Social influence in the adoption of mosquito bites preventive measures in Meghalaya, India

Exploring policy interventions through an empirical agent-based model

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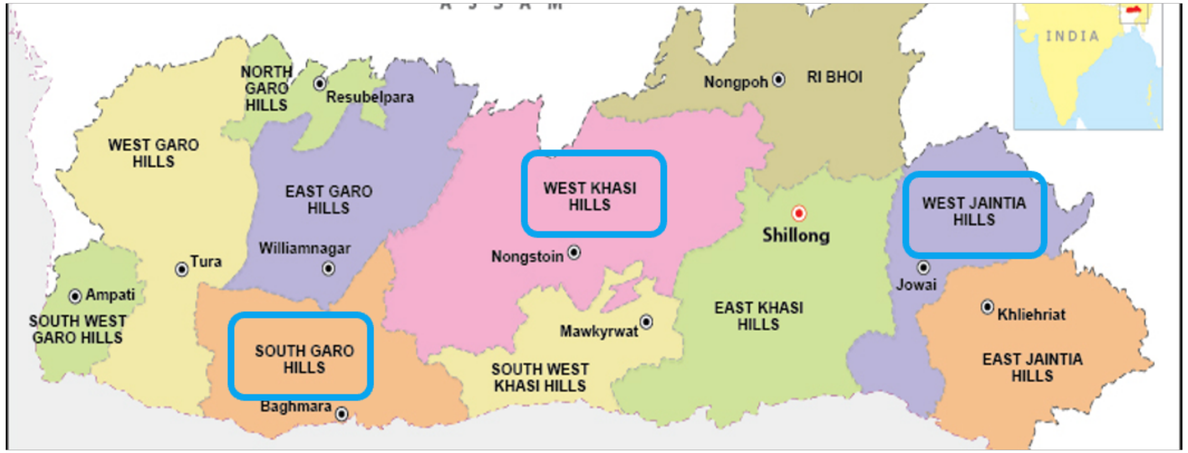
Malaria prevention in hard-to-reach populations

- WHO goal: eradicating malaria by 2030
- **Hard-to-reach populations** still face a high risk of infection —> policy needs to be designed in cooperation with local population
- **10 villages** in **Meghalaya, North-Eastern India** (mountainous area with patches of tropical forest)
- Hard-to-reach tribal population (Garo and Khasi-Jaintia): geographical **marginalization**, low socio-economic status, **poor access to health care**, resistance to instituzionaled health practices because of cultural/religious beliefs



Preventive measures

- Measures of **indoor biting** prevention are highly adopted
- **Low adoption of outdoor biting prevention measures** (spray, body cream, boots, special clothing)

Inside vs outside biting preventive measures: no strikingly visible pattern

Mawlan village (network main component)

