

**Meeting the Challenge of
Antimicrobial Resistance:
From Communication to
Collective Action**

IACG Discussion Paper

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Disclaimer

This document reflects the discussions of the IACG subgroup responsible for the topic “public awareness, behaviour change, and communication” to date and will be subject to change as the discussions continue. It does not necessarily reflect the views of the IACG as a whole.

Key Messages

- Communicating about antimicrobial resistance (AMR) – from raising awareness to behavior change interventions and monitoring for accountability – is a cornerstone of the Global Action Plan on AMR by all the Tripartite agencies (WHO, FAO and OIE), partners, and stakeholders, as well as of National Action Plans on AMR.
- From developing normative guidance to supporting campaigns, intergovernmental agencies, including the Tripartite, have applied a range of programmatic approaches to support communicating for change on public health issues, including on AMR. These include translating evidence-based guidelines into practice, supporting campaigns targeting key actors, and enlisting and ensuring civil society participation in communicating AMR.
- To move awareness to action, this paper discusses five, interrelated, strategic components: targeting priorities, raising awareness, supporting behavior change, enabling collective action, and monitoring for accountability.
- From governments to funding agencies, targeting priorities for effective communication campaigns builds on expert normative guidance, is shaped by prevailing and disparate narratives like the war metaphor, One Health, or AMR’s role in attaining the Sustainable Development Goals, and would benefit from evidence-based modeling and stakeholder assessments.
- Successful campaigns to raise public and provider awareness have taken a multi-modal approach. Their design might be informed, and their effectiveness measured by surveys, focus group discussions and stakeholder interviews. Campaigns like tobacco control’s MPOWER efforts have, with government and philanthropic support, supported and complemented an array of policy and behavior change interventions.
- Approaches to behavior change in AMR take direction from research and piloted interventions, but much work remains to adapt these efforts to target different stakeholder groups and differently resourced settings. Education and training, credentialing, and expert norms help to shape the enabling environment for behavior change in the healthcare delivery system, veterinary services activities, food production systems, and the environment.
- Scaling behavior change among individual actors to system-wide change will involve enabling collective action. Professional societies, civil society, industry trade associations, and intergovernmental agencies all have a role to play and will require investment.
- Importantly, monitoring for accountability can help benchmark progress made towards goals in the AMR strategy. Various examples show that monitoring can help make data actionable, and surveillance findings, a trigger for policy change. Collectively, these efforts can hold stakeholders accountable and comprise a global watch for AMR.

Meeting the Challenge of Antimicrobial Resistance: From Communication to Collective Action

Objective

This paper provides a cross-cutting framework for considering how communication approaches might help protect human, animal and environmental health. We hope that the paper will serve as a useful sounding board for discussing potential areas for recommendation by the IACG. These recommendations are meant to provide practical guidance for approaches needed to ensure sustained effective action to address antimicrobial resistance, including options to improve coordination, taking into account the Global Action Plan on Antimicrobial Resistance and the IACG Framework for Action¹ We invite input from all stakeholders on the strategic approaches raised in this paper.

Key Questions for Stakeholders

1. How can we best measure and prioritize efforts that communicate AMR effectively, so that limited resources are used optimally?
2. What are the major barriers to changes in antimicrobial use and management among priority stakeholder groups and communications recommendations to tackle these?
3. What are appropriate and practical incentives for changes in practice? What lessons might be learned from other areas, from vaccination to WASH (water, sanitation and hygiene) campaigns, that could inform what the IACG might recommend?
4. What research agenda is needed to support efforts to communicate AMR? How might this communications research best be funded and coordinated?
5. What model approaches best mobilize key actors in tackling AMR while raising awareness? How might one best structure a multi-stakeholder platform for AMR communications and a community of practice linking these key communications focal points?
6. Where and what would be the most strategic opportunities for investing in efforts that communicate AMR? How can the Tripartite agencies and other intergovernmental agencies be supported to carry out this work?
7. How can we best scale promising strategies for changing individual behavior into collective action to effect AMR change? What groups might be enlisted in these efforts? What role does civil society, professional societies and industry trade associations among others constructively play in these efforts, and how might this be supported?
8. What opportunities are there for enabling effective monitoring for accountability towards effecting AMR change? What enabling conditions are critically important for such efforts, and how can we best ensure that these conditions are met?

¹ McKinsey & Company. AMR Framework for Action: Working Document, August 2017. Available at: http://www.who.int/antimicrobial-resistance/interagency-coordination-group/20170818_AMR_FfA_v01.pdf

Global Progress and Priorities for Action

Improving awareness and understanding of antimicrobial resistance (AMR) is a cornerstone of the Global Action Plan on AMR, adopted by the World Health Assembly, and FAO and OIE delegates; communications also feature in the [FAO Action Plan](#) and [OIE Strategy](#) on AMR. The tripartite (FAO, OIE and WHO) annual country self-assessment survey reports at least 100 countries are now implementing or developing National Action Plans to combat AMR — since the commitments made in 2015 — with the aim of protecting global health as drug-resistant pathogens cross borders. Effective communication to empower and enable stakeholder action on AMR is foundational to the successful implementation of these National Action Plans. The findings from AMR surveillance can help trigger policy change and strengthen governance by feeding into monitoring and evaluation efforts to track progress and ensure accountability. But the paucity of surveillance data in resource-limited countries is a major obstacle, and ultimately changes in practice will depend on mobilizing key actors — from human, animal and plant health workers to those working throughout the food value chain — to change how we prevent and respond to infectious disease.

The growing awareness of drug-resistant infections by citizens and policymakers helps to support collective behavior change among key actors. The World Health Organization (WHO) Director-General Margaret Chan warned that the world was at the precipice of a post-antibiotic era.² A year later, the World Economic Forum identified AMR as one of the most significant global risks.³ The World Bank's analysis reveals the global toll from antimicrobial resistance and its disproportionate burden on low- and middle-income countries (LMICs). Their report estimates the cost of AMR containment at US\$9 billion annually in LMICs. But without immediate action, the costs of AMR will rise to US\$3.8 trillion each year by 2030 and will push an additional 24 million people into extreme poverty. The Bank argues that putting resources into stopping AMR now is one of the highest-yield investments countries can make.

A 2015 survey by the WHO in 12 countries across the six WHO regions provides a useful baseline of the general public's knowledge over the appropriate use of antibiotics.⁴ Over a third of the nearly 10,000 survey respondents had taken antibiotics in the past month. Over half (64%) mistakenly believed that viral infections such as influenza or colds could be treated with antibiotics, and nearly a third (32%) thought that stopping antibiotics when they felt better rather than completing a course as prescribed was the appropriate behavior. However, the vast majority of respondents indicated that regular hand washing would help address the problem of antibiotic resistance (91%) and that antibiotics should be used only when prescribed (87%). Yet over half (57%) believed there was little that people like themselves could do to stop the problem of antibiotic resistance. These findings point to the

² Chan M. Antimicrobial resistance in the European Union and the world. Keynote address at conference on "Combating antimicrobial resistance: time for action," Copenhagen, Denmark, 14 March 2012. Available at: http://www.who.int/dg/speeches/2012/amr_20120314/en/

³ Global Risks 2013: An Initiative of the Risk Response Network, eighth edition. Geneva, Switzerland: World Economic Forum, 2013. Available at: http://www3.weforum.org/docs/WEF_GlobalRisks_Report_2013.pdf

⁴ World Health Organization. Antibiotic Resistance: Multi-Country Public Awareness Survey. Geneva, Switzerland: WHO, 2015. Available at: <http://apps.who.int/medicinedocs/documents/s22245en/s22245en.pdf>

considerable opportunity to improve the public’s understanding of drug-resistant infections and to engage key stakeholders in such efforts.

The same WHO survey revealed broad awareness of the growing problem of drug-resistant infections (72%), but three in four respondents (76%) incorrectly thought that the body, not bacteria, becomes resistant to antibiotics. Mendelson and his colleagues have called upon the IACG to review the terminology used in this policy landscape.⁵ The authors proposed that “drug-resistant infection” — not AMR — would more clearly communicate to most people the challenge faced. This would also be consistent with the framing used in tuberculosis. They point to other examples — “global warming,” “second hand smoke” and “human immunodeficiency virus” — where words mattered in communicating major global health concerns to the general public. For effective communication, terminology can be tailored to the particular audience, stakeholder group and context as there is no “one size fits all” solution.

