



Mitigating AMR-related Mortality and Morbidity in Lao PDR through Enhanced Awareness and Education of the Public and Health Care Providers in both Human and Animal Health Sectors

Formative Evidence Brief for Policy from the RADAAR Initiative



Fondation
Mérieux

 **UK International
Development**
Partnership | Progress | Prosperity

 **The
Fleming Fund**
Regional Grants

 **International
Vaccine
Institute**

Formative Evidence Brief for Policy

Mitigating AMR-related Mortality and Morbidity in Lao PDR through Enhanced Awareness and Education of the Public and Health Care Providers in both Human and Animal Health Sectors

Suggested Citation

Formative Evidence Brief for Policy: Mitigating AMR-related Mortality and Morbidity in Lao PDR through Enhanced Awareness and Education of the Public and Health Care Providers in both Human and Animal Health Sectors. Ministry of Health, Government of the Lao People's Democratic and the RADAAR Project, International Vaccine Institute (IVI), Republic of Korea. 2025

© 2025 Ministry of Health, Government of the Lao People's Democratic and the RADAAR Project, International Vaccine Institute (IVI), Republic of Korea.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means - electronic, mechanical, photocopying, recording, or otherwise - without the prior written permission of the copyright holders.

General Disclaimer

This Formative Evidence Brief for Policy (EBP) is intended for informational and policy guidance purposes only. The views expressed herein are those of the authors and do not necessarily reflect the official policy or position of the Ministry of Health, Government of the Lao People's Democratic, the RADAAR Project, or the International Vaccine Institute (IVI). While every effort has been made to ensure the accuracy of the information presented, the authors and publishers accept no liability for any consequences arising from its use. Readers are advised to consult relevant experts and official sources before making decisions based on this brief.

CONTENTS

CONTRIBUTORS AND ACKNOWLEDGEMENT	iv
Authors, Contributors, and Funding	iv
Acknowledgements, and peer review	v
ABBREVIATIONS AND ACRONYMS	vi
EXECUTIVE SUMMARY	vii
1. DESCRIPTION OF THE PROBLEM	1
Problem statement	1
Consequences of inaction	3
2. POLICY OPTIONS TO ADDRESS THE PROBLEM	7
Option 1. Strengthening enforcement of existing AMR-related laws and guidelines (AMR National Strategic Plan, Food and Drug Law, treatment policies, drug decree, essential medicines list, and veterinary/food-safety regulations) to ensure antibiotics are used only with valid prescriptions	7
Option 2. Enhancing public awareness interventions on AMR through existing media platforms and targeted campaigns for the general population, farmers and health-care professionals	9
Option 3. Developing an interprofessional curriculum on antimicrobial resistance	12
3. IMPLEMENTATION CONSIDERATIONS	14
REFERENCES	17
ANNEXES	I
Annex 1: DOCUMENTATION OF SEARCH STRATEGY: PROBLEM STATEMENT	I
Annex 2: DOCUMENTATION OF SEARCH STRATEGY: POLICY OPTIONS AND IMPLEMENTATION CONSIDERATIONS	II

LIST OF TABLES AND FIGURES

Table 1: Underlying causes of the problem..... 4

Table 2: Summary of key findings from reviews and primary studies relevant to policy option 1 ... 7

Table 3: Summary of key findings from reviews and primary studies relevant to policy option 2 ... 9

Table 4: Summary of key findings from reviews and primary studies relevant to policy option 3 . 12

Table 5: Barriers to policy options and corresponding counter strategies 14

Fig. 1. The number of deaths due to Global Burden of Disease in 2019, Lao PDR1

CONTRIBUTORS AND ACKNOWLEDGEMENT

Authors

- Dr Phonevixay VILAYLANGSY, Technical Officer at Department of Communicable Disease Control (DCDC)
- Dr Davone DUANGDANY, Chief of Drug and Medical Devices Division at Food and Drug Department (FDD)
- Dr Kongchack PHOMMACHACK, Technical Officer at Food and Drug Department
- Dr Phoumsavath OUNNAVONG, Technical Officer at Department of Health and Rehabilitation (DHR)
- Dr Souphatsone HOUATTHONGKHAM, Deputy Chief of Laboratory Session at National Center for Laboratory and Epidemiology (NCLE)
- Dr Khambai NOILATH, Laboratory Technician at National Center for Laboratory and Epidemiology (NCLE)
- Mrs Vilayvanh SOUKVILAY, Director of Quality Assurance Division at Department of Livestock and Fisheries (DLF)
- Dr Somphaivanh CHANTHAVONG, Deputy Director of National Animal Health Laboratory (NAHL)
- Dr Loungnilanh MANIVANH, Deputy Director of Laboratory at Setthathirath hospital
- Dr Anousone RASAPHONH, Paediatrician at Setthathirath hospital

Contributors

- Dr Phonepadith SANGXAYARATH, Director General of DCDC
- Dr Bounxou KEOHAVONG, Director General of FDD
- Dr Viengsakhone LUANGPADITH, Deputy Director General of DHR
- Dr Bouaphanh KHAMPHAPHONGPHANH, Director of NCLE
- Dr Boualay NORCHALEUN, Deputy Director of NCLE
- Mr Souphavanh KEOVILAY, Deputy Director General of DLF
- Dr Phouvong PHOMMACHANH, Director of NAHL
- Dr Khamla SYOUDOM, Deputy Director of Sethathirath Hospital

Funding

This evidence brief for policy and training workshops to support its preparation were funded by the UK Fleming Fund under the Phase II grant, in partnership with its regional grantee – Regional AMR Data Analysis for Advocacy, Response and policy (RADAAR), International Vaccine Institute (IVI), Republic of Korea.

Conflicts of interest

The authors and the funder declare that they have no professional or commercial interests related to any information, product or statement related to this brief evidence.

Acknowledgements

The authors would like to express their gratitude to the Department of Communicable Disease Control under Ministry of Health, for the approval to develop this evidence brief and for their valuable guidance in their role as the steering committee. They would also like to thank the following:

- **Knowledge to Policy (K2P) Center:** Professor Fadi El-Jardali (American University of Beirut, Founder and Director of the Knowledge to Policy (K2P) Center), for capacity building and mentoring the authors in preparing this evidence brief for policy, sharing his experience and providing feedback throughout the development of the brief.
- **RADAAR-IVI:** Satyajit Sarkar, Anthony Burnett and Prerana Parajulee, RADAAR project, Policy and Economic Research Department, IVI), for the support they provided in training and capacity-building.
- **Fondation Merieux team-Lao PDR:** Dr Rattanaxay Phetsouvanh, Dr David Raminashvili, Mr Thongchanh Landsy, Dr May Soe Thwe, Dr Boualapha Chanthilath for providing support in developing this evidence brief in close collaboration with the in-country authors.

Editorial and design

- Bandana Malhotra, Consultant, IVI | Independent Scientific Writer/Editor, Bangalore, India
- Jaehee Hwang, Workshops and Webinars Coordinator, Policy and Economic Research Department, EPIC Unit, IVI, Republic of Korea
- Sujung Kim, Consultant, Global Affairs and Communication Unit, IVI, Republic of Korea

Peer review

This EBP was reviewed by the following group of international researchers and subject experts to ensure its scientific rigour and relevance for the health system:

- Fadi El-Jardali, Professor of Health Policy and Systems, Founder and Director of Knowledge to Policy Center, American University of Beirut
- Satyajit Sarkar, Research Scientist (AMR Policy & Advocacy), Project Coordinator & Project Technical lead (RADAAR), IVI, Republic of Korea
- Prerana Parajulee, Researcher, Policy and Economic Research Department, EPIC Unit, IVI, Republic of Korea
- Emmanuel Eraly, Consultant, Antimicrobial Resistance Department, IVI, Hanoi, Viet Nam
- Sajan Gunarathna, Associate Researcher, Policy and Economic Research Department, EPIC Unit, IVI, Republic of Korea

ABBREVIATIONS AND ACRONYMS

AMR – antimicrobial resistance

FAO – Food and Agricultural Organization

FMx – Fondation Mérieux

GBD – Global Burden of Disease

GDP – gross domestic product

HCP – health-care provider

HCW – health-care worker

IPC – infection prevention and control

KAP – knowledge, attitude and practice

LMICs – low- and middle-income countries

LOMWRU – Lao-Oxford Mahosot Wellcome Trust Research Unit

NASCC – National Antimicrobial Surveillance Coordination Committee

OOP – out of pocket

OTC – over the counter

RADAAR – Regional AMR Data Analysis for Advocacy, Response, and Policy

WAAW – World Antimicrobial Awareness Week

WHO – World Health Organization

EXECUTIVE SUMMARY

The problem

Antimicrobial resistance (AMR) poses a serious and escalating public health threat in Lao People's Democratic Republic (Lao PDR), with mortality rates among the highest in South-East Asia. Inappropriate antibiotic use in both the human and animal sectors is a key driver. In the human health sector, antibiotics are frequently dispensed without prescriptions, and self-medication is common due to easy over-the-counter access. Many health-care providers prescribe antibiotics inappropriately, with poor adherence to treatment guidelines and limited awareness of their role in resistance. In the animal health sector, farmers routinely mix antibiotics into animal feed without veterinary oversight, responding to the growing demand for meat production. These behaviours contribute to the spread of resistant pathogens between humans, animals and the environment.

