Measuring farm-level antimicrobial use in low- and middle-income countries as part of implementation research projects

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ICARS — INTERNATIONAL CENTRE FOR **ANTIMICROBIAL RESISTANCE** SOLUTIONS

AACTING
Herd level antimicrobial consumption in animals
Collect | Analyze | Benchmark | Communicate

ICARS is...

- An international organisation working in partnership with governments in LMICs to develop and test context-specific solutions for AMR.

- Providing funding and expertise across the One Health sector.

- Danish-initiated (2018), now an independent self-governed organisation (2021), attracting funding from member states as well as foundations.

Our mission is to partner with LMIC ministries and research institutions to co-develop and test cost-effective, context-specific AMR solutions with potential for scale-up, building on National Action Plans, and informed by intervention and implementation research.

Why is implementation research important?

- Examines how to ensure interventions lead to their expected effect

- Improves delivery, quality and effectiveness of health services

- Considers contextual factors that impact intervention success and uptake
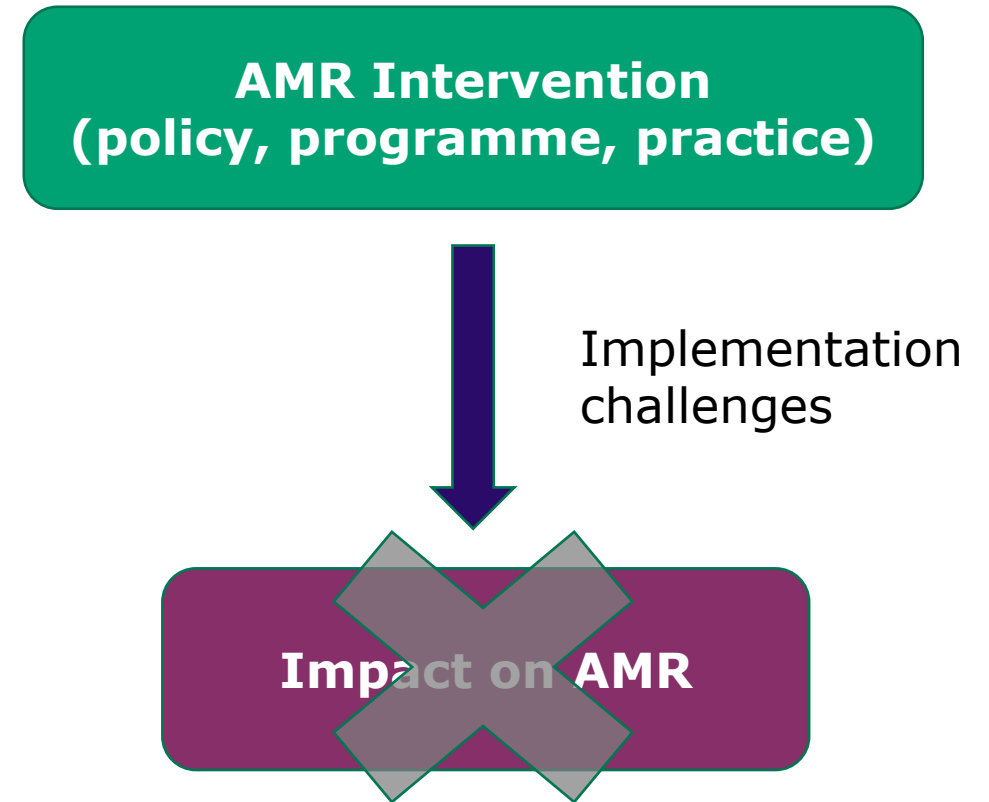
**AMR Intervention
(policy, programme, practice)**

Implementation challenges

Impact on AMR

[1]Peters DH, et al. *BMJ* 2013; **347:** f6753.
[2]Bauer MS et al. *BMC* Psych 2015; *3*(1), 32.
https://www.tdrmooc.org/courses/course-v1:TDR+IR102+Aug_2020/course/