Narratives shaping the response to antimicrobial resistance

The prevailing narrative of AMR shapes how the public and policymakers understand and respond to drug-resistant infections, paving the way for novel approaches, but also sometimes creating blindspots to addressing this challenge. Combating AMR reflects the language of the war metaphor — an understanding of bacterial disease as a battle between invading microorganisms and susceptible hosts. Although fear can be an effective motivator, stakeholders may ‘switch off’ and disconnect if communications are framed in catastrophic terms. But framing a response to drug-resistant infections in terms of achievable progress and hope can also be a challenge.

A more holistic view of AMR would also consider other convergent factors contributing to the emergence of infectious disease and human responses — ecological and human-constructed environments, genetic and biological factors, and social, ideational, political and economic differences.⁶ Such a broader view is reflected in traditional cultural approaches, such as *sumak kawsay*, an indigenous Andean belief system of living in harmony with oneself, one’s community and the environment. This has led to ReAct Latin America working with other regional networks to address antibiotic resistance in an ecosystem context.⁷ It has also spawned investigations of how antibiotics have affected the gut microbiota of children and its potential effects on weight gain⁸ and of cattle and methane production.⁹ Leveraging

⁵ Mendelson M, Balasegaram M, Jinks T, Pulcini C, Sharland M. Antibiotic resistance has a language problem. *Nature* 2017; 545: 23-25. Available at:

https://www.nature.com/polopoly_fs/1.21915!/menu/main/topColumns/topLeftColumn/pdf/545023a.pdf

⁶ Forum on Microbial Threats, Board on Global Health. Ending the War Metaphor: The Changing Agenda for Unraveling the Host-Microbe Relationship. A Workshop Summary. Washington, DC: National Academy of Sciences, 2006. Available at:

https://www.ncbi.nlm.nih.gov/books/NBK57071/pdf/Bookshelf_NBK57071.pdf

⁷ “Holistic vision—‘Sumak Kawsay’ or ‘Living Well.’ ReAct Latin America. Available at:

<https://www.reactgroup.org/about-us/a-global-network/react-latin-america/>

⁸ Million M, Lagier J-C, Yahav D, Paul M. Gut bacterial microbiota and obesity. *Clin Microbiol Infect* 2013; 19: 305-313. Available at: [https://www.clinicalmicrobiologyandinfection.com/article/S1198-743X\(14\)60976-9/pdf](https://www.clinicalmicrobiologyandinfection.com/article/S1198-743X(14)60976-9/pdf)

this more holistic view of AMR has led to alternative treatment approaches, from fecal transplants to treat *Clostridium difficile* diarrhea to the use of synbiotics to reduce neonatal sepsis.¹⁰

In the food and agriculture system, FAO with the support of UK's [Fleming Fund](#) and the United States Agency for International Development (USAID) is working with local stakeholders in resource-limited countries using an anthropological approach to better understand myriad factors influencing farmer and veterinarian decisions when it comes to preventing and treating infections. By viewing challenges and solutions in a systems context that is wider than just antimicrobial use patterns, experts and stakeholders can initiate practical changes in behavior where addressing AMR is just one part of solving broader health and farming challenges to build safer and more sustainable production systems overall. Framing AMR in the context of achieving these other goals is also aided by connecting the language of AMR to the language of everyday living and working towards these other achievements.

Tackling AMR can also be viewed as critically important to achieving sustainable development.¹¹ AMR can threaten food security and the inroads made in lowering maternal mortality, deaths from neonatal sepsis, and even the treatment of non-communicable diseases, from cancer to organ transplants. If unchecked, AMR will swell the ranks of the impoverished. Sustainable Development Goals (SDGs) do not currently include any indicators specific to antimicrobial resistance. Yet interventions from WASH (water, sanitation and hygiene) to vaccination can influence the prevalence of bacterial infections and avert antibiotic treatment days. Framing AMR as part of these campaigns could help mainstream these efforts.

Following another narrative, a One Health approach recognizes that more than half of all known infectious diseases in humans have zoonotic origin.¹² This interconnection among healthcare delivery systems, animal health systems and the environment has led to interdisciplinary collaboration, from professional societies to the Tripartite agencies, and has prompted a multisectoral response to emerging zoonotic diseases in the Global Health Security Agenda.

In the UK Government's Independent Review on AMR, one of the report's key recommendations called for "a massive global public awareness campaign," costing such efforts at US\$40-100 million a year. However, such efforts can also be made more

⁹ Hammer TJ, Fierer N, Hardwick B, et al. Treating cattle with antibiotics affects greenhouse gas emissions, and microbiota in dung and dung beetles. *Proc R Soc B* 2016; 283: 1-7. Available at: <http://rspb.royalsocietypublishing.org/content/283/1831/20160150>

¹⁰ Panigrahi P, Parida S, Nanda NC, et al. A randomized symbiotic trial to prevent sepsis among infants in rural India. *Nature* 24 August 2017; 548: 407-412. Available at: <http://eutils.ncbi.nlm.nih.gov/entrez/eutils/elink.fcgi?dbfrom=pubmed&id=28813414&retmode=ref&cmd=prlinks>

¹¹ Jasovsky D, Littman J, Zorzet A, Cars O. Antimicrobial resistance—a threat to the world's sustainable development. *Ups J Med Sci* 2016 Aug; 121(3): 159-164. Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4967260/>

¹² CDC. "One Health." Atlanta, GA: U.S. Centers for Disease Control and Prevention, Last retrieved June 29, 2018. Available at: <https://www.cdc.gov/onehealth/index.html>

economical by embedding communications on AMR into existing and related campaigns such as those promoting better hygiene and biosecurity practices. Increased awareness and understanding will be critical to sustaining AMR efforts years into the future, but it is just a first step. The critical challenge is how to engage the public and policymakers, enlist key stakeholders, and shape incentives and institutions to support these goals. This will require more than an annual, public service announcement (PSA) campaign.

Priorities for the strategic use of communications

This discussion paper proposes five core components to help frame and connect the range of activities needed to make strategic communications an effective tool to address AMR. These five components include:

1. Targeting Priorities
2. Raising Awareness
3. Supporting Behavior Change
4. Enabling Collective Action
5. Monitoring for Accountability

Collectively, these five components offer a unifying framework for aligning communication efforts with other strategic policy areas that the IACG has under consideration, from improving antimicrobial stewardship and feedback from surveillance systems to supporting the work under National Action Plans and global governance. Depicting these five components as a cycle speaks to their interconnectedness and the synergy that comes from this interplay. Powerfully, monitoring for accountability can contribute to targeting priorities for AMR. However, it does belie non-linear and sometimes bidirectional relationships among these components. For example, in raising awareness, priorities for targeting key messages may shift over time. Supporting behavior change among individual health care workers or those working in food production systems can lead to collective action on AMR, and vice versa.



Figure 1: Five Components of Communicating AMR

Governance Approaches

A range of governance approaches can support or enable effective communication on AMR. Coordinating communications among Tripartite and partner organizations could help mainstream AMR into their activities and avoid duplication of effort. Going a step further, one could build multi-stakeholder platforms for AMR communications and a community of practice that engages communication focal points in Member States, private industry, civil society, the research community, NGOs and UN and partner organizations. Multi-stakeholder platforms might be particularly useful for facilitating dialogue and information exchange as well as improving how resources are used through improved collaboration on initiatives. Applied to local, national and regional levels, such platforms could support a stronger, bottom-up community mobilization approach.

Drawing upon previous efforts in other sectors, IACG recommendations can build on a rich array of examples. As a starting point, several examples take approaches that 1) translate evidence into practice; 2) support campaigns that communicate public health and good production practice messages; or 3) engage civil society participation.

One approach would be to build upon the normative guidance put forward by intergovernmental agencies and to translate evidence-based guidelines into practice.

The Tripartite agencies (World Health Organization, Food and Agriculture Organization, and the World Organisation for Animal Health) as well as other UN agencies and norm-setting institutions like the Codex Alimentarius Commission all issue expert and evidence-based guidance on the use of antimicrobials. Such guidance plays an important role in informing global norms such as the World Trade Organization's Sanitary and Phytosanitary Measures, identifying priorities for drug-resistant pathogens and antibiotics critically important for human and veterinary health, and shaping regulatory standards at the national and professional society levels. Tripartite efforts to give shape to the Global Framework for Development and Stewardship to Combat Antimicrobial Resistance also represent another important, norm-setting process.¹³

Two childhood illnesses — pneumonia and diarrhea — claim the lives of more than one out of every four children that die under the age of 5 globally.¹⁴ Of those with suspected pneumonia, fewer than one in three receive antibiotics globally. Yet of those children with diarrhea, fewer than four in ten receive appropriate treatment with oral rehydration therapy and continued feeding, and many of these children instead are treated inappropriately with antibiotics. The twin challenges of overuse and underuse — and of access and stewardship — of antibiotics come into sharp relief with this example. Responding to this challenge, WHO and UNICEF promulgated the Integrated Management of Childhood Illness strategy in 1995.