Public understanding of AMR remains low, with widespread misconceptions that antibiotics can treat viral infections such as colds and flu. Studies reveal that both the public and health-care professionals lack adequate knowledge about the causes and consequences of resistance, leading to misuse and incomplete treatment courses. Previous awareness campaigns, including the World Antimicrobial Awareness Week (WAAW), have increased visibility but had limited behavioral impact due to inconsistent messaging, poor contextual adaptation and weak follow-up mechanisms. Awareness interventions have largely reached only small, privileged groups, leaving rural and low-literacy communities underserved and perpetuating misinformation about antibiotic use.

The underlying causes of AMR misuse are rooted in weak governance, fragmented coordination among ministries, and insufficient financial and technical resources. Despite the existence of a National Strategic Plan on AMR (2026–2030), implementation is constrained by limited domestic funding and dependence on external partners. The lack of an integrated One Health surveillance system, minimal data on public knowledge, and absence of standardized monitoring tools hinder evidence-based policy action. Awareness and education programmes are sporadic, short-term and project-based rather than sustained national efforts. Without improved intersectoral coordination, adequate budget allocation and continuous evaluation, AMR awareness initiatives will struggle to achieve meaningful and lasting behavioural change.

Policy options to address the problem

To address the problems outlined above, three viable policy options were chosen. These three options may be implemented in combination or individually.

Policy option 1:

Strengthening enforcement of existing AMR-related laws and guidelines (AMR National Strategic Plan, Food and Drug Law, treatment policies, drug decree, essential medicines list, and veterinary/food-safety regulations) to ensure antibiotics are used only with valid prescriptions

Policy option 2:

Enhancing public awareness interventions on AMR through existing media platforms and targeted campaigns for the general population, farmers and health-care professionals

Policy option 3:

Developing an interprofessional curriculum on antimicrobial resistance

Implementation considerations

Effective implementation of awareness and education on AMR in Lao PDR requires addressing barriers at multiple levels. At the community level, low engagement, limited literacy and reliance on over the counter (OTC) antibiotics necessitate culturally tailored communication strategies and expanded veterinary outreach. Among professionals, the absence of targeted training and strong pharmaceutical marketing calls for standardized curricula, nationwide AMR training and stricter regulation of drug promotion. Organizational challenges such as insufficient government funding and weak intersectoral coordination can be mitigated through advocacy workshops, integration of ministries and leveraging donor support. At the system level, the lack of nationwide awareness programmes and monitoring tools demands the development of knowledge, attitude and practice (KAP) evaluation mechanisms, improved communication channels, and strengthened enforcement of coordination frameworks under a One Health approach. These counterstrategies, combined with sustained financial commitment and stakeholder collaboration, are essential for long-term impact.

1. DESCRIPTION OF THE PROBLEM

Problem statement

In the People's Democratic Republic (Lao PDR), there were 838 deaths attributable to AMR and 3810 deaths associated with AMR in 2021. The number of deaths due to AMR in Lao PDR is higher than deaths from diabetes and kidney diseases, maternal and neonatal disorders, chronic respiratory diseases, digestive diseases and other noncommunicable diseases (Fig. 1). Lao PDR has the 65th highest age-standardized mortality rate per 100 000 population associated with AMR across 204 countries (1). In the Global Burden of Disease (GBD) region of South-East Asia, Lao PDR has the third-highest age-standardized mortality across 13 countries.

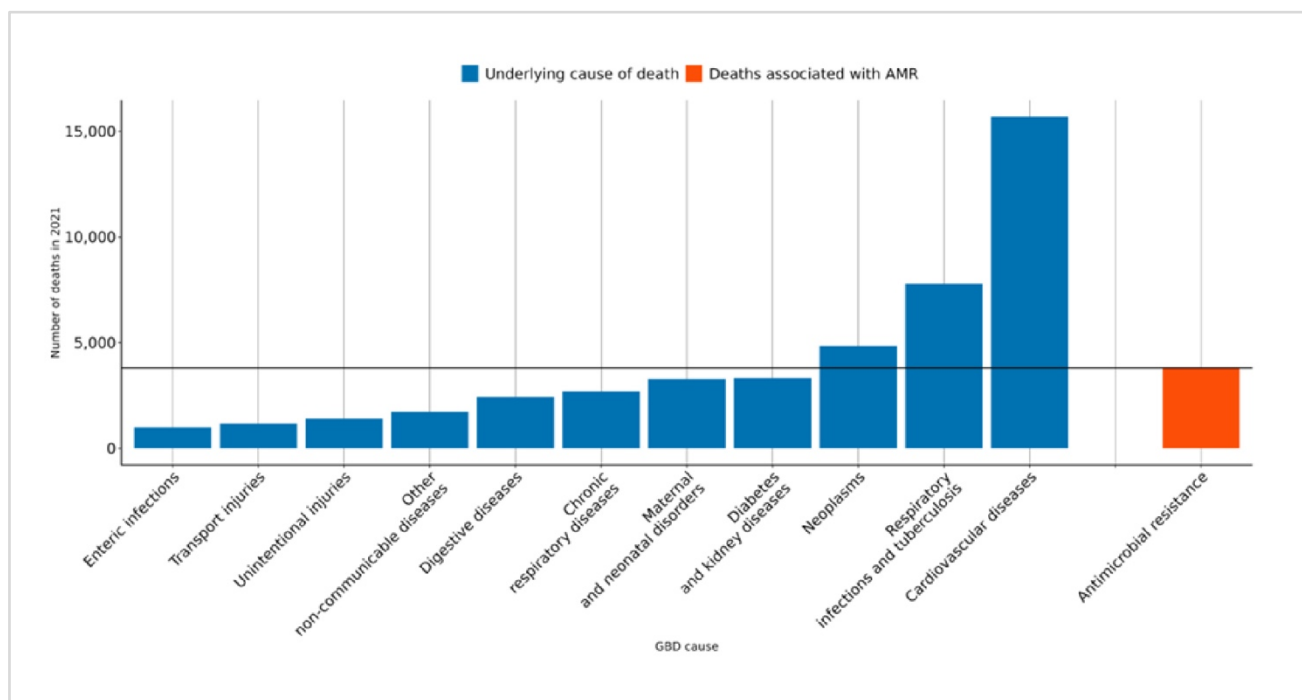


Fig. 1. The number of deaths by underlying cause, and those associated with AMR in 2021, Lao PDR (1)

In fact, awareness of antibiotic misuse remains challenging and less than optimal in Lao PDR. Lack of knowledge on antimicrobial resistance (AMR) in combination with misinformation and current attitudes and behaviours can result in irrational use of antibiotics and contribute to the spread of resistance. Many people lack an understanding of antibiotic resistance (1). Misconceptions of taking antibiotics for a cold or flu, viral infection, are common. People often do not complete antibiotic courses or resort to self-medication, which worsens resistance (2,3). In fact, in Lao PDR, people can buy antibiotics over the counter (OTC) in any pharmacy without a doctor's prescription. Farmers also often mix antibiotics in animal feed without a veterinary prescription (4).

A 2018 systematic review found that pharmacists frequently experience pressure to dispense antibiotics without a prescription. This pressure stems from patient-related factors such as high demand, self-medication, limited knowledge and low socio-economic status, as well as health system factors including weak enforcement of antibiotic policies and pressure from pharmacy owners (5). Therefore, understanding and influencing public perceptions, beliefs and behaviours on antibiotic misuse are crucial for tackling AMR.

