel Time (min) | Log. Travel Time (min) | Log. Travel Time (min) | Proximity Borders (m) | Proximity Borders (m) | Travel Time Ratio (min) | Travel Time Ratio (min) |
|-----------|------------------|-------------------|------------------|------------------|------------------|------------------|-------------------|-------------------|-------------------|-------------------|------------------------|------------------------|------------------------|-----------------------|-------------------------|-------------------------|
| exposure | 0.003 (0.022) | | 0.021 (0.019) | | 0.002 (0.075) | | 0.248 (0.237) | | 0.115 (0.186) | | 0.115 (0.186) | | 1139.465 (2895.347) | | 4.355 (2.887) | |
| exposure2 | | -0.029 (0.025) | | 0.002 (0.022) | | 0.015 (0.087) | | 0.267 (0.255) | | 0.089 (0.224) | | 0.089 (0.224) | | 512.614 (2960.084) | | 2.686 (2.745) |
| Num.Obs. | 167111 | 167111 | 167111 | 167111 | 171903 | 171903 | 171903 | 171903 | 171903 | 171903 | 171903 | 171903 | 171903 | 171903 | 171903 | 171903 |
| R2 Adj. | 0.074 | 0.074 | 0.097 | 0.097 | 0.361 | 0.361 | 0.796 | 0.796 | 0.586 | 0.586 | 0.586 | 0.586 | 0.985 | 0.985 | 0.825 | 0.825 |

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Male Attitudes

| | Attitude Any | Attitude Any | Attitude Count | Attitude Count |
|------------------|-------------------|-------------------|-------------------|-------------------|
| exposure | -0.017 (0.046) | | -0.008 (0.120) | |
| 15-24 x exposure | | -0.020 (0.039) | | -0.027 (0.108) |
| 25-34 x exposure | | 0.005 (0.040) | | 0.019 (0.111) |
| 35-44 x exposure | | -0.012 (0.041) | | 0.013 (0.111) |
| 45-49 x exposure | | -0.017 (0.051) | | -0.086 (0.146) |
| Num.Obs. | 30970 | 30970 | 30970 | 30970 |
| R2 Adj. | 0.103 | 0.103 | 0.088 | 0.088 |
| Mean Y | 0.303 | 0.303 | 0.696 | 0.696 |
| SD Y | 0.46 | 0.46 | 1.28 | 1.28 |

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Experience of Domestic Violence

| | Any Violence | Any Violence |
|------------------|-------------------|-------------------|
| exposure | -0.011 (0.031) | |
| 15-24 x exposure | | -0.034 (0.047) |
| 25-34 x exposure | | -0.020 (0.037) |
| 35-44 x exposure | | 0.002 (0.031) |
| 45-49 x exposure | | 0.017 (0.036) |
| Num.Obs. | 18392 | 18392 |
| R2 Adj. | 0.072 | 0.072 |
| Mean Y | 0.27 | 0.27 |
| SD Y | 0.444 | 0.444 |

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Effect on Consumption of Other Media

| | TV Owner | TV Consumer | Newspaper Consumer | Internet User | Mobile Phone Owner |
|----------|-------------------|-------------------|--------------------|------------------|--------------------|
| exposure | -0.019 (0.023) | -0.006 (0.020) | -0.004 (0.017) | 0.008 (0.015) | 0.028 (0.035) |
| Num.Obs. | 190157 | 196537 | 196537 | 167111 | 34324 |
| R2 Adj. | 0.295 | 0.237 | 0.189 | 0.174 | 0.213 |
| Mean Y | 0.752 | 0.817 | 0.45 | 0.148 | 0.494 |
| SD Y | 0.432 | 0.387 | 0.498 | 0.355 | 0.5 |

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Radio Consumption: By Gender

| | Radio Consumer | Radio Familyplanning | Radio: HIV/AIDS |
|--------------------------|-------------------|----------------------|--------------------|
| is female = 1 x exposure | 0.033* (0.019) | 0.057** (0.025) | 0.071** (0.029) |
| is female = 0 x exposure | 0.035 (0.036) | 0.031 (0.035) | 0.058** (0.029) |
| Num.Obs. | 228289 | 228289 | 55508 |
| R2 Adj. | 0.073 | 0.098 | 0.092 |
| Mean Y | 0.184 | 0.197 | 0.164 |
| SD Y | 0.388 | 0.398 | 0.37 |

Note: Standard errors are adjusted for spatial correlation (Conley, 1999, 2010): 100km, spherical kernel

Radio Consumption: Intensity

| | Radio Consumer | Radio Intensity (0-3) | Radio: None (0) | Radio: (Almost) Daily (3) | Radio: At Least Weekly (2) | Radio: Less Than Weekly (1) |
|----------|--------------------|-----------------------|---------------------|---------------------------|----------------------------|-----------------------------|
| exposure | 0.038** (0.018) | 0.066* (0.035) | -0.038** (0.018) | 0.009 (0.008) | 0.010 (0.008) | 0.019** (0.009) |
| Num.Obs. | 196537 | 196537 | 196537 | 196537 | 196537 | 196537 |
| R2 Adj. | 0.060 | 0.063 | 0.060 | 0.041 | 0.019 | 0.019 |
| Mean Y | 0.165 | 0.322 | 0.835 | 0.047 | 0.063 | 0.055 |
| SD Y | 0.371 | 0.792 | 0.371 | 0.212 | 0.242 | 0.229 |