individuals (nodes) = 98

positive ties = 272

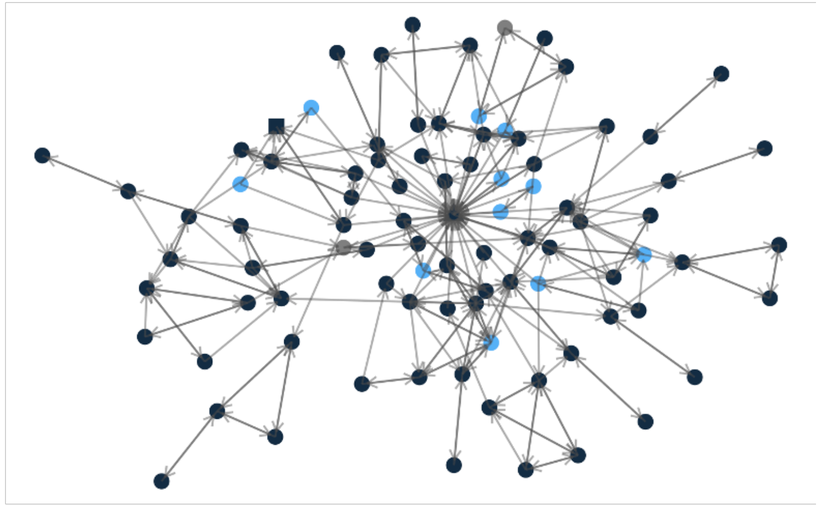
positive ties = 27

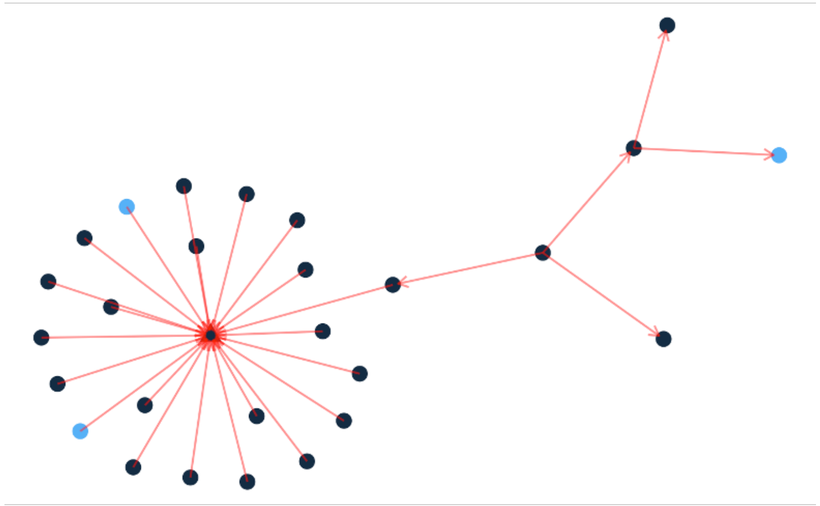
avg. degree (positive ties) = 2.78

avg. degree (negative ties) = 0.28

adoption rate bednets = 95.10%

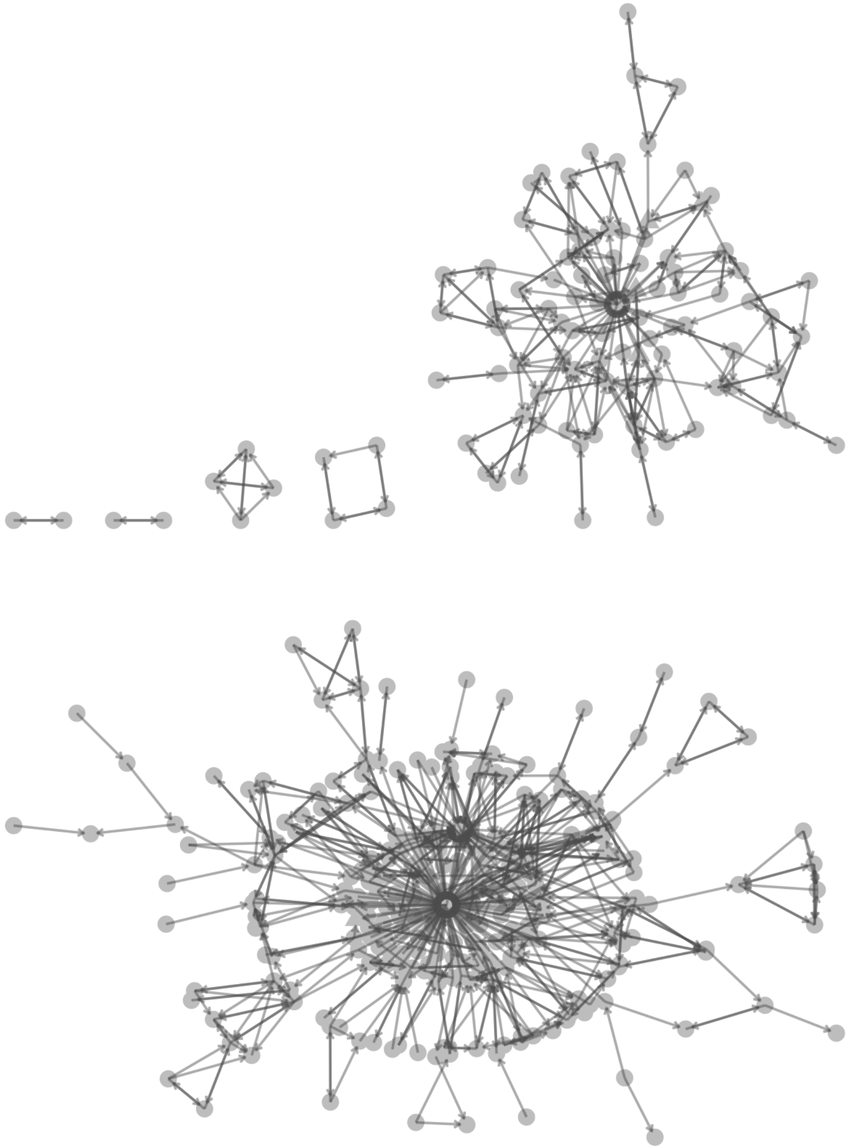
adoption rate cream = 12.75%





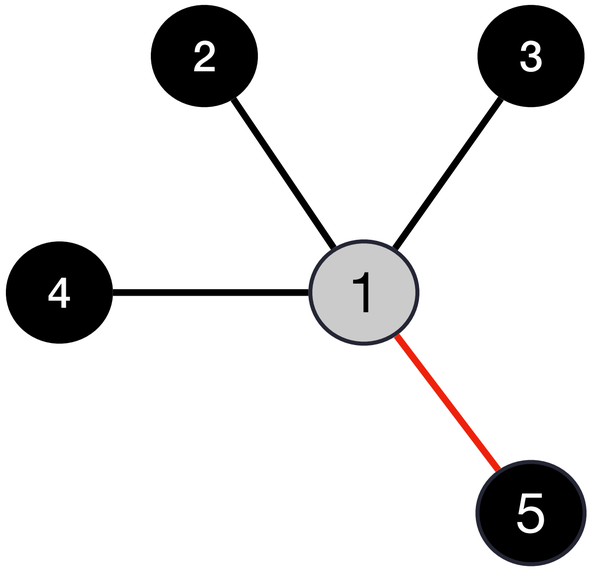
Data

- **Full-network** design - **cross-sectional** data
- Data collection: 2020 - 2021 through face-to-face questionnaire administration
- 10 villages selected because of availability of register data and small enough to ensure high respondent ratio
- Networks:
  - **Whom they talk to about health**
  - **Whom they avoid to talk to about health**
- Behaviour: **which prevention measures they adopted**
- Socio-demographic characteristics
- **ASHA** (Accredited Social Health Activist) + **traditional healer**