A comparative study on public knowledge and attitudes toward antibiotics and drug resistance in Chiang Rai (Thailand) and Salavan (Lao PDR) revealed notable differences. In Salavan, 86.4% of villagers were aware of antibiotics and 62.5% had heard of drug resistance – significantly lower than Chiang Rai, where awareness levels were 95.7% and 74.8%, respectively. In Salavan, drug resistance was commonly misunderstood, with 50.9% interpreting it as the body becoming tolerant to medicine, 24.9% as addiction to medicine and 21.8% as refusal to take medicine. Antibiotics were frequently used without prescriptions for various conditions, including external wounds (44.4%), cough (30.5%), fever (30.5%) and sore throat (28.9%) (2).

In addition, health-care providers (HCPs) also demonstrate limited understanding of AMR (6). A 2021 study revealed that 36% of Lao health professionals had below-average knowledge of antibiotic use and resistance, and 67% prescribed antibiotics for uncomplicated vaginal deliveries. Half of the HCPs did not believe that their prescribing contributed to antibiotic resistance, and only 9% had participated in antibiotic education program(s) (7). In hospitals in Lao PDR, compliance with local treatment guidelines for antibiotic use was only 26%, with inappropriate prescribing predominantly for surgical prophylaxis (99%), as reported by point prevalence surveys conducted between 2017 and 2020 (8). A 2015 study assessed antibiotic prescribing practices among doctors in Laos found that 59.8% reported having insufficient knowledge about antibiotics. Only 14% were aware of cephalosporin cross-resistance in methicillin-resistant *Staphylococcus aureus*, while 54.8% and 65.9% lacked knowledge of local antibiotic resistance patterns for *Salmonella typhi* and hospital-acquired pneumonia, respectively (9).

Furthermore, there remains a significant knowledge and awareness gap among the entire population, despite some awareness campaigns on AMR in Lao PDR. A study of AMR education and awareness-raising in Lao PDR in 2018 demonstrated that interventions targeting small group audiences does not translate into changes in the entire population, and there might be incomplete diffusion of messages, which reach mainly privileged groups (3).

On the other hand, in the animal health sector, there is an increasing demand for pig and poultry meat (8). This increase is often associated with an increased demand for antibiotics for prophylaxis or treatment, and the limited access to veterinary services by farmers for

proper guidance on appropriate antibiotic use compounds the problem of antibiotic misuse. Moreover, there was a finding that bacteria isolated from pigs and humans carry different virulence genes in the Thai–Lao border provinces (10). These may serve as potential reservoirs for spreading AMR from animals to humans via the food chain.

Although campaigns such as World Antibiotic Awareness Week (WAAW) have raised visibility, their impact on actual behaviour change remains limited, inconsistent and in some instances, potentially counterproductive. Messages can be scientifically unclear, contextually inappropriate or risk creating stigma, while overworked health staff struggle to balance competing priorities. Moreover, the growing involvement of industry in awareness campaigns risks distorting messaging toward corporate interests rather than public health goals. To address this, AMR awareness in Lao PDR should move beyond one-size-fits-all approaches and instead adopt evidence-based, context-specific communication strategies tailored to different audiences – policy-makers, health professionals and the public – while maintaining strong oversight to avoid industry capture and ensuring that campaigns complement broader health system strengthening and sustainable AMR policy reforms (12).

These issues underscore the critical need to raise public awareness of AMR across multiple sectors not only within communities but also among HCPs. Furthermore, increasing awareness among veterinarians, para-vets and farmers is essential, as AMR can be transmitted to humans through the food chain (11).

Consequences of inaction

Globally, the World Bank estimates that AMR could result in US\$ 1 trillion additional health-care costs by 2050, and US\$ 1 trillion to US\$ 3.4 trillion gross domestic product (GDP) losses per year by 2030. Patients with infections due to antimicrobial-resistant organisms have higher treatment and hospital costs (approximately US\$ 6000–30 000) than patients with infections due to antimicrobial-susceptible organisms (13).

A study in Lao PDR showed a growing prevalence of extended-spectrum beta-lactamase (ESBL)-producing *E. coli* and emerging carbapenem-resistant strains. The proportion of ESBL-producing *E. coli* in blood cultures increased significantly from 7.8% in 2010 to 34.7% in 2014 (14). If awareness and antimicrobial stewardship programmes do not improve, these resistant infections could become more widespread and harder to treat. Colistin-resistant *Klebsiella pneumoniae* has already been found in livestock and humans, posing a risk of untreatable infections if resistance spreads further (14).

Table 1: Underlying causes of the problem

<p>System arrangement</p>	<p>Governance arrangement</p> <ol style="list-style-type: none"> 1. There is a lack of a shared understanding of AMR among relevant line ministries such as Ministry of Health, Ministry of Education, Ministry of Agriculture and Environment, Ministry of National Defense, national veterinary governmental authorities, province and district veterinary governmental authorities and Ministry of Securities (15). 2. Lao PDR has faced challenges in integrating AMR surveillance and action across the human, animal and agriculture sectors despite a National Strategic Plan on AMR that has been developed and revised in a One Health approach (16). Its surveillance system was not integrated across these sectors, resulting in inconsistent coordination between ministries and agencies (17). Improvement in multisectoral coordination mechanisms and more effective stakeholder engagement is required. 3. Timely and accurate information-sharing across sectors needs to be further strengthened. A pilot surveillance in livestock (pigs and chickens) between 2018 and 2021 also emphasized that comprehensive and representative baseline information across sectors is still lacking (18). 4. There are limited nationally representative baseline data on awareness on AMR, despite awareness being one of the strategic objectives of the current National Strategic Plan. Government commitment and financial contribution are crucial for the sustainability of awareness activities.
	<p>Financial arrangement</p> <ol style="list-style-type: none"> 1. There are limited domestic budget and funding for AMR awareness activities, and a heavy reliance on development partners. According to a World Bank update, the country spent 2.02% of GDP or US\$ 41.35 per capita on health in 2022. While the share of the general government health expenditure has increased in recent years (31.04% of current health expenditure in 2022 from 26.21% in 2021), the country remains highly reliant on out-of-pocket (OOP) expenditure (28.69% in 2022), external financing for health (36.29% in 2022), and other sources (3.98%). In fact, domestic financial

support for coordination, meetings and activity implementation on AMR and antimicrobial use is still insufficient (18).

2. Furthermore, there are limited comprehensive costing data on AMR surveillance at the national level using the One Health approach.
3. Additionally, limited funding for baseline awareness studies and monitoring and evaluation hampers targeting and measuring communication impact.
4. Donor funds are important opportunities but also create sustainability risks once grants end. Current examples include the UK-funded Fleming Fund Country Grant and related governance/coordination grants.
5. Project-based, short-term funding leads to episodic awareness activities (e.g. WAAW events and discrete workshops) rather than sustained national campaigns. Examples include WHO-supported WAAW workshops and partner-funded initiatives such as Fleming Fund and Fondation Mérieux etc.

Delivery arrangement

1. Existing Ministry of Health websites have limited community reach, largely due to low public engagement.
2. Inadequate availability and variety of AMR-related information, education and communication (IEC) materials are available on Ministry of Agriculture and Environment (MAE) and Department of Livestock and Fisheries (DLF) platforms, with low user interest.
3. A standardized platform for AMR-related knowledge-sharing is absent.
4. There is a lack of sufficient time, training or motivation among health as well as media professionals to educate patients and the public, respectively, on appropriate antibiotic use (20).
5. Awareness campaigns often fail to reach all population groups, particularly those in remote or low-literacy areas (21).
6. There is no established system for evaluating AMR knowledge, attitudes and behaviours among the general public and HCPs.

Degree of implementation of an agreed-upon course of action

1. Interventions and strategies to raise awareness of AMR among the general public and health-care providers are inadequate. Although awareness-raising is one of strategic objectives in the National Strategic Plan on AMR (NSP), key planned activities such as KPIs for assessing AMR knowledge among health-care professionals and establishing baseline awareness data were not effectively implemented, leaving a gap in achieving the NSP's aims.
2. Limited efforts have been made to evaluate the effectiveness of educational programmes delivered through social media, schools, printed materials and other forms of mass media such as radio and television.
3. There is weak enforcement of regulations restricting the sale of antimicrobials without a prescription in both the human and animal health sectors (15,22).
4. Involvement and authorization of pharmacists is limited in monitoring prescriptions of clinicians and addressing AMR in the human health sector (22).
5. The role of veterinarians in monitoring antimicrobial misuse on farms and in slaughterhouses is insufficient (15).