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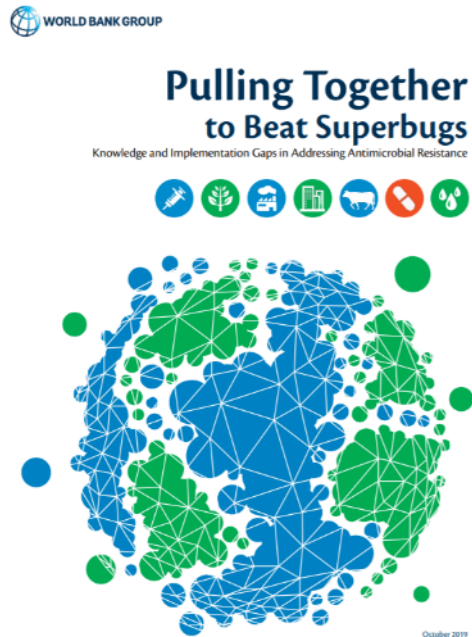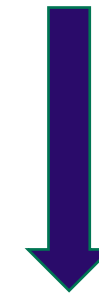
> Efforts to address AMR… have been complicated and are compromised by the low level of implementation, the fragmentation of interventions… There is an urgent need to address these knowledge and implementation gaps.[1]

WORLD BANK GROUP

Pulling Together to Beat Superbugs
Knowledge and Implementation Gaps in Addressing Antimicrobial Resistance

October 2019

AMR Intervention (policy, programme, practice)

Implementation solutions

Impact on AMR

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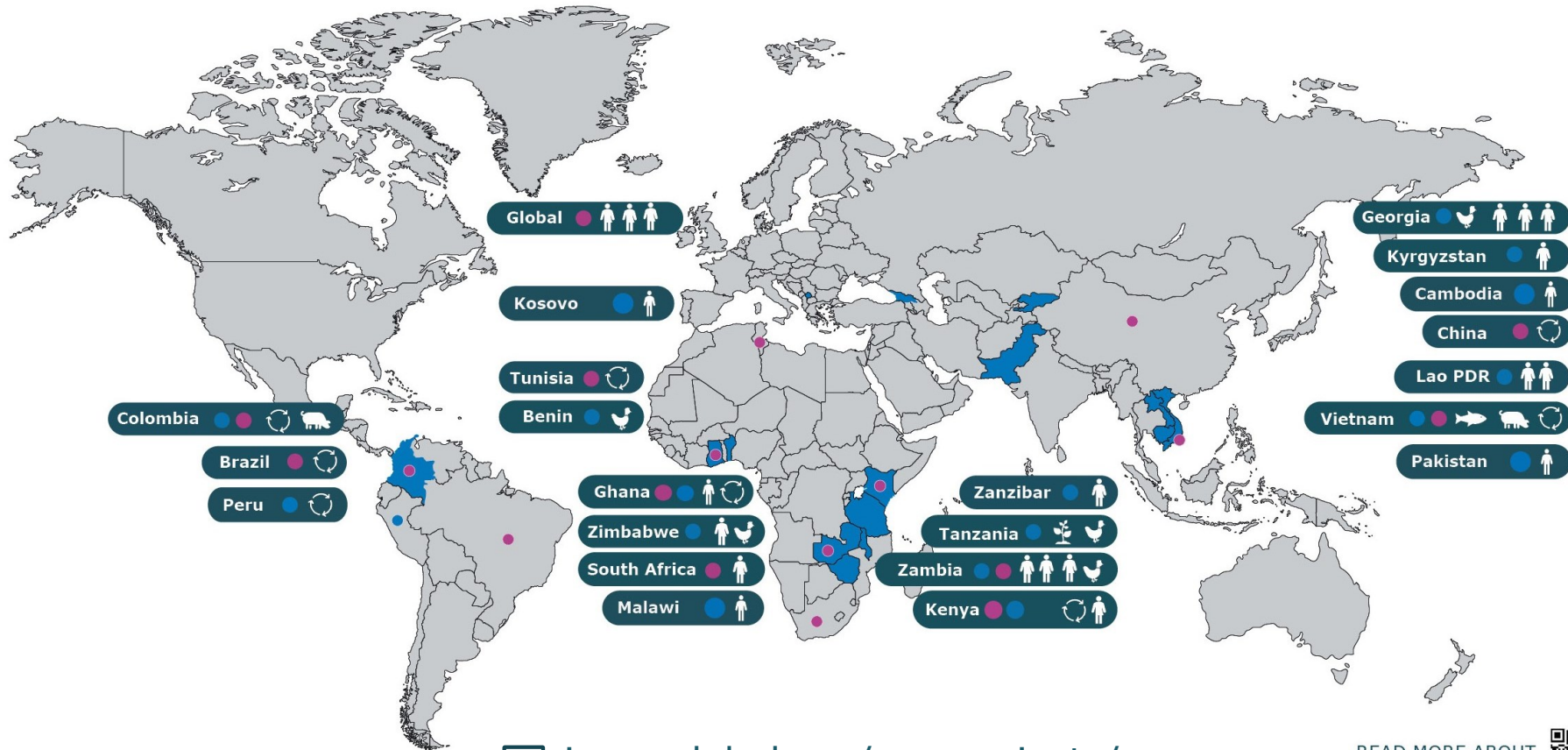https://www.tdrmooc.org/courses/course-v1:TDR+IR102+Aug_2020/course/

41 Projects

21 Countries & territories

ICARS-funded
Co-developed between ICARS and LMIC ministries to tackle a specific AMR challenge and contribute to NAP implementation.