Note: Standard errors are adjusted for spatial correlation (Conley, 1999, 2010): 100km, spherical kernel

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Comparison of Estimators

| | Radio Owner | Radio Owner | Radio Consumer | Radio Consumer | Radio Familyplanning | Radio Familyplanning | Radio HIV/AIDS | Radio HIV/AIDS |
|------------------|-------------------|-------------------|------------------|-------------------|----------------------|----------------------|--------------------|--------------------|
| exposure (Point) | -0.003 (0.010) | | 0.014 (0.012) | | 0.032** (0.014) | | 0.047** (0.020) | |
| exposure | | -0.010 (0.018) | | 0.033* (0.019) | | 0.053** (0.026) | | 0.065** (0.027) |
| Num.Obs. | 190157 | 190157 | 228289 | 228289 | 228289 | 228289 | 55508 | 55508 |
| R2 Adj. | 0.065 | 0.065 | 0.073 | 0.073 | 0.098 | 0.098 | 0.092 | 0.092 |
| Mean Y | 0.095 | 0.095 | 0.184 | 0.184 | 0.197 | 0.197 | 0.164 | 0.164 |
| SD Y | 0.293 | 0.293 | 0.388 | 0.388 | 0.398 | 0.398 | 0.37 | 0.37 |

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Household Decisions

| | Autonomy Decision | Autonomy Decision (15-25) | Autonomy Decision (26-35) | Autonomy Decision (36-45) | Autonomy Decision (45-49) |
|----------|-------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| exposure | 0.042 (0.030) | 0.129*** (0.040) | 0.036 (0.044) | -0.021 (0.029) | 0.078 (0.071) |
| Num.Obs. | 24411 | 5484 | 9572 | 7212 | 2143 |
| R2 Adj. | 0.058 | 0.065 | 0.035 | 0.040 | 0.036 |
| Mean Y | 0.741 | 0.655 | 0.744 | 0.786 | 0.793 |
| SD Y | 0.382 | 0.419 | 0.378 | 0.355 | 0.355 |

Mobility

| | Autonomy Mobility | Autonomy Mobility (15-25) | Autonomy Mobility (26-35) | Autonomy Mobility (36-45) | Autonomy Mobility (45-49) |
|----------|-------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| exposure | 0.031 (0.030) | 0.080* (0.044) | -0.023 (0.030) | 0.010 (0.048) | 0.074 (0.067) |
| Num.Obs. | 34324 | 13451 | 10386 | 8000 | 2487 |
| R2 Adj. | 0.165 | 0.114 | 0.116 | 0.097 | 0.125 |
| Mean Y | 0.506 | 0.368 | 0.545 | 0.637 | 0.667 |
| SD Y | 0.456 | 0.436 | 0.454 | 0.435 | 0.428 |

Education: Degree Completed [▶ Back](#)

| | Primary | Secondary | Higher |
|--------------------------|--------------------|-------------------|-------------------|
| is female = 1 x exposure | 0.032** (0.015) | 0.037* (0.021) | 0.027* (0.015) |
| is female = 0 x exposure | 0.013 (0.013) | 0.017 (0.021) | 0.015 (0.015) |
| Num.Obs. | 238425 | 191899 | 191899 |
| R2 Adj. | 0.161 | 0.160 | 0.134 |
| Mean Y | 0.807 | 0.41 | 0.255 |

Education: School Attended

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| | Lower Primary (5-10) | Upper Primary (11-14) | Lower Secondary (15-16) | Higher Secondary (17-18) |
|--------------------------|----------------------|-----------------------|-------------------------|--------------------------|
| is female = 1 x exposure | -0.004 (0.013) | 0.003 (0.010) | 0.043** (0.022) | 0.052** (0.021) |
| is female = 0 x exposure | 0.000 (0.014) | 0.007 (0.010) | 0.024 (0.016) | 0.030* (0.017) |
| Num.Obs. | 91376 | 62630 | 31737 | 32339 |
| R2 Adj. | 0.136 | 0.094 | 0.127 | 0.137 |
| Mean Y | 0.904 | 0.922 | 0.799 | 0.648 |
| SD Y | 0.295 | 0.267 | 0.4 | 0.478 |