2. POLICY OPTIONS TO ADDRESS THE PROBLEM

Option 1. Strengthening enforcement of existing AMR-related laws and guidelines (AMR National Strategic Plan, Food and Drug Law, treatment policies, drug decree, essential medicines list, and veterinary/food-safety regulations) to ensure antibiotics are used only with valid prescriptions.

- It is essential to implement strict regulations prohibiting the sale of antibiotics without a valid prescription in both human and animal health sectors while monitoring for consequences (23–25).
- In parallel, the National AMR Surveillance and Control Committee (NASCC) should be empowered to take a leading role in implementing nationwide public awareness campaigns on AMR and rational antibiotic use (16).
- Furthermore, specific legislation should be advanced to enhance awareness among the general public and HCPs, while ensuring that AMR-related topics are systematically integrated into educational curricula (26,27).

Table 2: Summary of key findings from reviews and primary studies relevant to policy option 1

Category	Option 1 Strengthening enforcement of existing AMR-related laws and guidelines (AMR National Strategic Plan, Food and Drug Law, treatment policies, drug decree, essential medicines list, and veterinary/food-safety regulations) to ensure antibiotics are used only with valid prescriptions.
Benefits	<p>Reduced misuse via legal enforcement: enforcing prescription-only policies and regulatory inspections can curb OTC antibiotic sales and inappropriate dispensing. A systematic review of low- and middle-income countries (LMICs) found that regulatory enforcement, especially when combined with public awareness and stakeholder engagement, led to sustained reductions in OTC antibiotic sales (52,53).</p> <p>Aligns with Lao PDR’s AMR strategy: Lao PDR’s National Strategic Plan on AMR (2026–2030) explicitly includes goals such as establishing and enforcing laws and regulations on antibiotic use. This reflects the country’s policy-level commitment to improve antimicrobial stewardship through regulatory mechanisms (16). The Lao National Strategic Plan on AMR (2026–2030) also encourages the expansion of public awareness programmes, aiming to increase knowledge and awareness on AMR by 20% compared to the 2026 baseline among HCWs and veterinary professionals (16).</p>

	<p>Supports surveillance and stewardship efforts: by reducing misuse, enforcement helps to improve surveillance data quality and reinforces stewardship activities (52,53).</p>
Potential harms	<p>Restricted access in underserved areas: strict enforcement may hinder access to necessary antibiotics, especially in rural or resource-limited regions where people often rely on informal or OTC sources due to limited health-care infrastructure, which may lead to purchasing antibiotics from unregulated or informal sources (54).</p> <p>Government staff are overstretched due to limited human resources (55,56).</p>
Cost and/or cost-effectiveness in relation to the status quo	<p>Intervention costs will include multiple advocacy meetings, cross-sector coordination for law enforcement, regulation of private pharmacies regarding antibiotic sales, annual committee meetings to review the progress of implementation, information dissemination and related activities.</p> <p>The estimated budget for awareness activities is US\$ 659 050, as outlined in the revised National Strategic Plan (2026–2030) for 5 years (16).</p>
Uncertainty regarding benefits and potential harms	<p>The impact of public awareness efforts on actual behaviour changes regarding AMR is unclear (7).</p> <p>Even if enforcement reduces OTC sales or unregulated distribution, people may seek informal channels (black market, cross-border purchase). The net reduction in misuse is uncertain (54).</p> <p>The impact on resistance trends is hard to attribute to enforcement alone (54).</p> <p>Regulation alone may vary the effectiveness across geographical rural/urban settings, depending on the availability of health-care access (54).</p>
Stakeholders' views	<p>Enforcement of the law/regulation/legislation and coordination among stakeholders are required to reduce and regulate the sale, distribution and use of veterinary antibiotics in Lao PDR (15,27).</p> <p>Continued financial and technical support from international organizations remains essential for AMR-related activities.</p> <p>Strong commitment from local authorities is vital to ensure system autonomy and long-term sustainability.</p> <p>The Ministry of Health, Department of Communicable Disease Control (DCDC), Ministry of Agriculture and Environment, Ministry of Education and Sports, Department of Healthcare and Rehabilitation, Food and Drug Department, National Centre of Laboratory and Epidemiology, National Animal Health Laboratory, provincial health departments, central and provincial hospitals, as well as international development partners such as the</p>

World Health Organization (WHO), Food and Agricultural Organization, Lao–Oxford Mahosot Wellcome Trust Research Unit, and Fondation Merieux influence the acceptability and feasibility of this option.

Option 2. Enhancing public awareness interventions on AMR through existing media platforms and targeted campaigns for the general population, farmers and health-care professionals

- To improve public understanding of and responsible antibiotic use, health education should use multiple approaches. Hospitals, veterinarians, interactive elements such as games or videos and mass media platforms like government websites, WhatsApp, TikTok and Facebook can help share accurate information at community and village levels, reducing misunderstanding and ensuring equal access to key messages. For example, England’s “Keep Antibiotics Working” campaign showed that this approach can be effective (28–32). In Lao PDR, AMR awareness was promoted through annual workshops, WAAW, and One Health Symposia, supported by government and media, alongside distribution of communication materials such as posters, videos, and printed items (33).
- At the same time, social media education programmes with peer support can be developed to help parents better understand AMR (30,34–36).
- Patient education interventions should also extend into households and workplaces, offering guidance to avoid unnecessary antibiotic use for illnesses like acute bronchitis and reinforcing messages to follow doctors’ advice (37–39).
- To promote equity and wider reach, messages should be developed together with stakeholders and target audiences, ensuring that they are culturally appropriate, practical and communicated in clear language through suitable platforms, educational materials and media channels (40). These messages should reach the entire population, ensuring that vulnerable groups are not left behind (41).
- Additionally, long-term evaluations of knowledge, attitudes and behaviours are essential to monitor awareness levels among the general public, farmers, veterinarians and HCPs, as well as to assess the overall impact of AMR interventions (42–45).

Table 3: Summary of key findings from reviews and primary studies relevant to policy option 2

Category	Option 2 Enhancing public awareness interventions on AMR through existing media platforms and targeted campaigns for the general population, farmers and health-care professionals
-----------------	---

Benefits

Improved knowledge and awareness: campaigns using mass media (TV, government websites, social media, WhatsApp, TikTok and Facebook) have shown success in increasing public understanding of AMR and appropriate antibiotic use. Targeted messaging (e.g. focusing on respiratory infections) is more effective than general messaging (56). In one Lao study, awareness of the term “drug resistance” rose from 27% to 91% among participants (2,7). A 2024 One Health-oriented project in northern Lao PDR conducted dissemination activities, including workshops and poster campaigns aimed at farmers, veterinarians and local officials to promote awareness and responsible antimicrobial use. Post-workshop surveys revealed an impressive 60% increase in AMR awareness among participants (57).

Behavioural influence: some interventions led to reduced self-medication and increased consultation with HCPs. School-based and parental education campaigns were particularly effective in changing behaviours (34–36). When well-designed, campaigns can promote responsible use of antibiotics, such as avoiding unnecessary prescriptions or respecting withdrawal periods in livestock and increasing access to veterinarian services (7,58).

Wide reach and engagement: media platforms allow rapid dissemination of information, especially in rural or underserved areas. Interactive elements (e.g. games, videos) boost engagement and retention of key messages (30).

Gender and minority considerations: promote equal participation of women, men and vulnerable groups in awareness programmes, ensuring that knowledge and information on AMR are accessible and inclusive at all levels (41).

Policy and funding mobilization: campaigns like WAAW have helped governments allocate resources and raise political attention to AMR (12,15).

Building trust in the health-care system: hospital-led awareness campaigns on AMR can help build or reinforce trust in the health-care system (55).