¹³ Food and Agriculture Organization, World Organisation for Animal Health & World Health Organization. Global Framework for Development & Stewardship to Combat Antimicrobial Resistance Draft Roadmap, May 2017. Available at:

http://www.who.int/phi/implementation/research/WHA_BackgroundPaper-AGlobalFrameworkDevelopmentStewardship.pdf

¹⁴ UNICEF. Pneumonia and diarrhoea: Tackling the deadliest diseases for the world's poorest children. June 2012. Available at:

https://www.unicef.org/eapro/Pneumonia_and_Diarrhoea_Report_2012.pdf

In 2003, the strategy adopted a component focused on care for newborns under one week old and was renamed accordingly to Integrated Management of Newborn and Childhood Illness (IMNCI), a strategy adopted by over 100 countries. In taking stock over the past couple decades, important lessons inform the IMNCI work going forward.¹⁵ From the vantage point of communicating effectively on AMR, these lessons include mainstreaming IMNCI efforts within a more holistic view of child health and framing the work of IMNCI within the Sustainable Development Goals; ensuring country-led planning for scale-up and implementation with WHO/UNICEF training materials and guidance through an integrated community case management approach; enabling countries to apply innovative strategies to identify and prioritize where services must be targeted to reach underserved populations; coming up with less resource-intensive approaches to training community health workers, reaching settings with few facilities, and extending efforts to include the private sector; establishing a global, online repository of guidelines, documentation and tools along with a platform for sharing best practices and south-to-south partnerships over collaboration research. Building upon AMR-specific efforts within IMNCI not only has promise, but also opens a range of policy options that the IACG could consider in making recommendations for advancing efforts that better communicate AMR.

Another approach is to support campaigns that communicate public health and good production practice messages. The Tobacco Free Initiative (TFI), established in 1998 by WHO, is committed to raising awareness of tobacco use and to help countries implement effective tobacco ‘demand-reduction’ strategies. The initiative produces a variety of communications and advocacy materials to promote its activities aimed at journalists, the general public and country partners about the harmful effects of tobacco. The TFI website houses a range of tools, case studies and best practices on tobacco control ranging from a health warnings database to country profiles and multimedia campaign products for partners to effectively carry out observance of “World No Tobacco” Day.

The [#ColostrumIsGold](#) campaign created by the Responsible Use of Medicines in Agriculture ([RUMA](#)) Alliance unites the UK cattle, sheep and pig sectors with the common aim of making sure that newborn calves, lambs and piglets receive the right amount of quality colostrum as quickly as possible after birth to help prevent respiratory infections and reduce antibiotic use and mortality rates. RUMA’s [farmantibiotics.org](#) website also features tools, videos, case studies, myth-busting information, questions answered by experts, and progress updates on antibiotic use in UK farming.

The Tripartite agencies and many other partners have sought to raise awareness through the annual observance of [World Antibiotic Awareness Week](#) (this year from 12-18 November, 2018). Rallying the global community around AMR issues, the challenge remains how to sustain such efforts throughout the year and to move from awareness raising to behavior change.

All three Tripartite agencies have active work underway on behavior change. FAO has a roadmap and toolkit to assist country teams in assessing priority stakeholder groups to

¹⁵ Costello AM and Dalglish SL on behalf of the Strategic Review Study Team. Towards a Grand Convergence for child survival and health: A strategic review of options for the future building on lessons learnt from IMNCI. Geneva: WHO, 2016.

evaluate awareness, understanding, attitudes, practices, barriers and incentives to change, and for designing appropriate interventions through communication campaigns, education and training programs. With the support of the Fleming Fund and USAID, FAO is working directly with local stakeholders in select resource-limited countries on pilot projects. These include stakeholder assessments and interventions with monitoring and evaluation to assess uptake and sustainability of new practices. The aim of these pilot projects is to build a community of practice and develop effective approaches for improving production and antimicrobial use patterns so that these approaches can be upscaled and implemented in more countries.

With Wellcome Trust support, WHO has convened the [first expert global technical consultation group of AMR behavior change](#) in November 2017. The group has focused on relevant behaviors among target audiences that drive overuse and misuse of antimicrobials on the human health side. The group also discussed best practices to establish appropriate antibiotic use through lessons learned from other long-standing behavior change programs, such as malaria, HIV and tobacco. The consultation also sought to identify priority target audiences, potential barriers and interventions as well as approaches to evaluating and measuring their impact.

Joining and complementing these efforts, OIE's Communication Unit has included in its five regional seminars for Communication Focal points a specific module dedicated to AMR communication and behavior change. As part of this training program, participants work together to identify barriers and possible behavior change interventions for ensuring responsible and prudent use of antimicrobials in animals. With the support of the Fleming Fund, OIE is also planning a behavior change expert consultation and meeting focused on animal health. The objective is to build an evidence-based methodology and framework for national Veterinary Services to drive behavior change on the responsible and prudent use of antibiotics in the animal health sector. Additional resources would enable the Tripartite agencies to deepen their human resource commitment to these activities, work on behavior change guidelines dissemination, implement campaigns in partnership with Member States, support needed research, and train journalists in covering AMR issues.

Finally, engaging civil society can amplify and sustain efforts to communicate effectively. The Stop TB Partnership's *Challenge Facility for Civil Society (CFCS)* is an innovative small grants mechanism that, since 2007, has supported hundreds of CSO and community-led responses to fight TB.¹⁶ To date, the CFCS has made over US\$ 2 million in investments to 120-plus CSO grantees in over 40 countries, and in so doing, demonstrated the effectiveness of local, community responses. In fact, the Stop TB Partnership's Global Plan to Stop TB 2016-2020 categorically called for integrated responses to TB that "include strong partnerships with communities and civil society." Such an approach might be emulated more broadly for other work on drug-resistant infections, across the healthcare delivery system, veterinary services and the food production system. This work with civil society can bolster existing programs or extend communication efforts to tackle AMR in hard-to-reach places.

¹⁶ Stop TB Partnership. "Challenge Facility for Civil Society." Available at: <http://www.stoptb.org/global/awards/cfcs/>

Component 1: Targeting Priorities

Key Takeaways

1. Those who prescribe (healthcare workers or veterinarians), those who dispense (pharmacists, retailers or veterinarians), and those who consume (patients or farmers treating diseases in plants or animals) each play key roles in shaping the response to AMR. By investigating how antimicrobials flow through the supply chain and where they are used, “hotspots” for priority intervention and communications can be identified. Engaging key stakeholders early can help enlist their participation and determine how best to focus interventions for greatest impact.
2. An evidence-based approach can be bolstered by modelling the predicted impact of different intervention options and by using feedback from measuring intervention impact and sustainability to adapt these approaches. The findings from surveys can help guide the effective framing of campaign messages, target interventions, and trigger policy change. Beyond surveys — stakeholder interviews, focus group discussions, and informal community meetings can clarify the motivations of different stakeholders and ground the development of more practical interventions.
3. Mainstreaming AMR into broader health, agricultural and environmental projects can extend the reach of such efforts and make more efficient use of resources, as well as integrating such programs more sustainably into longstanding development efforts.

Setting priorities is key. Various factors influence priority setting. Normative frameworks can help policymakers identify specific priorities. For example, the WHO’s work on a Priority Pathogens List, population-targeted guidelines such as IMNCI, and disease-specific guidelines from gonorrhoea¹⁷ to carbapenem-resistant Enterobacteriaceae triangulate to prioritize antibiotics on the WHO Essential Medicines List.¹⁸

By examining the supply chain and flow of antimicrobials from manufacturing to use, certain points make more strategic targets for intervention. For example, conducting surveillance of antimicrobials at the level of drug manufacturers requires a far smaller sampling frame than doing so at the pharmacy outlet. Similarly, certain stakeholder groups will play a greater role in influencing the use of antibiotics — those who prescribe (healthcare workers or veterinarians), those who dispense (pharmacists, retailers and veterinarians), and those who consume (patients or farmers treating plant and animal infections). Each of these groups requires different messaging and targeting strategies. Priority setting helps to pinpoint where efforts should be focused for greatest impact and return on investment.