Co-funded
Developed with funding partners and local research institutes to generate evidence and advance AMR mitigation nationally and globally.

One Health
Environment
Animal
Human
Aquaculture

ICARS

Global
Kosovo
Tunisia
Benin
Colombia
Brazil
Peru
Ghana
Zimbabwe
South Africa
Malawi
Zanzibar
Tanzania
Zambia
Kenya
Georgia
Kyrgyzstan
Cambodia
China
Lao PDR
Vietnam
Pakistan

🖥 icars-global.org/our-projects/

READ MORE ABOUT THE PROJECTS

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Georgia: Getting prepared for a ban of antimicrobial growth promoters (AGPs)

Context	Using AGPs is the norm in large commercial broiler farms. The government is preparing a ban on AGPs.
Research question	Can farmers maintain profitability without using AGPs, if they also improve their practices? Which practices? What are drivers and barriers for changing these practices?
Partners	Ministry of Environmental Protection and Agriculture State Laboratory of Agriculture Farmers, veterinarians, economists, social scientists
Main study design	Randomized controlled trial

Zimbabwe & Zambia: Farmer Field Schools (FFS) to reduce antimicrobial use

Context	Inadequate biosecurity and non-prudent AMU in small to medium scale broiler farms. Frequent presence of antimicrobial residues in meat.
Research questions	Do farmers attending FFS improve their biosecurity, reduce AMU and meat residues? Is it a sustainable solution? Should it be scaled up and, if yes, how?
Partners	Departments of Veterinary Services Universities Medicines Control Agencies Farmers, veterinarians, economists, social scientists FAO
Main study design	Before / after

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Tanzania: Optimizing vaccination and biosecurity in poultry production

Context	High AMU Limited use of bacterial vaccines Sub-optimal biosecurity in small/medium poultry farms
Research questions	How can bacterial vaccination and biosecurity be optimised? What are the current challenges for viral vaccine effectiveness on farms?
Partners	Tanzanian Ministry of Livestock and Fisheries Sokoine University of Agriculture Ministry of Agriculture Irrigation, Natural Resources and Livestock in Zanzibar Zanzibar Livestock Research Institute
Main study design	Cluster randomized controlled trial

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What do we measure?

- **Antimicrobial use**

- Knowledge, attitudes and practices

- Production parameters

- Biosecurity scores

- Antimicrobial residues

- Costs, investments, benefits

- Behaviour change

- AMR

- Vaccine implementation

Different contexts, challenges and solutions

Georgia

Zimbabwe

Challenges encountered (1)

- Limited expertise/experience in farm-level AMU data collection and analysis

- Scarcity of baseline AMU data to support sample size calculations

- A potentially high proportion of farmers might leave the study before the end of it

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Case example: Zimbabwe

- The aim is to observe a 30% reduction in AMU

- Need to be able to measure a 20% reduction

- Paired sample size calculation

- **No previous AMU estimate** in poultry in Zimbabwe
  - Study found in Nigeria (Jibril. *et al.*, 2021)
    - mean of 28 mg/kg/week
    - SD calculated at 14.36 mg/Kg/week

- Correlation between pre and post measurements: 0.3
  - ➜ 73 farmers needed

- **Risk of up to 50% reduction in farmer attendance**
  - ➜ 150 farmers to enroll

Association between antimicrobial usage and resistance in Salmonella from poultry farms in Nigeria

Abdurrahman Hassan Jibril [1] [2], Iruka N Okeke [3], Anders Dalsgaard [1] [4], John Elmerdahl Olsen [5]

Affiliations + expand

ICARS

Challenges encountered (2)