Potential harms

Lack of long-term impact: many campaigns improve short-term awareness but fail to sustain behaviour change over time (30). One study described that awareness only among the public and HCPs cannot reduce antibiotic prescriptions and dispensing, leading to the use of next-line available antibiotics. Hence, other contextual factors such as alternative guidance instead of antibiotics, strong regulation and improved IPC measures are critical in reducing reliance on antibiotics (59).

	<p>Stigmatization and misinformation: poorly designed campaigns can stigmatize certain groups (e.g. farmers, ethnic minorities) or spread misleading narratives like the “antibiotic apocalypse” (12).</p> <p>Overburdening local health systems: campaigns may strain already limited resources, especially if they require extensive staff involvement without adequate support (12).</p> <p>Reducing antibiotic use can increase the morbidity and mortality of animals and extra feed will be required to compensate for reduced growth (60).</p>
<p>Cost and/or cost-effectiveness in relation to the status quo</p>	<p>In Lao PDR, WAAW is being celebrated annually since 2015. For the 2021 WAAW, the United Kingdom Agency for International Development, through the Fleming Fund and FAO, supported AMR risk communication materials for officials of the Lao Department of Livestock and Fisheries, including polo-shirts, caps, bags, posters and booklets costing about Laotian Kip (LAK) 250 million (33).</p> <p>There are currently no baseline data on awareness campaigns for veterinarians in Lao PDR. However, a study in Tanzania mentioned that the cost savings from reducing antibiotic use are relatively higher than the increased production costs, whether or not precautionary measures are taken to prevent and control disease (60).</p>
<p>Uncertainty regarding benefits and potential harms</p>	<p>Evidence from a study conducted in Lao PDR indicates that educational interventions can improve awareness and understanding of AMR; however, their influence on behavioural change remains limited. Moreover, awareness campaigns often demonstrate incomplete diffusion of key messages beyond direct participants, while information disseminated through social media may fail to reach populations in areas with unstable or limited internet connectivity (7).</p> <p>Farms in remote rural areas of Lao PDR cannot receive the full range of veterinarian services such as vaccination and visits by a veterinary doctor from another village. Vaccination rates reported during a mission were at 80% in 2029 and pigs and poultry were rarely vaccinated (61).</p>
<p>Stakeholders’ views</p>	<p>All stakeholders within the NASCC are committed to advancing AMR awareness in both the human and animal health sectors, as it represents a key strategic objective of the National Strategic Plan. Nevertheless, they continue to rely on financial and technical support from external partners and international organizations, including WHO, FAO, Fondation Merieux (FMx) and Lao–Oxford Mahosot Wellcome Trust Research Unit (LOMWRU).</p>

Strong commitment from local authorities is also vital to ensure system autonomy and long-term sustainability.

Option 3. Developing an interprofessional curriculum on antimicrobial resistance

- Strengthening knowledge and capacity across multiple levels of education and practice is critical to addressing AMR. Robust training programmes should be designed to meet the specific needs of health-care workers (HCWs) in resource-limited settings, with a focus on improving AMR-related knowledge, ensuring appropriate prescribing and dispensing of antibiotics, and enhancing patient communication skills (46).
- At the same time, AMR modules should be integrated into school and university curricula, using interactive and team-based learning approaches to establish a foundational understanding among students of drug misuse (47).
- For medical students in particular, the development of a dedicated antimicrobial stewardship curriculum is essential for building prescribing competence, introducing core stewardship principles and encouraging interprofessional collaboration in AMR management (14,48,49).
- Complementing these measures, clinicians should receive regular training on the interpretation of antibiograms, infection prevention and control (IPC) practices, and adherence to clinical guidelines to ensure consistent and effective application in clinical settings (50,51).

Table 4: Summary of key findings from reviews and primary studies relevant to policy option 3

Category	Option 3 Developing an interprofessional curriculum on antimicrobial resistance
Benefits	<p>Improved knowledge, attitudes and stewardship behaviours across professions: undergraduate medical students showed significant gains in understanding AMR, appropriate antimicrobial use, adherence to local guidelines and collaborative practices after participating in interprofessional antimicrobial stewardship curricula (48,49,62). A study in Nigeria indicated that AMR knowledge regarding the spread and impact of AMR increased from 40.5% to 62.4% after educational interventions on AMR among health-care students (63).</p> <p>Supports multisectoral One Health goals: interprofessional health training promotes collaboration among veterinary, laboratory and public-health professionals (57).</p>

	<p>Optimized patient care and outcomes: this leads to better patient outcomes, as it reduces the misuse and overuse of antibiotics, minimizes adverse effects, and helps preserve the effectiveness of these life-saving drugs for future use (62).</p>
Potential harms	<p>Fragmented or inconsistent messaging: if disciplines (medicine, pharmacy, nursing, veterinary, environmental sciences) are not aligned, learners may receive conflicting information about AMR practices (64).</p> <p>Increased workload and workforce resistance: adding new interprofessional modules can be perceived as extra work by already stretched educators/clinicians and may provoke resistance from faculties protective of disciplinary curricula (65).</p>
Cost and/or cost-effectiveness in relation to the status quo	<p>The main cost components cover planning and design of both new and existing curricula, engagement of subject-matter experts, training activities, delivery, as well as monitoring and evaluation. The revised National Strategic Plan on AMR (2026–2030) highlights curriculum revision in medical and school programmes under the strategic objective of raising awareness, with an allocated budget of US\$ 659 050 (16). Implementing an AMR curriculum is expected to improve public knowledge on antibiotic misuse, help reduce AMR trends, and consequently lower costs associated with antibiotic purchases and hospital stays.</p>
Uncertainty regarding benefits and potential harms	<p>Many educational interventions reliably increase knowledge and attitudes, but improvements in knowledge do not always produce sustained changes in prescribing, dispensing or patient behaviour, especially where structural drivers (drug supply, patient demand, lack of diagnostics, incentives) remain (7).</p> <p>The long-term impact on AMR prevalence is uncertain and hard to attribute. Reductions in inappropriate antibiotic use are an intermediate outcome; the downstream effect on local AMR rates depends on many interacting factors (animal/agriculture use, infection control, diagnostics, surveillance). Attribution to a single curriculum is difficult without longer-term surveillance and modelling (48).</p>
Stakeholders' views	<p>All relevant stakeholders, in collaboration with government partners, agreed to include the revision of medical and school curricula in the National Strategic Plan on AMR as a formal commitment, recognizing and accepting the importance and benefits of this activity.</p>

3. IMPLEMENTATION CONSIDERATIONS

Table 5: Barriers to policy options and corresponding counter strategies

Level	Barriers	Counterstrategies
<p>Patient / Community</p>	<p>Community-specific research and literature are limited in both the human and animal health sectors (13).</p> <p>There are low public interest and engagement in AMR issues (7).</p> <p>Patients often prioritize quick relief from symptoms, leading to inappropriate antibiotic use (3).</p> <p>Many individuals cannot afford hospital visits and instead rely on nearby pharmacies for medication (3).</p> <p>Pet owners frequently do not follow veterinarians' instructions. Farmers are primarily concerned with preventing illness or death in their animals, often relying heavily on antimicrobials for this purpose (15).</p>	<p>Conduct additional research on public awareness of AMR in both the human and animal health sectors (16).</p> <p>Utilize innovative and engaging communication methods that are easy for local communities and influencers to understand (30).</p> <p>Promote knowledge about the risks and long-term consequences of AMR, rather than focusing solely on quick symptom relief through antibiotics (3).</p> <p>Apply realistic and persuasive strategies that motivate community participation in addressing AMR (30).</p> <p>Encourage veterinarians to conduct regular monitoring visits to farms, slaughterhouses and markets (15).</p>
<p>Professional</p>	<p>Tailored training programmes specifically adapted to the needs of HCPs are limited.</p> <p>There is a continued need for technical support from external experts.</p> <p>There is intense competition among pharmaceutical companies, driven by strong marketing strategies to promote their products (66).</p> <p>AMR, antimicrobial use and antimicrobial stewardship training</p>	<p>Develop well-designed training programmes tailored to specific target groups (46,47).</p> <p>Strong coordination with various stakeholders is needed to ensure adequate technical support.</p> <p>Clear and standardized guidelines for drug production and registration should be established (15).</p> <p>Strict regulation of pharmaceutical marketing practices is required (15).</p> <p>Effective enforcement of food and drug policies must be prioritized.</p>