¹⁷ WHO, WHO Guidelines for the Treatment of *Neisseria gonorrhoeae*, 2016. Available at: <http://apps.who.int/iris/bitstream/10665/246114/1/9789241549691-eng.pdf?ua=1>

¹⁸ WHO, Guidelines for the prevention and control of carbapenem-resistant Enterobacteriaceae, *Acinetobacter baumannii* and *Pseudomonas aeruginosa* in health care facilities. Geneva: World Health Organization; 2017. Licence: CC BY-NC-SA 3.0 IGO. Available at: <http://apps.who.int/iris/bitstream/10665/259462/1/9789241550178-eng.pdf?ua=1>

Guiding the setting of priorities, policymakers would benefit from models that point to investment targets and from tools that measure the impact and sustainability of interventions. Such targeting might focus an intervention on a particular stakeholder group, location, or place in the supply chain of the healthcare delivery or food production system. AMR-specific approaches may target, for example, medical conditions or production practices prompting antibiotic overuse. By contrast, AMR-sensitive approaches could mainstream efforts into broader development efforts.

Surveys, stakeholder interviews, focus group discussions, and informal community meetings can all help in developing practical interventions and this participatory approach is vital to ensure that stakeholders are invested in the process and to increase probability of success. In a study of the public and community pharmacists in affluent and deprived areas in London, two-thirds of those from affluent areas responded that they would distrust their physician if the doctor refused their request for an antibiotic, but among deprived areas, only one out of five would feel the same.¹⁹ With most prescribed antibiotics in human health occurring in the primary care setting, community pharmacists have an opportunity to counsel patients on the use of antibiotics. Though participants in deprived areas responded much better to such counseling on correctly taking an antibiotic, fewer than one in five benefited from such counseling on antibiotic usage from a community pharmacist. Such studies point to potential “hotspots” for intervention.

The lack of data in many countries limits priority setting efforts. Country governments and organizations must invest in surveys, stakeholder assessments and other tools for monitoring to help identify risk 'hotspots' for intervention. Such instruments can do more than capture knowledge, attitudes and practices. Their findings can also trigger policy change on AMR. Raising public awareness over the use of antibiotics in food production, India's Centre for Science and Environment (CSE) has documented that 40% of poultry samples on the market in 2016 tested positive for one or more antibiotics. CSE used the study to flag concerns over the use of antibiotics for growth promotion in raising poultry and the need for government regulation. Taking a similar approach, Consumer Reports in the United States found nearly seventy percent of pork samples from a range of major store brands carried *Yersinia enterocolitica*, a cause of foodborne infection afflicting over 100,000 Americans a year.²⁰ Most of the bacteria identified on the pork samples were also resistant to at least one antibiotic. Such surveys conducted by consumer organizations have usefully spurred public and policymaker attention over the excessive use of antibiotics in food production and other sectors.

Priorities for targeting communications can be set in various ways. To better assist countries in directing and assessing where resources are required and optimally deployed, the Tripartite agencies and partners can help develop AMR needs assessment tools and a priority setting decision framework. The Tripartite Monitoring and Evaluation Framework

¹⁹ Mason T, Trochez C, Thomas R, Babar M, Hesso I, Kayyali R. Knowledge and awareness of the general public and perception of pharmacists about antibiotic resistance. BMC Public Health 2018; 18:711. Available at:

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5994078/pdf/12889_2018_Article_5614.pdf

²⁰ “Pork chops and ground pork contaminated with bacteria.” Consumer Reports, January 2013.

Available at: <https://www.consumerreports.org/cro/magazine/2013/01/what-s-in-that-pork/index.htm>

provides a start to these efforts. Another noteworthy example is WHO's *Priority interventions: HIV/AIDS prevention, treatment and care in the health sector*,²¹ an umbrella document that brings together over 230 WHO guidance and references for the health sector response to HIV/AIDS.

In a similar vein, a set of comprehensive, up-to-date and user-friendly AMR priority interventions could: 1) promote and support rational decision-making in designing and delivering services requiring the use of antimicrobials; 2) provide a summary of key policy and technical recommendations; and 3) direct stakeholders to the key resources and references

containing the best available information on the overall health, food and agriculture sector responses to AMR.

Competing for limited resources, several widely used methods work to establish priorities for both programs and related communication efforts. One example — the criteria weighting method—is a mathematical process involving defining relevant criteria, assigning weights to these criteria based on their relative significance, and ranking each option by these criteria.²² The USAID MEASURE Evaluation project has applied this to mHealth Initiatives, and within this context, information and communication technology (ICT) priorities set by guidelines resulted in better outcomes than decisions made in an ad hoc manner.²³

Modeling also can provide guidance to priority setting by projecting how different interventions will play out. For HIV/AIDS, UNAIDS has used the AIDS Impact Model, part of the Spectrum suite of policy models. The model allows stakeholders to project scenarios from taking no action to differently funded levels of an intervention strategy. Every two years, the model can be updated with UNAIDS latest national and regional data.²⁴ Making such models publicly available allows governments, civil society and other stakeholders to engage in policy dialogue and advocacy for prioritizing and allocating resources. Simulation modeling can also inform policymaker decisions to prioritize, say, restrictions on cigarette advertising compared to smoke-free spaces and places or a tobacco tax. The SimSmoke model simulates policy scenarios for tobacco control interventions.²⁵ While the model does not capture social interactions or changing norms, it does offer policymakers a forecast of prevention gains, years before such policies play out, based on the best available evidence for such interventions in similar settings. Such models are data-dependent. While they

²¹ WHO. *Priority Interventions: HIV/AIDS prevention, treatment and care in the health sector*. Geneva, Switzerland: WHO, 2010. Available at: http://apps.who.int/iris/bitstream/handle/10665/44418/9789241500234_eng.pdf;jsessionid=2CDB313A4991523B257DEA4739028F05?sequence=1

²² "Prioritization," chapter in *APEXPH in Practice*. Available at: <https://www.cdc.gov/nphsp/documents/Prioritization%20section%20from%20APEXPH%20in%20Practice.pdf>

²³ "Prioritizing ICT Interventions for Health." MEASURE Evaluation, January 2017. Available at: https://www.measureevaluation.org/resources/publications/fs-17-201/at_download/document

²⁴ USAID Health Policy Initiative. *AIDS Impact: HIV and AIDS projections for policy dialogue, planning and advocacy*, June 2010. Available at: http://www.healthpolicyplus.com/archive/ns/pubs/hpi/1182_1_EOP_Brief_HIV_Tools_AIM_6_30_10_FINAL_acc.pdf

²⁵ Levy DT, Bauer JE, Lee HR. Simulation modeling and tobacco control: creating more robust public health policies. *American journal of public health* 2006; 96(3): 494-498.

cannot fully account for how campaigns and collective action might amplify an intervention's effect, they may have value as countries weigh what direction to take National Action Plans on AMR. A range of AMR-focused models, particularly looking at economic costs, have emerged, but approaches similar to the AIDS Impact Model or SimSmoke might be especially useful as more data on surveillance and interventions in LMICs become available.

Geospatial mapping can also help target the allocation of resources. Some lessons can be drawn from the Mapping Malaria Risk in Africa (MARA) Collaboration, set up in 1996, to better inform malaria control activities across sub-Saharan Africa. MARA is an open-access, collaborative and web-based platform that anticipates malaria incidence and transmission. It does not rely just on point prevalence estimates and seasonal data, but also takes into account temperature and rainfall data. Malarial incidence tracks with some of these trends, helping to offset gaps in surveillance data. The findings from MARA help in the strategic deployment of vector control interventions, such as insecticide-treated malaria bednets, and the tracking of local drug resistance.²⁶ Similarly, the use of antibiotics follows seasonal patterns as well, peaking in the winter months when upper respiratory tract infections are more common in human populations²⁷ and peaking in the summer months in the environment timing with agricultural use.^{28,29} Such patterns from geospatial models can help direct when and where communication for AMR might be timed in different countries.

Given limited time and resources to avert a post-antibiotic era, there is value in mainstreaming AMR into broader health, agricultural and environmental projects. Doing so can enable policy implementation by making the issue more visible and facilitating behavior change. There are also opportunities to improve the efficiency by which such resources are deployed and to integrate this work more sustainably into larger development concerns. Mainstreaming looks for opportunities to advance efforts to tackle AMR, in concert, with these objectives, from vaccination to water, sanitation and hygiene (WASH) campaigns.³⁰

²⁶ Gemperli A, Sogoba N, Fondjo E, Mabaso M, Bagayoko M, Briet OJT, et al. Mapping malaria transmission in West and Central Africa. *Tropical Medicine and International Health* 2006; 11(7), 1032-1046. Available at: <https://onlinelibrary.wiley.com/doi/epdf/10.1111/j.1365-3156.2006.01640.x>

²⁷ Goossens H, Ferech M, Vander Stichele R, Elseviers M, ESAC PG. Outpatient antibiotic use in Europe and association with resistance: a cross-national database study. *Lancet* 2005; 365(9459): 579-587. Available at: http://wido.de/fileadmin/wido/downloads/pdf_arzneimittel/wido_arz_ESAC_Lancet_paper_0505.pdf

²⁸ Li N, Zhang X, Wu W, Zhao X. Occurrence, seasonal variation and risk assessment of antibiotics in the reservoirs in North China. *Chemosphere* 2014; 111: 327-335.