Education: Placebo

Years of Education

| | Lower Primary (5-10) | Upper Primary (11-14) | Lower Secondary (15-16) | Higher Secondary (17-19) | Higher Education (19-30) | All (5-30) |
|--------------------------|----------------------|-----------------------|-------------------------|--------------------------|--------------------------|-------------------|
| is female = 1 x exposure | 0.016 (0.046) | -0.066 (0.110) | 0.010 (0.107) | -0.065 (0.186) | -0.126 (0.176) | -0.077 (0.113) |
| is female = 0 x exposure | 0.026 (0.049) | -0.025 (0.088) | -0.028 (0.136) | -0.246 (0.175) | -0.286* (0.173) | -0.119 (0.098) |
| Num.Obs. | 75528 | 51086 | 25964 | 36825 | 141241 | 320039 |
| R2 Adj. | 0.620 | 0.325 | 0.163 | 0.156 | 0.217 | 0.529 |
| Mean Y | 1.633 | 5.82 | 8.234 | 9.503 | 9.356 | 6.873 |
| SD Y | 1.618 | 2.146 | 2.574 | 3.407 | 4.869 | 4.821 |

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Education: Placebo

School Type

| | Primary | Secondary | Higher |
|--------------------------|-------------------|-------------------|-------------------|
| is female = 1 x exposure | -0.006 (0.013) | -0.025 (0.018) | -0.019 (0.019) |
| is female = 0 x exposure | -0.017 (0.015) | -0.023 (0.015) | -0.011 (0.015) |
| Num.Obs. | 155556 | 155556 | 155556 |
| R2 Adj. | 0.155 | 0.148 | 0.124 |
| Mean Y | 0.785 | 0.397 | 0.24 |
| SD Y | 0.411 | 0.489 | 0.427 |

Education

Years of Education (30-50 y/o)

| | Lower Primary (30-35) | Upper Primary (36-39) | Lower Secondary (40-41) | Higher Secondary (42-44) | Higher Education (45-49) | All (30-49) |
|--------------------------|-----------------------|-----------------------|-------------------------|--------------------------|--------------------------|-------------------|
| is female = 1 x exposure | 0.145 (0.268) | 0.357 (0.303) | 0.448 (0.340) | -0.019 (0.307) | 0.151 (0.268) | 0.187 (0.221) |
| is female = 0 x exposure | -0.113 (0.199) | -0.232 (0.345) | -0.159 (0.342) | -0.489 (0.333) | -0.101 (0.269) | -0.196 (0.220) |
| Num.Obs. | 75215 | 34983 | 22840 | 22937 | 44109 | 200084 |
| R2 Adj. | 0.263 | 0.283 | 0.286 | 0.307 | 0.315 | 0.294 |
| Mean Y | 7.872 | 7.471 | 6.588 | 6.875 | 5.972 | 7.122 |
| SD Y | 5.276 | 5.313 | 5.39 | 5.395 | 5.353 | 5.379 |

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Education

Degree Obtained (30-40 y/o)

| | Primary | Primary | Secondary | Secondary | Higher | Higher |
|--------------------------|------------------|-------------------|------------------|-------------------|------------------|------------------|
| exposure | 0.002 (0.016) | | 0.005 (0.018) | | 0.007 (0.015) | |
| is female = 1 x exposure | | 0.025 (0.018) | | 0.015 (0.019) | | 0.007 (0.015) |
| is female = 0 x exposure | | -0.021 (0.019) | | -0.005 (0.019) | | 0.007 (0.016) |
| Num.Obs. | 108281 | 108281 | 108281 | 108281 | 108281 | 108281 |
| R2 Adj. | 0.225 | 0.225 | 0.152 | 0.152 | 0.120 | 0.120 |
| Mean Y | 0.636 | 0.636 | 0.253 | 0.253 | 0.155 | 0.155 |
| SD Y | 0.481 | 0.481 | 0.434 | 0.434 | 0.362 | 0.362 |

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Marriage: Placebo

| | Married (13-18) | Married (19-24) | Married (25-29) | Married (30-34) | Married (35-39) |
|--------------------------|-------------------|-------------------|-------------------|-------------------|------------------|
| is female = 1 x exposure | -0.010 (0.007) | 0.013 (0.019) | 0.000 (0.028) | 0.007 (0.016) | 0.004 (0.012) |
| is female = 0 x exposure | 0.010 (0.008) | 0.034* (0.019) | -0.010 (0.025) | -0.012 (0.019) | 0.004 (0.015) |
| Num.Obs. | 77640 | 70719 | 55370 | 46710 | 37048 |
| R2 Adj. | 0.068 | 0.271 | 0.181 | 0.066 | 0.027 |
| Mean Y | 0.042 | 0.392 | 0.754 | 0.916 | 0.962 |
| SD Y | 0.2 | 0.488 | 0.431 | 0.277 | 0.19 |

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Fertility: Placebo

| | # Children (15-18) | # Children (19-25) | # Children (26-30) | # Children (31-35) | # Children (36-40) | # Children (41-49) |
|----------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| exposure | -0.001 (0.006) | 0.027 (0.026) | 0.015 (0.058) | 0.122* (0.069) | 0.060 (0.068) | 0.009 (0.091) |
| Num.Obs. | 16897 | 46327 | 26309 | 21216 | 19943 | 27676 |
| R2 Adj. | 0.015 | 0.295 | 0.205 | 0.222 | 0.231 | 0.258 |
| Mean Y | 0.008 | 0.623 | 1.85 | 2.426 | 2.753 | 3.055 |
| SD Y | 0.094 | 0.906 | 1.22 | 1.326 | 1.465 | 1.644 |

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