	<p>programmes are limited to surveillance sites only (3,7,18,57).</p> <p>Some veterinarians prescribe medications without accurately assessing the animal's weight (11,18).</p>	<p>Expand AMR, antimicrobial use and antimicrobial stewardship training programmes nationwide, beyond surveillance sites (3,7,8).</p> <p>Promote ethical standards in the prescription and dispensing of antibiotics (15).</p> <p>Strengthen enforcement of laws related to veterinary practices and animal farming (15).</p>
Organization	<p>Insufficient government funding poses a challenge to holding regular advocacy meetings.</p> <p>Strong leadership and commitment from institutional heads are crucial.</p> <p>Limited information-sharing among high-level decision-makers across the human and animal health sectors – particularly regarding current status, challenges, solutions and coordination – hinders effective collaboration.</p>	<p>Strengthening autonomy systems requires collaboration with both governmental and non-governmental stakeholders.</p> <p>Effective integration among the Ministry of Health, Ministry of Education, Ministry of Communication, Ministry of Finance, and provincial health departments is essential for implementing awareness campaigns.</p> <p>Advocacy workshops and meetings with high-level decision-makers play a critical role. Enhancing collaboration between the human and animal health sectors is vital for distribution of updated messages equally among public.</p>
System	<p>A nationwide awareness programme that reaches the entire population is absent (7).</p> <p>Monitoring systems to track antibiotic misuse and assess public knowledge levels are inadequate and irregular (7,8).</p> <p>Coordination mechanisms among key stakeholders are weak.</p>	<p>Enhance communication channels to ensure that knowledge-sharing reaches the entire population (7).</p> <p>Develop a monitoring tool to assess knowledge, attitudes and practices (KAP), with regular evaluations conducted by relevant institutions.</p> <p>Involve international partners to take the lead in formulating effective strategies for raising awareness. Strengthen enforcement of existing</p>

		coordination mechanisms to ensure effective management.
--	--	---

REFERENCES

1. GBD 2021 Antimicrobial Resistance Collaborators. Global burden of bacterial antimicrobial resistance 1990-2021: a systematic analysis with forecasts to 2050. *Lancet*. 2024 Sep 28;404(10459):1199-1226. doi: 10.1016/S0140-6736(24)01867-1. PMID: 39299261; PMCID: PMC11718157.
2. Haenssngen MJ, Charoenboon N, Zanello G, Mayxay M, Reed-Tsochas F, Lubell Y et al. Antibiotic knowledge, attitudes and practices: new insights from cross-sectional rural health behaviour surveys in low-income and middle-income South-East Asia. *BMJ Open*. 2019;9(8):e028224 (doi: 10.1136/bmjopen-2018-028224).
3. Sychareun V, Sihavong A, Machowska A, Onthongdee X, Chaleunvong K, Keohavong B et al. Knowledge, attitudes, perception and reported practices of healthcare providers on antibiotic use and resistance in pregnancy, childbirth and children under two in Lao PDR: a mixed methods study. *Antibiotics (Basel)*. 2021;10(12):1462 (doi: 10.3390/antibiotics10121462).
4. Poupaud M, Goutard FL, Phouthana V, Muñoz Viera F, Caro D, Patriarchi A et al. Different kettles of fish: varying patterns of antibiotic use on pig, chicken and fish farms in Lao PDR and implications for antimicrobial resistance strategies. *Transbound Emerg Dis*. 2022;69(6):3940–51 (doi: 10.1111/tbed.14766).
5. Servia-Dopazo M, Figueiras A. Determinants of antibiotic dispensing without prescription: a systematic review. *Journal of Antimicrobial Chemotherapy*. 2018 Dec 1;73(12):3244–53.
6. Jahromi AS, Namavari N, Jokar M, Sharifi N, Soleimanpour S, Naserzadeh N et al. Global knowledge, attitudes, and practices towards antimicrobial resistance among healthcare workers: a systematic review and meta-analysis. *Antimicrob Resist Infect Control*. 2025;14(1):47 (doi: 10.1186/s13756-025-01562-1).
7. Haenssngen MJ, Xayavong T, Charoenboon N, Warapikuptanun P, Khine Zaw Y. The consequences of AMR education and awareness raising: outputs, outcomes, and behavioural impacts of an antibiotic-related educational activity in Lao PDR. *Antibiotics (Basel)*. 2018;7(4):95 (doi: 10.3390/antibiotics7040095).
8. Chansamouth V, Chommanam D, Roberts T, Keomany S, Paphasiri V, Phamisith C et al. Evaluation of trends in hospital antimicrobial use in the Lao PDR using repeated point-prevalence surveys-evidence to improve treatment guideline use. *Lancet Reg Health West Pac*. 2022;27:100531 (doi: 10.1016/j.lanwpc.2022.100531).
9. Quet F, Vlieghe E, Leyer C, Buisson Y, Newton PN, Naphayvong P, et al. Antibiotic prescription behaviours in Lao People’s Democratic Republic: a knowledge, attitude and practice survey. *Bull World Health Organ*. 2015 Apr 1;93(4):219–27.
10. Napisirth V, Vongsamphanh P. Current situation livestock production in Lao PDR (keynote 1, page 1). In: *The 9th International Conference on Sustainable Animal Agriculture for Developing*

Countries (SAADC 2023), Vientiane, Lao PDR, 21–24 November 2023. SAADC; December 2024 (<https://www.researchgate.net/publication/387419148>, accessed 19 November 2025).

11. Thu WP, Sinwat N, Bitrus AA, Angkittitrakul S, Prathan R, Chuanchuen R. Prevalence, antimicrobial resistance, virulence gene, and class 1 integrons of *Enterococcus faecium* and *Enterococcus faecalis* from pigs, pork and humans in Thai-Laos border provinces. *J Glob Antimicrob Resist*. 2019;18:130–8 (doi: 10.1016/j.jgar.2019.05.032).
12. The BMJ opinion [website]. The benefits and risks of public awareness campaigns: World Antibiotic Awareness Week in context. 18 November 2019 (<https://blogs.bmj.com/bmj/2019/11/18/the-benefits-and-risks-of-public-awareness-campaigns-world-antibiotic-awareness-week-in-context/>, accessed 19 November 2025).
13. Cosgrove SE. The relationship between antimicrobial resistance and patient outcomes: mortality, length of hospital stay, and health care costs. *Clin Infect Dis*. 2006;42 (Suppl 2):S82–89 (doi: 10.1086/499406).
14. Chansamouth V, Mayxay M, Dance DA, Roberts T, Phetsouvanh R, Vannachone B et al. Antimicrobial use and resistance data in human and animal sectors in the Lao PDR: evidence to inform policy. *BMJ Glob Health*. 2021;6(12):e007009 (doi: 10.1136/bmjgh-2021-007009).
15. Poupaud M, Putthana V, Patriarchi A, Caro D, Agunos A, Tansakul N et al. Understanding the veterinary antibiotics supply chain to address antimicrobial resistance in Lao PDR: roles and interactions of involved stakeholders. *Acta Trop*. 2021;220:105943 (doi: 10.1016/j.actatropica.2021.105943).
16. World Health Organization (WHO). (2019). Lao PDR: National strategic plan on antimicrobial resistance in Lao PDR 2019–2023. WHO. <https://cdn.who.int/media/docs/default-source/wpro---documents/countries/lao-people%27s-democratic-republic/our-work/amr/national-strategic-plan-on-amr-2019-2023-%28lao%29.pdf>
17. Willemsen A, Reid S, Assefa Y. A review of national action plans on antimicrobial resistance: strengths and weaknesses. *Antimicrob Resist Infect Control*. 2022;11(1):90 (doi: 10.1186/s13756-022-01130-x).
18. Inthavong P, Chanthavong S, Nammaninh P, Phommachanh P, Theppangna W, Agunos A et al. Antimicrobial resistance surveillance of pigs and chickens in the Lao People’s Democratic Republic, 2018–2021. *Antibiotics (Basel)*. 2022;11(2):177 (doi: 10.3390/antibiotics11020177).
19. World Bank Open Data [online database]. The World Bank Group (<https://data.worldbank.org>, accessed 19 November 2025).
20. Ayorinde A, Ghosh I, Shaikh J, Adetunji V, Brown A, Jordan M et al. Improving healthcare professionals’ interactions with patients to tackle antimicrobial resistance: a systematic review of interventions, barriers, and facilitators. *Front Public Health*. 2024;12:1359790 (doi: 10.3389/fpubh.2024.1359790).