²⁹ Jaimes-Correa JC, Snow DD, Bartelt-Hunt SL. Seasonal occurrence of antibiotics and a beta agonist in an agriculturally-intensive watershed. *Environmental Pollution* 2015; 205: 87-96.

³⁰ Cecilia Stålsby Lundborg & Ashok J. Tamhankar. Understanding and changing human behaviour—antibiotic mainstreaming as an approach to facilitate modification of provider and consumer behavior. *Upsala Journal of Medical Sciences* 2014; 119(2): 125-133. Available at: <http://dx.doi.org/10.3109/03009734.2014.905664>

Component 2: Raising Awareness

Key Takeaways

1. Sustaining behavior change requires more than just increasing public awareness. Successful communication campaigns are typically multimodal in approach. Such interventions can benefit from going beyond a “knowledge deficit” approach and be informed by engaging stakeholders in a participatory approach.
2. Governments and intergovernmental agencies bring considerable experience in supporting awareness campaigns targeting the public and key actors. Such strategies can be usefully deployed to address the challenge of drug-resistant infections.
3. Such campaigns have benefited from sharing tools and best practices through a global repository from successful efforts. Joint efforts on World Antibiotic Awareness Week have seeded the start to such a repository, but the success from tobacco control to trachoma suggests much more can be done to scale campaigns to tackle drug-resistant infections.

Efforts to raise awareness can target the public more broadly or key stakeholder groups more directly engaged with antibiotic use. Normative guidance might help determine what messages to prioritize, but surveys and contextualized qualitative research might offer guidance on how to effectively frame and develop simple, clear messages to communicate these norms. Surveys of public or professional knowledge or attitudes unsurprisingly consistently document deficits that explain why antibiotics are overused, underused or misused. Picking up from these findings, public information campaigns might then target one of these deficits: raising awareness of the growing problem of drug resistance, reducing patient expectations of providers’ prescribing antibiotics, or explaining why antibiotics will not work to address common conditions like cold or flu.³¹ Survey findings in Sweden lend credence to the hope that public awareness can change: only 4.5 percent would stop a prescribed antibiotic when feeling better after taking half the treatment course, and 87% would trust a doctor who did not prescribe an antibiotic. Indeed multimodal campaigns in Europe and part of England have resulted in lowered antibiotic use.³² However, sustaining changes in the population’s behavior requires more.

A 'knowledge deficit' approach can fall short though in changing physician behavior. A recent behavioral economics study demonstrates the limitations of an information-only approach against approaches that used peer comparisons. The Chief Medical Officer of Australia’s

³¹ McNulty CAM, Boyle P, Nichols T, Clappison P, Davey P. The public’s attitudes to and compliance with antibiotics. *Journal of Antimicrobial Chemotherapy* 2007; 60(1): i63-i68. Available at: https://academic.oup.com/jac/article-pdf/60/suppl_1/i63/3201827/dkm161.pdf

³² Ashiru-Oredope D, Hopkins S. Antimicrobial resistance: moving from professional engagement to public action. *J Antimicrob Chemother* 2015; 70:2927-2930. Available at: <https://academic.oup.com/jac/article/70/11/2927/2364109>

government sent out letters to high-prescribing general practitioners. The letters that offered peer comparisons, as opposed to an education-only message, were consistently found to be more effective in reducing prescription rates over the subsequent six months.³³

Engaging stakeholder groups in a participatory process could help guide the design of such interventions. In a WHO-commissioned analysis, teams from the London School of Hygiene & Tropical Medicine (LSHTM) and the Royal Veterinary College carried out interviews of health care professionals across a range of LMIC settings in six countries (India, Philippines, Vietnam, Sierra Leone, Nigeria and Ethiopia).³⁴ Certain key themes emerged. Health professionals faced common challenges in prescribing and dispensing antibiotics, including barriers to access to diagnostics and next line antibiotics as well as the need to access information on local resistance patterns and patient medical records. They struggled with deciding whether to treat empirically with antibiotics or not, and which antibiotic to use. The local clinical context—from experience with substandard and falsified drugs to an awareness of resistance—shaped their decision making as did the pressure of dealing with heavy patient loads. Larger environmental concerns over inadequate sanitation and hygiene, burden of infectious disease and infection control, and nutrition also figured into their approach to prescribing and dispensing. Drug company representatives visited frequently, and this reportedly influenced prescribing. Veterinary health workers noted challenges in ensuring adequate antibiotic withdrawal periods in livestock.

Governments play a critical role in leading and supporting campaigns to improve public and provider awareness. From trachoma to tobacco control, intergovernmental agencies also have a long history of backing such campaigns at a global level. In 1997, WHO launched the Alliance for the Global Elimination of Trachoma by the year 2020 (GET2020). GET2020 is a multisectoral partnership that supports implementation of a strategy to eliminate trachoma and works to strengthen national capacity through epidemiological assessment, monitoring, surveillance, project evaluation and resource mobilization. The trachoma strategy was built around four pillars, captured by the acronym SAFE: **S**urgery for people at immediate risk of blindness; **A**ntibiotic therapy to treat individual active cases; **F**acial cleanliness and improved hygiene to reduce transmission and **E**nvironmental improvements, particularly improved access to water and sanitation. Much along the lines of what is urgently needed for AMR, SAFE focuses on addressing behavioral and environmental needs in high-risk countries as well involves donation of antibiotics for treatment through the International Trachoma Initiative. In 2016, 85 million people were treated with azithromycin to eliminate trachoma.

In 2008, WHO introduced a branded package of cost-effective tobacco control measures under the acronym of **MPOWER**:

³³ Australian Department of Health and Department of the Prime Minister and Cabinet. Nudge vs Superbugs: A behavioural economics trial to reduce the overprescribing of antibiotics, June 2018. Available at: <http://www.health.gov.au/internet/main/publishing.nsf/content/Nudge-vs-Superbugs-behavioural-economics-trial-to-reduce-overprescribing-antibiotics-June-2018>

³⁴ Pearson M, Doble A, Glogowski R, Ibezim S, Lazenby T, Haile-Redai A, Shaikh N, Treharne A, Yardakul S, Yemanaberhan R, Reynolds L, Chandler C. Antibiotic Prescribing and Resistance: Views from LMIC Prescribing and Dispensing Professionals. Report to World Health Organisation AMR Secretariat, 2018. Available at: <http://www.who.int/antimicrobial-resistance/LSHTM-Antibiotic-Prescribing-LMIC-Prescribing-and-Dispensing-2017.pdf>

- **M**onitoring tobacco use and prevention policies
- **P**rotecting people from tobacco smoke
- **O**ffering help to quit tobacco use
- **W**arning about the dangers of tobacco
- **E**nforcing bans on tobacco advertising, promotion and sponsorship
- **R**aising tobacco taxes

The MPOWER measures can easily be tailored to each country's needs and are rigorously tracked, particularly in LMICs where the tobacco industry aggressively seeks new markets. To date, MPOWER initiatives have contributed to policy efforts in nearly 60 countries, touching the lives of almost 3.5 billion people and saving an estimated 30 million of them.³⁵

FAO has also championed campaigns on various issues. Their work on stopping child labor in agriculture focuses on the 108 million girls and boys worldwide, who toil under often hazardous conditions and for very long hours. This campaign provides a glimpse at the spectrum of activities in which FAO has engaged to bring attention to this issue.³⁶ Working with other agencies from the International Labour Organization to the International Fund for Agricultural Development, the FAO works with the International Partnership for Cooperation on Child Labour in Agriculture on a multi-faceted approach to this global concern. Working to address the root causes of child labor, FAO has built the knowledge base, alternative strategies such as the adoption of labor-saving technologies, and regulatory guidance for agricultural practices that reduce the occupational hazards involved. FAO has also had to work with country governments to integrate child labor concerns into national agricultural development planning and taken these issues forward for policymaker commitment at the national and regional levels. FAO also supports initiatives, like the World Day Against Child Labor, as well as opportunities to address these concerns through the revised International Code of Conduct on Pesticide Management, signaling how both governments and the pesticide industry might decrease the exposure of children vulnerable to pesticide use.

