Determining the Drivers of Antibiotic Resistance in Poultry, India
... and other bilateral, cross-disciplinary research projects
2018-2021
Bringing social science into AMR research
Socioecological System (SES) approach to AMR
Planetary Health

“Put simply, planetary health is the health of human civilization and the state of the natural systems on which it depends.”

Planetary Health

Human Health

+ 
Environmental Health

+ 
PESTLE

(Cole and Bickersteth, 2018)
Antimicrobial resistance

700,000 annual deaths; 10 million by 2050
Globally, 3.8% of GDP lost annually by 2050
Global annual cost in 2050: $100 trillion
Biggest impact in LMICs
Antimicrobial resistance

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Biggest impact in LMICs
Little (financial) incentive for pharma to act
4 projects under one (sandpit) call

**DARPI** (intensive, modern poultry farming)
**Chicken & Egg** (Small farms/communities)
**SMART** (policy landscape/opportunities)
**DOSA** (diagnostic tools; co-design)

*Staff crossover between projects (most staff on two; some on three)*
UK – Partners – India
Understand the Problem Space

- AMR is known to be a problem
- India has 2nd largest poultry production industry in the world
- Fastest growing agrarian industry
- 70-75% (both of layer and broiler) production in Southern States (AP, TS, KA, TN, MH).
- Comprehensive interdisciplinary perspectives of AMR.
- Methodologies to reflect community level practices and provide robust data on the scope of AMR and behavioural practices that drive it.
Multi-discipline

Why are antibiotics used?
- Anthropology
- Human geography
- Service design
- Economics

What do they do?
- Microbiology
- Veterinary science
- Animal science
- Economics

What would be the result of different approaches?
- Microbiology
- Epidemiology
- Policy
- Economics
- Community dynamics
Weaving in the social science

• Participatory rural action (PRA) and rapid ethnographic assessments
• Participatory design tools for co-design
• Make visible practices that contribute to AMR
• Apply and synthesize qualitative and quantitative AMR data to provide a rich narrative of the poultry journey map

3x locations in 15 farms involving 3x sets of monitoring of the poultry service journey; local researchers, farm workers and community members collect data
Animal Farms & Human Hospitals
(Composite – multi species – farming system)

Social survey for antibiotic use: Farmers, Vets & others

Sample collection & Analysis

Animal & farm environment
- Residue analysis
- AMR Phenotypes & Genotypes

Foods
- Residue analysis
- AMR Phenotypes & Genotypes

Human & hospital environment
- Residue analysis
- AMR Phenotypes & Genotypes

CORRELATION

Whole genome analysis of AMR pathogens & phylogenetic analysis

Epidemiological analysis

Identified Pathways & decide interventions

Social Science - Take it to farmers
Impact

• Establish flow maps of AMR through the poultry food chain, identifying key points where interventions will be most cost effective for industry, consumers and the community.

• Inform policy makers on best practice to rationalise AB use in the poultry food chain in order to inform government investment in interventions.

• Co-develop effective and feasible interventions to enable poultry to better manage AB use.

• Build capability and capacity with regards to managing AMR in the poultry food chain.

• Build capability and capacity in onsite sampling, monitoring and surveillance of AMR.
ANTIBIOTIC RESISTANCE
Will Kill More People Than Cancer and Diabetes Combined By 2050

How Resistance Develops and Spreads

80% of all antibiotics are given to livestock, mostly to speed their growth and prevent diseases.

Fertilizing with antibiotic resistant manure

Manure encourages the proliferation of antibiotic resistant bacteria when applied as a fertilizer in agriculture.

50% of all antibiotics given to humans are prescribed unnecessarily or used inappropriately.

Consumption of livestock and grain treated with multi-use antibiotics significantly increases the spread of resistance in bacteria.
Reduce antibiotics in livestock

Public health: reduce AMR
Cobenefit: Healthier diets

Environment: reduce GHGs, prevent eutrophication, improve soil quality
Water, Sanitation & Hygiene (WaSH)

- Health Equity
- Food systems
- Human health
  - Reduce AMR
  - Healthier people
  - Healthier diets
- Animal welfare
  - Less crowded conditions
  - More hygienic conditions
- GHGs
  - Better Waste management
  - Less methane
UK Five Year AMR Strategy

Human health/Pharmaceutical industry
Animal health/Farming industry/Vets
Food Systems/Agriculture
Environmental protection
Academia

and security
UK Five Year AMR Strategy

Human health/Pharmaceutical industry
Animal health/Farming industry/Vets
Food Systems/Agriculture
Environmental protection
Academia

... and security
UN IACG AMR
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