21. Poomchaichote T, Kiatying-Angsulee N, Boonthaworn K, Naemiratch B, Ruangkajorn S, Prapharsavat R et al. Embedding community and public voices in co-created solutions to mitigate antimicrobial resistance (AMR) in Thailand using the 'Responsive Dialogues' public engagement framework. *Antimicrob Resist Infect Control*. 2024;13(1):71 (doi: 10.1186/s13756-024-01416-2).
22. Stenson B, Tomson G, Syhakhang L. Pharmaceutical regulation in context: the case of Lao People's Democratic Republic. *Health Policy Plan*. 1997;12:329–40 (doi: 10.1093/heapol/12.4.329).
23. Thandar MM, Baba T, Matsuoka S, Ota E. Interventions to reduce non-prescription antimicrobial sales in community pharmacies. *Cochrane Database Syst Rev*. 2025;2025(1):CD013722 (doi: 10.1002/14651858.CD013722.pub2).
24. Saha SK, Hawes L, Mazza D. Effectiveness of interventions involving pharmacists on antibiotic prescribing by general practitioners: a systematic review and meta-analysis. *J Antimicrob Chemother*. 2019;74(5):1173–81 (doi: 10.1093/jac/dky572).
25. Tang KL, Caffrey NP, Nóbrega DB, Cork SC, Ronksley PE, Barkema HW et al. Examination of unintended consequences of antibiotic use restrictions in food-producing animals: sub-analysis of a systematic review. *One Health*. 2019;7:100095 (doi: 10.1016/j.onehlt.2019.100095).
26. Lim JM, Singh SR, Duong MC, Legido-Quigley H, Hsu LY, Tam CC. Impact of national interventions to promote responsible antibiotic use: a systematic review. *J Antimicrob Chemother*. 2020;75(1):14–29 (doi: 10.1093/jac/dkz348).
27. Al Sattar A, Chisty NN, Irin N, Uddin MdH, Hasib FMY, Hoque Md A. Knowledge and practice of antimicrobial usage and resistance among poultry farmers: a systematic review, meta-analysis, and meta-regression. *Vet Res Commun*. 2023;47(3):1047–66 (doi: 10.1007/s11259-023-10082-5).
28. Fletcher-Miles H, Gammon J, Williams S, Hunt J. A scoping review to assess the impact of public education campaigns to affect behavior change pertaining to antimicrobial resistance. *Am J Infect Control*. 2020;48(4):433–42 (doi: 10.1016/j.ajic.2019.07.011).
29. Gilham EL, Casale E, Hardy A, Ayeni AH, Sunyer E, Harris T et al. Assessing the impact of a national social marketing campaign for antimicrobial resistance on public awareness, attitudes, and behaviour, and as a supportive tool for healthcare professionals, England, 2017 to 2019. *Euro Surveill*. 2023;28(47):2300100 (doi: 10.2807/1560-7917.ES.2023.28.47.2300100).
30. Parveen S, Garzon-Orjuela N, Amin D, McHugh P, Vellinga A. Public health interventions to improve antimicrobial resistance awareness and behavioural change associated with antimicrobial use: a systematic review exploring the use of social media. *Antibiotics (Basel)*. 2022;11(5):669 (doi: 10.3390/antibiotics11050669).

31. Lam TT, Dang DA, Tran HH, Do D Van, Le H, Negin J et al. What are the most effective community-based antimicrobial stewardship interventions in low- and middle-income countries? A narrative review. *J Antimicrob Chemother.* 2021;76(5):1117–29 (doi: 10.1093/jac/dkaa556).
32. Sharma G, Mutua F, Deka RP, Shome R, Bandyopadhyay S, Shome BR et al. Comparing the effectiveness of different approaches to raise awareness about antimicrobial resistance in farmers and veterinarians of India. *Front Public Health.* 2022;10:837594 (doi: 10.3389/fpubh.2022.837594).
33. Food and Agriculture Organization of the United Nations (FAO); Department of Livestock and Fisheries (Lao PDR). 2022. Antimicrobial resistance in livestock in the Lao People's Democratic Republic. Vientiane, FAO. Available from: <https://doi.org/10.4060/cb9344en> (Accessed: 28 November 2025).
34. Or PL, Ching TY. The effectiveness of raising Hong Kong parents' awareness of antimicrobial resistance through an education program with peer support on social media: a randomized, controlled pilot study. *BMC Public Health.* 2022;22(1):315 (doi: 10.1186/s12889-022-12697-w).
35. Abuhammad S, Daood T, Hijazi H, Hamaideh S, Alhawtmeh H, Mehrass AAO et al. Evaluating the impact of a training program on mothers' awareness and perceptions of antibiotic use and antimicrobial resistance in pediatric care. *BMC Public Health.* 2025;25(1):575 (doi: 10.1186/s12889-025-21836-y).
36. Appiah B, Asamoah-Akuoko L, Samman E, Koduah A, Kretchy IA, Ludu JY et al. The impact of antimicrobial resistance awareness interventions involving schoolchildren, development of an animation and parents engagements: a pilot study. *Antimicrob Resist Infect Control.* 2022;11(1):26 (doi: 10.1186/s13756-022-01062-6).
37. Gonzales R, Corbett KK, Leeman-Castillo BA, Glazner J, Erbacher K, Darr CA et al. The "minimizing antibiotic resistance in Colorado" project: impact of patient education in improving antibiotic use in private office practices. *Health Serv Res.* 2005;40(1):101–16 (doi: 10.1111/j.1475-6773.2005.00344.x).
38. Mortazhejri S, Hong PJ, Yu AM, Hong BY, Stacey D, Bhatia RS et al. Systematic review of patient-oriented interventions to reduce unnecessary use of antibiotics for upper respiratory tract infections. *Syst Rev.* 2020;9(1):106 (doi: 10.1186/s13643-020-01359-w).
39. Ranji SR, Steinman MA, Shojania KG, Gonzales R. Interventions to reduce unnecessary antibiotic prescribing. *Med Care.* 2008;46(8):847–62 (doi: 10.1097/MLR.0b013e318178eabd).
40. World Health Organization, UNEP, FAO, WOA. Global Action Plan on Antimicrobial Resistance: accelerating the global response, second edition 2026–2035 (https://cdn.cseindia.org/attachments/0.57363000_1757314889_zero-draft-updated-gap-amr.pdf, accessed 19 November 2025).
41. Addressing gender inequalities in national action plans on antimicrobial resistance: guidance to complement the people-centred approach. Geneva: World Health Organization; 2024

<https://iris.who.int/server/api/core/bitstreams/61638972-e5c5-4866-9550-2e5160f9cd54/content>). Licence: CC BY-NC-SA 3.0 IGO.

