

# Reframing and unpacking 'irrational' antibiotic use

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# Executive Summary

The overuse of antibiotics is often deemed as an "irrational" practice that limits the effectiveness of antibiotics by contributing to antimicrobial resistance (AMR), especially in emerging economies or low-and-middle-income countries such as India. One multi-country study from low-income and lower-middle-income countries (LMICs) found that children received an average of 25 antibiotic prescriptions in the first five years of life. However, care seeking behavior is often governed by structural factors and socio-ecological environments that are not adequately accounted for in the discourse around AMR. My thesis explores the social and structural forces influencing prescription and consumption behavior in LMICs like India, and critically examines behavioral, structural, and policy interventions to address antibiotic misuse in India.

Chapters 1 and 2 examine findings from a mixed-methods knowledge, attitudes, and practices study that explores provider perceptions governing antibiotic use in a district in West Bengal. Doctors scored highest in questions assessing knowledge (77.3%) and attitudes (87.3%), but performed poorly in practices (67.6%), indicating a clear gap between knowledge and practice. Many doctors knew that antibiotics were not indicated for viral infections, but over 87% (n = 82) reported prescribing them in this situation. Nurses, pharmacy shopkeepers, and informal providers were more likely to perform poorly on the survey compared to allopathic doctors (OR: 10.4, 95% CI 5.4, 20.0,  $p < 0.01$ ). The role of pharmaceutical company representatives as a source of knowledge was particularly salient as 30.8% (n = 118) of all providers reported relying on these representatives as a major source of information about antibiotics.

Key informant interviews and qualitative findings in Chapter 2 further explained individual behavioral motivations behind some of these prescription practices. Among allopathic providers, inconsistent follow up, lack of testing facilities, risk of secondary infections, and unhygienic living conditions have a major influence on the decision to antibiotics. Pharmaceutical company representatives actively network with informal health providers and formal healthcare providers alike, and regularly visit providers even in remote areas to market newer antibiotics. Allopathic doctors and informal health providers frequently blame the other party for being responsible for antibiotic resistance, and yet both display interdependence in referring patients to one another.

Chapter 3 is a systematic review of the current evidence landscape on interventions to influence antibiotic prescriptions by health professions in outpatient settings within low-and-middle-income and lower-middle-income countries. Behavioral interventions were classified as persuasive, enabling, restrictive, structural, or bundle (mix of different interventions). In total, 3,514 abstracts were screened and 42 studies were selected for full-text review, with 13 studies included in the final narrative synthesis. Our review found that enabling or educational interventions alone may not be sufficient to overcome the ingrained incentives to link revenue generation to sales of antibiotics, and hence, inappropriate prescription or misuse of antibiotics. Multi-faceted, bundle interventions, in contrast, appear to be very effective at changing prescription behavior among healthcare providers, including drug sellers or pharmacists.

Chapter 4 outlines the results of a qualitative study with 23 semi-structured, in-depth interviews with a variety of key informants with diverse backgrounds in academia, non-government organizations, policy, advocacy, pharmacy, medicine, and others. The goal was to complement the systematic review and assess the use and effectiveness of policy or behavioral interventions. Data were charted into a framework matrix and analyzed using a hybrid, inductive and deductive thematic analysis according to the socio-ecological model. As outlined in chapter 3, there was a similar recognition by key informants from all backgrounds that educational interventions targeting individual or interpersonal interactions were largely ineffective, and policy interventions needed to incorporate behavioral nudge interventions, improve the healthcare infrastructure and embrace task shifting to rectify staffing disparities in rural areas. Key informants also expressed a need to adopt a hub-and-spoke model to target informal providers via existing networks with formal providers and pharmaceutical company representatives, incorporate smart regulation for antibiotic use, and leverage pharmaceutical companies in decoupling sales and incentives.

Finally, chapter 5 takes a deeper dive into the national action plan to combat AMR in India. While the NAP-AMR successfully mirrors the Global Action Plan and lays out ambitious goals, the lack of financial allocations across states, poor enforcement, and inadequate multi-sectoral coordination have hampered progress. The central government should emulate the successes of the Kerala State Action Plan in promoting a One Health approach and effectively coordinating between public and private sector actors to implement antibiotic stewardship initiatives.