The OIE "[We Need You](#)"³⁷ campaign, supported by the Fleming Fund, focuses on components of the OIE's Strategy on Antimicrobial Resistance and the Global Action Plan by building awareness and understanding, supporting good governance and capacity building and encouraging national implementation by Member Countries of the OIE international Standards on antimicrobials to improve the responsible and prudent use of antimicrobials in veterinary services and other key stakeholders. The preliminary analysis conducted with animal health stakeholders identified a strong reliance on peer-to-peer methods of communication. As part of this campaign, the OIE developed a toolkit for national Veterinary Services, outlining principal actions for several target groups, such as policymakers,³⁸

³⁵ WHO. "New tobacco control investment supports MPOWER roll-out," Press Release, 5 December 2016. Available at: <http://www.who.int/tobacco/communications/news/bloomberg-new-tobacco-control-commitment/en/>

³⁶ FAO. Child Labour in Agriculture. Available at: <http://www.fao.org/childlabouragriculture/en/>

³⁷ OIE, WE NEED YOU to handle antimicrobials with care. Available at: <http://www.oie.int/for-the-media/press-releases/detail/article/we-need-you-to-handle-antimicrobials-with-care/>

³⁸ OIE, We need you to take action to ensure antimicrobials are handled with care (Policy makers).

Available at:

http://www.oie.int/fileadmin/Home/eng/Media_Center/docs/pdf/PortailAMR/WAAW2017/Leaflets/EN_OIE-AMR-POLICY-MAKERS-BD.pdf

veterinarians,³⁹ pharmaceutical industry,⁴⁰ animal feed manufacturers,⁴¹ wholesalers and retailers.⁴² The key messages of the campaign highlight the recommendations covered by OIE International Standards that support well-structured Veterinary Services and adequate national legislation and thereby ensure that all countries, including LMICs, have the capacity to address the challenge of AMR.

A recent randomized trial in Burkina Faso showed that a radio campaign could successfully increase consultations for malaria, pneumonia and diarrhea for children under age five. Over the course of three years, a radio campaign specifically targeting these three diseases was broadcasted across seven community radio stations five days a week, which led to increased primary care consultations for malaria, pneumonia and diarrhea symptoms. The intervention changed healthcare-seeking behavior, and in so doing, averted deaths among children under age five by 7% per year. Such saturation-based media campaigns may have potential in low-income settings.⁴³

At both global and national levels, repositories could curate collections of communication materials and tested campaign messages that might readily be adapted to the local context and language. For example, the U.S. Centers for Disease Control and Prevention maintains the Media Campaign Resource Center to provide tobacco control groups CDC-licensed counter-advertising.⁴⁴ Such a clearinghouse can organize related materials into a campaign; negotiate talent, photographer and music fees associated with distribution; manage the use agreements for accessing these materials by non-profit organizations; and ensure the integrity of their use by for-profit organizations. With the annual observance of World Antibiotic Awareness Week, there is a growing opportunity to recruit such materials to expand the [Tripartite AMR repository](#).⁴⁵ The [ReAct Toolbox](#) also serves as a repository with

³⁹ OIE, WE NEED YOU to handle antimicrobials with care (Veterinarians). Available at: http://www.oie.int/fileadmin/Home/eng/Media_Center/docs/pdf/PortailAMR/WAAW2017/Leaflets/EN_OIE-AMR-Veterinarians-4P-BD.pdf

⁴⁰ OIE, WE NEED YOU to handle antimicrobials with care (Pharmaceutical industry). Available at: http://www.oie.int/fileadmin/Home/eng/Media_Center/docs/pdf/PortailAMR/WAAW2017/Leaflets/EN_OIE-AMR-PHARMACEUTICAL-INDUSTRY-BD.pdf

⁴¹ OIE, WE NEED YOU to handle antimicrobials with care (Animal feed manufacturers). Available at: http://www.oie.int/fileadmin/Home/eng/Media_Center/docs/pdf/PortailAMR/WAAW2017/Leaflets/EN_OIE-AMR-Animal-Feed-BD.pdf

⁴² OIE, WE NEED YOU to handle antimicrobials with care (Wholesale and retail distributors). Available at: http://www.oie.int/fileadmin/Home/eng/Media_Center/docs/pdf/PortailAMR/WAAW2017/Leaflets/EN_OIE-AMR-Wholesale-Retail-Distributors-BD.pdf

⁴³ Murray J, Head R, Sarrasat S, et al. Modelling the effect of a mass radio campaign on child mortality using facility utilisation data and the Lives Saved Tool (LiST): findings from a cluster randomised trial in Burkina Faso. *BMJ Global Health* 2018;3:e000808. Available at: <https://gh.bmj.com/content/3/4/e000808>

⁴⁴ Media Campaign Resource Center, Smoking & Tobacco Use, U.S. Centers for Disease Control and Prevention. Available at: <https://www.cdc.gov/tobacco/multimedia/media-campaigns/help/faq/index.html>

⁴⁵ FAO, OIE and WHO. Antibiotics: Handle with Care. Platform for World Antibiotic Awareness Week 2017. Available at: <http://apps.who.int/world-antibiotic-awareness-week/activities/en#/grid-content>

best practice examples and resources ranging from setting up a campaign to promoting behavior change among providers.⁴⁶

Component 3: Supporting Behaviour Change

Key Takeaways

1. A systematic review of the literature has documented how the hospital prescribing of antibiotics can be improved by both rules-based approaches (restrictive techniques) and feedback approaches (enablement techniques). But systems-level interventions involve more: effective targeting, multimodal campaigns, and changing the choice architecture. Multi-pronged approaches have effectively lowered antibiotic use in food production as well. Setting incremental targets, enhancing surveillance, and providing feedback to trigger behavior change among key users were key in the design of such interventions.
2. Incentives — both financial and non-financial — have an important role in shaping behavior change. New approaches from behavioral economics apply insights from psychology to support such change.
3. Integrating such behavior change approaches in professional education, training, certification and credentialing plays a critical role in enabling and enlisting key stakeholders to address drug-resistant infections and the use of antimicrobials. Peer-to-peer learning adds an important dimension to these efforts.

From awareness to action, global efforts must leverage opportunities to encourage behavior change. Public and provider awareness of a post-antibiotic era can motivate individual behavior change, and both healthcare delivery and food production systems can put in place ways for individual practitioners, health workers and farmers to respond. Systematic reviews have shown what approaches have had a useful impact, but replicating behavior change interventions is too often challenged by sparse descriptions in the available literature.

For the healthcare delivery system, a Cochrane systematic review found broadly two kinds of interventions that improved hospital prescribing of antibiotics — rules-based approaches to improve physician prescribing (restrictive techniques) and advice and feedback approaches to support physician prescribing (enablement techniques).⁴⁷ These approaches had the potential of shortening hospital length of stay without increasing patient mortality. Enablement techniques proved effective in improving antibiotic prescribing, whereas studies from multiple studies of restrictive techniques raised concerns over delayed treatment and the erosion of trust between hospital ward teams and infectious disease specialists.

⁴⁶ ReAct Toolbox for action on antibiotic resistance, available at: <https://www.reactgroup.org/toolbox/>

⁴⁷ Davey P, Marwick CA, Scott CL, Charani E, McNeil K, Brown E, Gould IM, Ramsay CR, Michie S. Interventions to improve antibiotic prescribing practices for hospital inpatients. Cochrane Database of Systematic Reviews, 9 February 2017. Available at: <http://cochranelibrary-wiley.com/doi/10.1002/14651858.CD003543.pub4/abstract;jsessionid=F5CE9CAB5A9A048B164AFE B9CFC6B387.f03t03>

Thailand's Antibiotic Smart Use (ASU) can provide a valuable example of how government initiatives can trigger behavior change among prescribers across the healthcare delivery system. The ASU project in Thailand aimed to curb antibiotic use for non-bacterial infections by focusing first on three conditions: upper respiratory infections (URIs) such as the common cold and sore throat, acute diarrhea and simple wounds. The ASU program combined interventions to improve prescribing practices and a public awareness campaign communicating that antibiotics do not alleviate all "inflammation," that they can cause serious side-effects such as resistance and that they are not effective against the three target conditions. One particularly innovative aspect of the ASU project was to promote herbal medicines as an alternative to antibiotics when faced with a viral infection. By changing the default choice architecture, this strategy supported the behavior change transition among prescribers who were reluctant to only give their patients counseling.⁴⁸ The National Health Security Office accelerated the program's expansion in Thailand by adopting the Antibiotic Smart Use as part of its pay-for-performance criteria.