42. Tangcharoensathien V, Chanvatik S, Kosiyaporn H, Kirivan S, Kaewkhankhaeng W, Thunyahan A et al. Population knowledge and awareness of antibiotic use and antimicrobial resistance: results from national household survey 2019 and changes from 2017. *BMC Public Health*. 2021;21(1):2188 (doi: 10.1186/s12889-021-12237-y).
43. Abo YN, Freyne B, Kululanga D, Bryant PA. The impact of antimicrobial stewardship in children in low- and middle-income countries. *Pediatr Infect Dis J*. 2022;41(3S):S10–17 (doi: 10.1097/INF.0000000000003317).
44. Rostami S, Kassaian N, Nokhodian Z, Ataei B, Zanimoghdam A, Nasri P et al. A process evaluation of the isfahan antibiotic awareness campaign: developing engagement on antimicrobial resistance. *Adv Biomed Res*. 2023;12:6 (doi: 10.4103/abr.abr_137_21).
45. Wubishet BL, Merlo G, Ghahreman-Falconer N, Hall L, Comans T. Economic evaluation of antimicrobial stewardship in primary care: a systematic review and quality assessment. *J Antimicrob Chemother*. 2022;77(9):2373–88 (doi: 10.1093/jac/dkac185).
46. St. Louis J, Okere AN. Clinical impact of pharmacist-led antibiotic stewardship programs in outpatient settings in the United States: a scoping review. *Am J Health Syst Pharm*. 2021;78(15):1426–37 (doi: 10.1093/ajhp/zxab178).
47. Anderson SM, Geyer S, Cailor SM, Chen AMH. Impact of a team-based learning drug misuse education training program on student pharmacists' confidence. *Curr Pharm Teach Learn*. 2019;11(1):58–65 (doi: 10.1016/j.cptl.2018.09.016).
48. Wang R, Degnan KO, Luther VP, Szymczak JE, Goren EN, Logan A et al. Development of a multifaceted antimicrobial stewardship curriculum for undergraduate medical education: the Antibiotic Stewardship, Safety, Utilization, Resistance, and Evaluation (ASSURE) elective. *Open Forum Infect Dis*. 2021;8(6):ofab231 (doi: 10.1093/ofid/ofab231).
49. Dirjayanto VJ, Lazarus G, Geraldine P, Dyson NG, Triastari SK, Anjani J V et al. Efficacy of telemedicine-based antimicrobial stewardship program to combat antimicrobial resistance: a systematic review and meta-analysis. *J Telemed Telecare*. 2025;31(5):615–27 (doi: 10.1177/1357633X231204919).
50. Mittal N, Goel P, Goel K, Sharma R, Nath B, Singh S et al. Awareness regarding antimicrobial resistance and antibiotic prescribing behavior among physicians: results from a nationwide cross-sectional survey in India. *Antibiotics (Basel)*. 2023;12(10):1496 (doi: 10.3390/antibiotics12101496).
51. Wong VWY, Huang Y, Wei WI, Wong SYS, Kwok KO. Approaches to multidrug-resistant organism prevention and control in long-term care facilities for older people: a systematic review and meta-analysis. *Antimicrob Resist Infect Control*. 2022;11(1):7 (doi: 10.1186/s13756-021-01044-0).

52. Jacobs TG, Robertson J, van den Ham HA, Iwamoto K, Bak Pedersen H, Mantel-Teeuwisse AK. Assessing the impact of law enforcement to reduce over-the-counter (OTC) sales of antibiotics in low- and middle-income countries; a systematic literature review. *BMC Health Serv Res.* 2019;19(1):536 Doi:
53. Kanan M, Ramadan M, Haif H, Abdullah B, Mubarak J, Ahmad W et al. RETRACTED: Empowering low- and middle-income countries to combat AMR by minimal use of antibiotics: a way forward. *Antibiotics (Basel).* 2023;12:1504 (doi: 10.3390/antibiotics12101504). Retraction in: *Antibiotics (Basel).* 2025;14:84 (doi: 10.3390/antibiotics14010084).
54. Jacobs TG, Robertson J, van den Ham HA, Iwamoto K, Bak Pedersen H, Mantel-Teeuwisse AK. Assessing the impact of law enforcement to reduce over-the-counter (OTC) sales of antibiotics in low- and middle-income countries; a systematic literature review. *BMC Health Serv Res.* 2019;19(1):536 (doi: 10.1186/s12913-019-4359-8).
55. Carelli D. From ignorance to awareness: quality of collaborative governance enhances public awareness of AMR. *Soc Sci Med.* 2024;361:117404 (doi: 10.1016/j.socscimed.2024.117404).
56. Gilham EL, Pearce-Smith N, Carter V, Ashiru-Oredope D. Assessment of global antimicrobial resistance campaigns conducted to improve public awareness and antimicrobial use behaviours: a rapid systematic review. *BMC Public Health.* 2024;24(1):396 (doi: 10.1186/s12889-024-17766-w).
57. Bounyavong S and Team. Building local capacity, shaping national strategy: tackling AMR in poultry in northern Laos through a One Health lens [website]. Southeast Asia One Health University Network (SEAOHUN); 2025. (https://www.seaohun.org/single-post/building-local-capacity-shaping-national-strategy-tackling-amr-in-poultry-in-northern-laos?utm_source=chatgpt.com, accessed 19 November 2025).
58. Dhayal VS, Krishnan A, Rehman BU, Singh VP. Understanding knowledge and attitude of farmers towards antibiotic use and antimicrobial resistance in Jhunjhunu district, Rajasthan India. *Antibiotics (Basel).* 2023;12(12):1718 (doi: 10.3390/antibiotics12121718).
59. Pearson M, Chandler C. Knowing antimicrobial resistance in practice: a multi-country qualitative study with human and animal healthcare professionals. *Glob Health Action.* 2019;12(1):1599560 (doi: 10.1080/16549716.2019.1599560).
60. Azabo RR, George JI, Mshana SE, Matee MI, Kimera SI. Farm costs and benefits of antimicrobial use reduction on broiler farms in Dar es Salaam, Tanzania. *Front Antibiot.* 2022;1:1011929 (doi: 10.3389/frabi.2022.1011929).
61. Food and Agriculture Organization of the United Nations [website]. Special Report - 2019 FAO/WFP Crop and Food Security Assessment Mission to the Lao People's Democratic Republic. Rome; 2020 (<https://doi.org/10.4060/ca8392en>, accessed 19 November 2025).
62. MacDougall C, Schwartz BS, Kim L, Nanamori M, Shekarchian S, Chin-Hong PV. An interprofessional curriculum on antimicrobial stewardship improves knowledge and attitudes

toward appropriate antimicrobial use and collaboration. *Open Forum Infect Dis.* 2017;4(1):ofw225 (doi: 10.1093/ofid/ofw225).

63. Orok E, Ikpe F, Williams T, Ekada I. Impact of educational intervention on knowledge of antimicrobial resistance and antibiotic use patterns among healthcare students: a pre- and post-intervention study. *BMC Med Educ.* 2025;25(1):283 (doi: 10.1186/s12909-025-06856-x).
64. Global Forum on Innovation in Health Professional Education; Board on Global Health; Institute of Medicine. *Interprofessional Education for Collaboration: Learning how to improve health from interprofessional models across the continuum of education to practice: workshop summary* In: National Library of Medicine [website]. Washington, DC: National Academies Press (US); 2013 Oct 3. 3, Implementing interprofessional education for improving collaboration (https://www.ncbi.nlm.nih.gov/books/NBK207103/?utm_source=chatgpt.com, accessed 19 November 2025).
65. Lash DB, Barnett MJ, Parekh N, Shieh A, Louie MC, Tang TT-L. Perceived benefits and challenges of interprofessional education based on a multidisciplinary faculty member survey. *Am J Pharm Educ.* 2014;78(10):180 (doi: 10.5688/ajpe7810180).

ANNEXES

Annex 1: DOCUMENTATION OF SEARCH STRATEGY: PROBLEM STATEMENT

Name of databases searched	Search terms used	Number of relevant studies retrieved
PubMed	("antimicrobial"[Title] OR "antibiotic"[Title] OR "drug"[Title] OR "multidrug resistance"[Title]) AND ("resistance"[Title] OR "misus*"[Title] OR "overus*"[Title]) AND ("media"[Title] OR "awareness"[Title] OR "education"[Title] OR "mass media"[Title] OR "social media"[Title] OR "health communication"[Title] OR "educational media"[Title]) AND ("impact"[Title] OR "effectiveness"[Title] OR "evaluation"[Title] OR "outcome*"[Title] OR "influence*"[Title] OR "result*"[Title]) NOT (otitis[Title/Abstract]) Filtered for the years 2000–2025	17 were retrieved (2 systemic reviews, 14 national surveys, 1 Google trends study)

Annex 2: DOCUMENTATION OF SEARCH STRATEGY: POLICY OPTIONS AND IMPLEMENTATION CONSIDERATIONS

Name of databases searched	Search terms used	Number of relevant studies retrieved
Health Evidence	<p>[aware* AND (antibiotic* OR antimicrobial* OR antimicro*) AND (public OR community OR population)]</p> <p>Filtered date = published from 2000 to 2025</p>	<p>25 were retrieved (4 meta-analysis, 1 narrative review, 1 scoping review, 5 irrelevant topics, 14 systematic reviews)</p>
Health System Evidence	<p>(antimicrob* OR antibiotic) AND Resistance AND aware*</p>	<p>3 were retrieved (2 systematic reviews, 1 national survey)</p>
Social System Evidence	<p>(antimicrob* OR antibiotic) AND (Resistance OR misus*) AND (public OR populat* OR communit*)</p>	<p>4 were retrieved (1 meta-analysis, 1 systematic review, 1 narrative review, 1 irrelevant)</p>