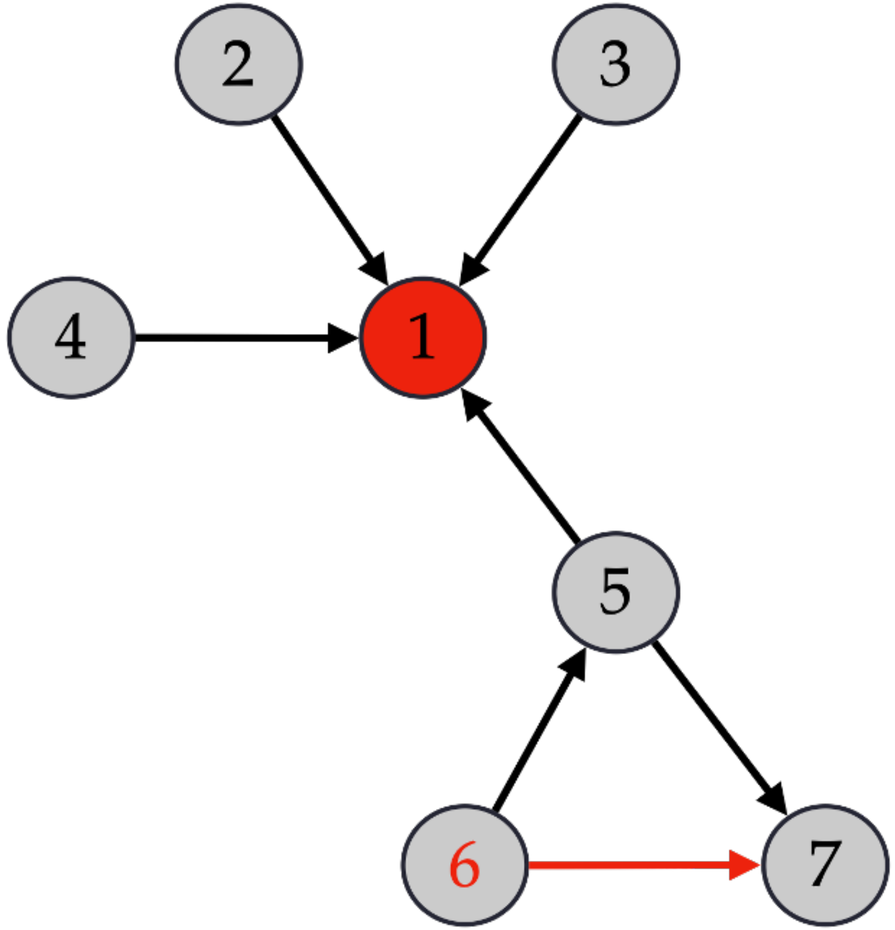
Social influence and complex contagion

- Diffusion of outdoor prevention measures requires individuals changing behaviours easily observable by others in small communities
- Sort of diffusion that requires **strong reinforcement by strong ties** (complex rather simple contagion)
- Threshold-based influence effect
- **Negative influence** through negative ties
- Role of '**stubborn agents**' like ASHA or traditional healer (Mobilia 2003)



Agent-based model estimating hidden behaviour

- Agent-based model (Gilbert, 2008; Squazzoni, 2012; Hedström & Manzo, 2015): computational dynamic model of the diffusion process in the empirically-observed networks (Bianchi & Renzini, *forthcoming*)
- ABM models individuals' adoption of preventive measure (binary choice) as a logistic objective function of local network properties
- **Estimating**:
  - **threshold levels** for adoption contagion
  - impact of **negative influence** (= adoption by negative contacts)
- Assuming:
  - positive impact of within-household adoption
  - ASHA and traditional healers as 'zealots'
- **Aim**: fitting the observed adoption rate by simulating the hypothesised processes within the empirical network
- Method: genetic algorithm searching parameter vector minimising distance between observed and simulated adoption rate



(preliminary) Results

Process	Estimated parameter
Threshold for contagion	3
Threshold-based contagion	0.811
Negative influence	-1.176
(baseline)	-2.788
Adoption by most household members	0.704
Positive tie to ASHA	1.388
Positive to healer	-0.877

Simulation-based policy testing

- Explaining diffusion is not enough
- We need to test policy interventions in a way that is both
  - Practically feasible
  - Ethically acceptable
- Which nodes are the most efficient to be targeted to maximise overall adoption?
- How would adoption change if ASHA or the traditional healer had different network positions?

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