- Poor farmer knowledge on antimicrobials

- Resource-intensive, logistical challenges

- Inconsistent record keeping, requiring a close follow-up at farm level

- Use of substandard and falsified drugs

- Frequent sale and use of antimicrobials without prescriptions

- Absent or inaccurate feed labels on antimicrobial content

- Sale of animals at different ages throughout the production cycles
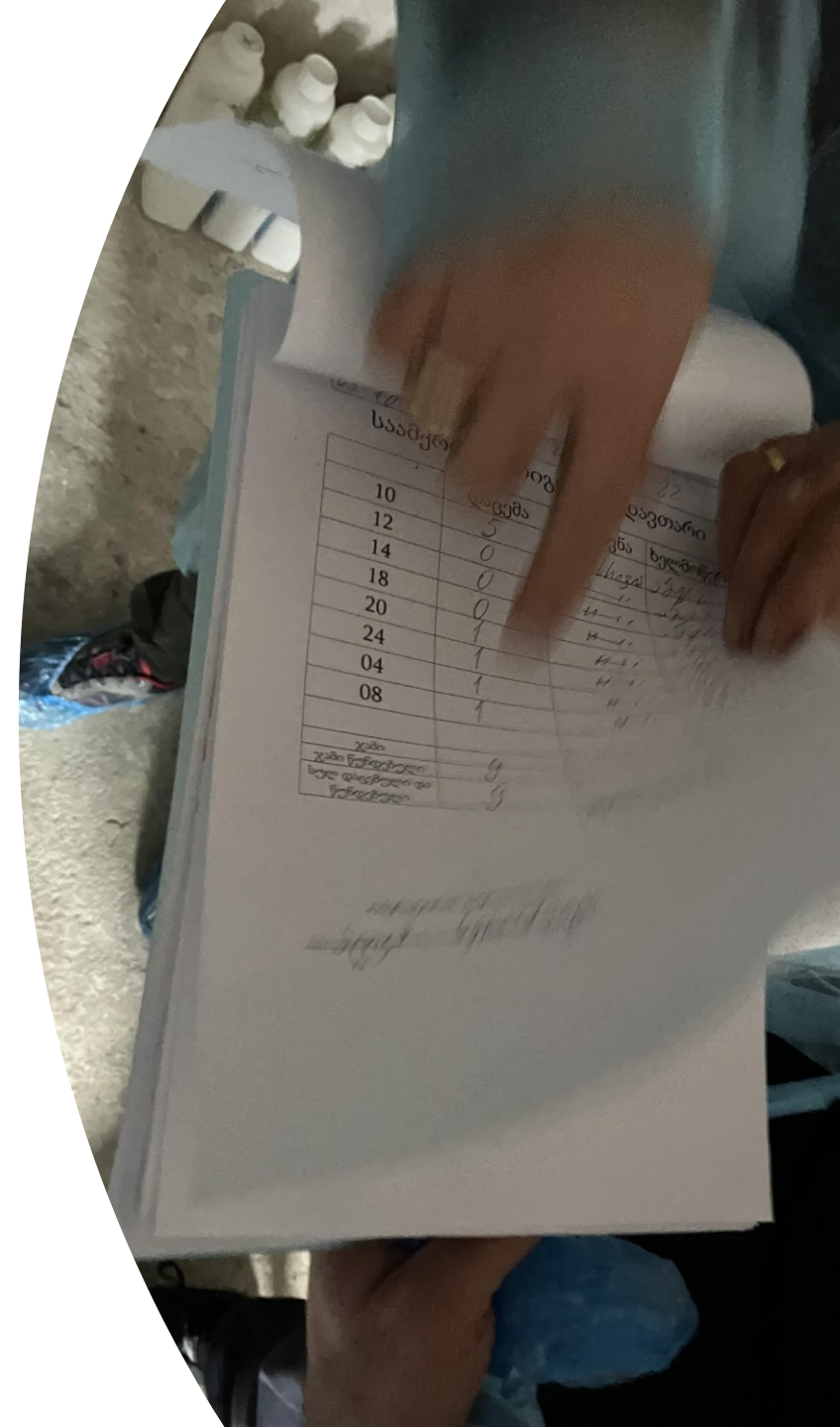
Solutions proposed

- Work with local teams who know the context
  - "Farmers will use the antibiotic bins for something else"
  - "There is a fasting period before Easter, so chicken production will decrease at that time"

- Capacity building / technical support

- Keep protocols simple, collect only the necessary data

- Test feed for antibiotic presence (qualitatively / quantitatively)

- Adapt the AMU indicator to available data sources

- Pilot-test protocols

Conclusion

- AMU is an essential outcome variable of implementation research projects

- Multiple factors challenge AMU data quantification in farms in LMICs

- Need for a solid understanding of the context

- Some solutions applicable for research studies but not monitoring systems

- ICARS-supported projects to fill important knowledge gaps on AMU in LMICs

Thank you for your attention!

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