The ASU project is one example of how behavioral economics can advance better stewardship of antibiotics. Behavioral economics applies the psychology of human behavior to shape economic decision-making. This can involve changing the choice architecture by which decisions are presented to consumers or providers and positively reinforcing helpful choices. For example, by having an herbal substitute to palliate the symptoms of a viral infection, Thai healthcare providers can satisfy patient expectations of receiving treatment for an illness, but can avoid giving out unnecessary antibiotics. Under the pay-for-performance approach, hospitals have incentive to implement ASU. Hospitals receive stepwise financial incentives as they implement treatment guidelines, ensure appropriate use through the hospital formulary, conduct training sessions, and carry out evaluation of the program's outcomes. Incentives — both financial and non-financial — can play an important part in motivating behavior change.

In the WHO-commissioned study from the LSHTM and the Royal Veterinary College, the health professionals volunteered solutions to address these challenges: greater access to second-line antibiotics; improved quality of medicines; restrictions on visits of drug company representatives; antibiograms that documented local resistance patterns; and an enabling infrastructure for delivering quality care, from basic hygiene to adequately staffed human resources and medical record keeping.⁴⁹ As a collaborative effort, OIE joined forces with WHO and the LSHTM to support these study goals in veterinarians and paraprofessionals.

⁴⁸ Sumpradit N, Chongtrakul P, Anuwong K, Pumtong S, Kongsomboon K, Butdeemee P, Khonglormyati J, Chomyong S, Tongyoung P, Losiriwat S, Seesuk P. Antibiotics Smart Use: a workable model for promoting the rational use of medicines in Thailand. *Bulletin of the World Health Organization* 2012; 90: 905-913. Available at:

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3524958/>

⁴⁹ Pearson M, Doble A, Glogowski R, Ibezim S, Lazenby T, Haile-Redai A, Shaikh N, Treharne A, Yardakul S, Yemanaberhan R, Reynolds L, Chandler C. Antibiotic Prescribing and Resistance: Views from LMIC Prescribing and Dispensing Professionals. Report to World Health Organisation AMR Secretariat, 2018. Available at: <http://www.who.int/antimicrobial-resistance/LSHTM-Antibiotic-Prescribing-LMIC-Prescribing-and-Dispensing-2017.pdf>

Multi-pronged approaches to curb the use of antimicrobials in the food production system are also underway. In 2009, antibiotic consumption in Denmark's pig sector represented 80% of all antibiotic prescriptions and was projected to keep rising. The Danish Veterinary and Food Administration (DVFA) set a 10% reduction target from 2010 to 2013 and established the Yellow Card Initiative, which provided an audit and feedback approach to enabling these swine farming operations to comply. Through the Yellow Card System, the DVFA continues to hold farmers accountable to the yearly antibiotic consumption thresholds it sets. Farms that do not reach the threshold within nine months receive a yellow card. If they still have not reached the target nine months later, the DVFA can require increased supervision and advice from an external expert veterinarian to help farms comply. Finally, if farms still have not met the target five months after that, they receive the "Red Card" injunction, and the DVFA will compel them to implement specific initiatives or reduce their stocking density. At each of these three steps, the farm owner is required to pay a fee and cover the cost of any inspection.⁵⁰ After successfully reaching the 10% target, Denmark set a new goal of reducing antibiotic consumption in pig farms by 15% from 2015 to 2018.

In 2007, the Netherlands had some of the highest sales of antimicrobials for food-producing animals in the EU⁵¹, prompting the government, animal sectors and veterinarians to take positive action. In 2010, the [Netherlands Veterinary Medicines Institute, SDa](#), was established to benchmark antimicrobial use among farmers and veterinarians. The SDa set ambitious targets aiming to reduce veterinary antimicrobial use by 50% by 2013 and 70% by 2015 (compared with the 2009 index year). Not only has the quantity of active antimicrobial substances sold decreased by 64%, but there has also been a concomitant decline in the prevalence of drug-resistant *E. coli* in fecal samples from veal calves, pigs and broilers.⁵²

Denmark's Yellow Card initiative and the Netherlands' benchmarking efforts are valuable examples of how incremental targets — supported by enhanced surveillance of antibiotic use and resistance among key users — can trigger behavior change and facilitate policy implementation.⁵³ Such initiatives also illustrate the benefit of twinning policy changes with investment in quality veterinary services to enable changes in antibiotic use at the farm-level without endangering animal welfare or public health.

⁵⁰ Danish Veterinary and Food Administration. Special provisions for the reduction of the consumption of antibiotics in pig holdings (the yellow card initiative), 2017. Available at: <https://www.foedevarestyrelsen.dk/english/SiteCollectionDocuments/Dyrevelfaerd%20og%20veterinaermedicin/Veterin%C3%A6rmedicin/Yellow%20Card,%20English%20version,%20180517.pdf>

⁵¹ European Medicines Agency (EMA). Fourth European surveillance of veterinary antimicrobial consumption (ESVAC) report. Sales of veterinary antimicrobial agents in 26 EU/EEA countries in 2012. Available at: http://www.ema.europa.eu/docs/en_GB/document_library/Report/2014/10/WC500175671.pdf

⁵² Dorado-García A, Dik JM, Jacobs JJH, Van Geijlswijk IM, Mouton JW, Wagenaar JA, Heederik DJ. Quantitative assessment of antimicrobial resistance in livestock during the course of a nationwide antimicrobial use reduction in the Netherlands. *Journal of Antimicrobial Chemotherapy* 2016; 71(12): 3607–3619. Available at: <https://academic.oup.com/jac/article/71/12/3607/2631265>

⁵³ Expert Commission on Addressing the Contribution of Livestock to the Antibiotic Resistance Crisis. COMBATING ANTIBIOTIC RESISTANCE: A Policy Roadmap to Reduce Use of Medically Important Antibiotics in Livestock. Washington, DC: Antibiotic Research Action Center, George Washington University's Milken Institute School of Public Health and Natural Resources Defense Council, 2017. Available at: <http://battlesuperbugs.com/sites/battlesuperbugs.com/files/Final%20Report%208.25.17.pdf>

Another example of efforts to support changes in farmer antimicrobial use practices is the Vietnamese Platform for Antimicrobial Reductions in Chicken Production, or [ViParc](#) study, led by Oxford University's Clinical Research Unit (OUCRU) with the support of [Wellcome Trust](#), academic and FAO collaborators. ViParc helps farms improve productivity and reduce the amount of antibiotics they use to raise their chickens. The project combines a study of the drivers of antibiotic use with an assessment of the intervention's cost-effectiveness and impact on productivity and profitability. The central hypothesis driving the study is that the lack of unbiased veterinary advisors pushes farmers to buy over-the-counter antibiotics to prevent disease. Therefore, ViParc is developing a group of poultry veterinarians to work with farms in the intervention group.⁵⁴ The study is taking place over three years, throughout which randomly selected farms will receive free locally adapted training and veterinary support to improve husbandry practices, prevent diseases and cut their antibiotic use in feed. To evaluate program effectiveness, ViParc will test for antibiotic resistance in fecal samples of livestock, retail meats, and antimicrobial residues in meat and the environment.⁵⁵

Making antimicrobial resistance a core component of professional education, training, certification and credentialing, continuing education in the health and veterinary sectors and agricultural practice can also help create an enabling environment for behavior change. WHO has developed a Global Competency Framework to shape the training curricula for healthcare workers. The framework aims to address the first objective of the Global Action Plan on AMR, "improve awareness and understanding of antimicrobial resistance through effective communication, education and training." Its goal is to help countries ensure that health workers have the necessary competencies to address AMR in policy and practice. The recommendations cover various AMR competencies (AMR awareness, appropriate use of antibiotics, infection prevention and control and diagnostic stewardship and surveillance) and is targeted at academic institutions, educators, accreditation bodies, and regulatory agencies. By defining competencies targeted at subsets of healthcare workers within each overarching goal, this framework is meant to guide the development of relevant education and training materials adapted to local settings and priorities.⁵⁶ In guidance for recommended competencies for veterinarians and a core curriculum for veterinary education, OIE has also noted the importance of understanding the link between antimicrobial use and resistance.^{57, 58} OIE's AMR strategy includes a commitment to work with Member States to encourage a professional culture through the veterinary education

⁵⁴ Carrique-Mas, J. J., & Rushton, J. (2017). Integrated interventions to tackle antimicrobial usage in animal production systems: the ViParc project in Vietnam. *Frontiers in microbiology*, 8, 1062.

Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5468401/>

⁵⁵ ViParc, ViParc Main Description. Available at: <http://viparc.org/what-is-viparc/>

⁵⁶ WHO competency framework for health workers' education and training on antimicrobial resistance. Geneva: World Health Organization; 2018 (WHO/HIS/HWF/AMR/2018.1). Licence: CC BY-NC-SA 3.0 IGO

⁵⁷ Group on Veterinary Education. Veterinary Education Core Curriculum: OIE Guidelines. Paris, France: OIE, September 2013. Available at:

http://www.oie.int/Veterinary_Education_Core_Curriculum.pdf

⁵⁸ OIE Competencies of 'Day 1 Graduates,' OIE Sub-Regional Representation for South-East Asia.

Available at: <http://www.rr->

asia.oie.int/fileadmin/SRR_Activities/strives/OIE_Competency_on_Day_1_Graduates_brochure.pdf

establishment, organize educational events, and expand its portfolio of educational and reference materials to support responsible use of antimicrobials in animals.⁵⁹

A recent mapping of educational programs and resources on AMR catalogued 94 initiatives, ranging from courses and workshops to guidelines and online resources, for healthcare workers globally. The study shows that governments, hospitals and professional societies lead many of these efforts, which are mainly focused in high-income countries and tend to be targeted at physicians.⁶⁰

The Tripartite agencies also are active in engaging and training key stakeholders. For example, FAO, with support from the Fleming Fund and USAID, is providing support to resource-limited countries to investigate stakeholder practices and develop practical and sustainable behavior change interventions, as well as improve AMR surveillance in the food and agricultural sector to track progress.⁶¹ The FAO Assessment Tool for Laboratory and AMR Surveillance Systems, known as ATLASS, has undergone successful piloting in seven Asian countries and six African countries. Beginning in May 2018, regional workshop trainings have been building the ranks of ATLASS assessors.⁶²

The [FAO project in 12 resource-limited countries in Africa and Asia](#) is engaging the food and agricultural sectors within the National Action Plans on AMR. The overarching goals of these partnerships are to align NAPs with global recommendations and standards, strengthen regulatory frameworks, laboratory capacity and infrastructure for surveillance, and increase awareness and implementation of best practices.⁶³

The One Health “We Need You” communication campaign, led by OIE with Fleming Fund support, promotes good antibiotic stewardship and responsible use practices globally as well as highlights the recommendations of OIE international standards.⁶⁴ During its debut year, the campaign was translated into 26 different languages to expand its reach throughout the world. The qualitative analysis of National Action plans for AMR communication have found that 70% of responding Member Countries have initiated communication activities, and 80% of those responding specifically used the “We Need You” campaign during 2017. Additionally, three-quarters of Member Country respondents have elevated AMR as a priority topic within their National Action Plans, thereby assuring future longevity of the campaign.

⁵⁹ The OIE Strategy on Antimicrobial Resistance and the Prudent Use of Antimicrobials. Paris, France: OIE, November 2016. Available at:

http://www.oie.int/fileadmin/Home/eng/Media_Center/docs/pdf/PortailAMR/EN_OIE-AMRstrategy.pdf

⁶⁰ Van Katwyk, S. R., Jones, S. L., & Hoffman, S. J. (2018). Mapping educational opportunities for healthcare workers on antimicrobial resistance and stewardship around the world. *Human resources for health*, 16(1), 9. Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5799960/>

⁶¹ FAO. “FAO regional training aims to improve access to new tool for assessment of laboratories and AMR surveillance systems,” May 10, 2018. Available at: <http://www.fao.org/asiapacific/news/detail-events/en/c/1129839/>

⁶² FAO (2018, May 17), FAO regional training aims to improve access to new tool for assessment of laboratories and AMR surveillance systems. Available at: <http://www.fao.org/resilience/news-events/detail/en/c/1132882/>

⁶³ FAO, Engaging the food and agriculture sectors to combat AMR using a One Health approach. Available at: <http://www.fao.org/antimicrobial-resistance/projects/ongoing/project-2/en/>

⁶⁴ OIE, WE NEED YOU to handle antimicrobials with care. Available at: <http://www.oie.int/for-the-media/press-releases/detail/article/we-need-you-to-handle-antimicrobials-with-care/>

For its part, the WHO has launched an online AMR-NAP community of practice holding discussions among those developing and implementing national action plans to combat antimicrobial resistance. Each discussion topic is introduced by a guest speaker and guided by a small number of starter questions. The goal is to facilitate greater understanding of the process of implementing AMR national action plans and to enable peer-to-peer support for stakeholders undertaking this task.

Previous efforts provide useful guidance upon which to build efforts to change individual behavior in curbing the unnecessary use of antibiotics. Normative guidelines help shape individual practice patterns of health care workers prescribing, dispensing and treating patients with antibiotics and similarly of veterinarians treating diseased animals. This normative guidance comes from a variety of sources: expert guidelines from WHO, FAO, OIE, Codex Alimentarius and other intergovernmental agencies; professional societies at the global and national levels; disease-specific program initiatives, from tuberculosis to the Integrated Management of Newborn and Childhood Illness; and country-level initiatives, such as Thailand's Antibiotic Smart Use project and Denmark's Yellow Card initiative.

Peer-to-peer learning can also be leveraged to promote stewardship efforts. The Breakthrough Series model, developed by the Institute for Healthcare Improvement (IHI), provides examples of effective strategies to use existing evidence, healthcare networks and collaborative learning to promote stewardship efforts and support behavior change in healthcare institutions. The Breakthrough Series convenes teams from like-minded and similarly situated hospitals and clinics for peer-to-peer learning and sharing of best practices. The model also brings in subject matter experts in specific clinical areas and application experts who can implement and drive change on the front lines of care. This learning model has been successful in training healthcare workers and improving quality of care in hundreds of U.S. organizations.⁶⁵

⁶⁵ Institute for Healthcare Improvement. The Breakthrough Series: IHI's Collaborative Model for Achieving Breakthrough Improvement, 2003.

Component 4: Enabling Collective Action

Key Takeaways

1. Collective action can amplify the behavior of individual healthcare workers, farmers or institutions — empowering groups and enabling coordinated efforts. Part of the challenge though is identifying and tapping networks of actors not yet enlisted in efforts to address drug-resistant infections and the use of antibiotics.
2. Various factors can help support and scale collective action. Technology can connect people in new ways and novel, point-of-care diagnostic tools empower providers, patients, food retailers and civil society with information. The regulatory and policy environment, and credentialing, can also support collective behavior change.
3. Civil society networks can mobilize key stakeholders to act collectively, and professional societies can support change by adopting practice guidelines and codes of conduct. Engaging civil society or professional societies requires providing the right conditions for collective action.

Significant potential in communicating for AMR change can come from enabling collective action. Efforts to change the behavior of individual clinicians, farmers or companies are amplified when this can be done by moving entire groups. Collective action refers here to groups where the individual, component units might independently take action, but where these units could do so better acting in concert. Part of the challenge is mobilizing actors that clearly have vested interest in tackling AMR, from hospitals and healthcare delivery systems to veterinary services and food producers. But another part of the challenge is identifying and tapping networks of actors that could be enlisted to address AMR, from medical tourism hospitals to food retail outlets.

Along these lines, FAO, in collaboration with OIE and WHO, is supporting country-level, One Health efforts. In Bangladesh, antibiotics have been banned from use as medicated feed for livestock. However, dealers have sent veterinarians to the farms of local producers and instructed them to add antibiotics instead to drinking water for their livestock or else to be held responsible for livestock losses if they do not.⁶⁶ Working to change this situation, FAO and the Bangladesh AMR Response Alliance (BARA) have brought together veterinarians and physicians to develop new antimicrobial use guidelines for their respective sectors. These guidelines are now available through a training program and mobile application in beta testing for ease of use in the field. BARA is also creating a community of practice online using social media so that practitioners can share resources and advice. In doing so, the poultry industry can contribute to feeding a growing population of more than 170 million people, help to reduce malnutrition, and protect the livelihoods of small-scale poultry farmers

⁶⁶ FAO. “Tackling AMR in Bangladesh—A One Health approach” (video), February 28, 2018. Available at: <https://www.youtube.com/watch?v=YmOey7FGfE>

in the poorest rural communities. This common forum has helped to support a more coordinated, One Health approach to these local challenges.

What type of factors might help enable and scale collective action? Products such as breakthrough diagnostic technologies could place novel tools into the hands of healthcare providers and even food producers and patients. For example, with Gates Foundation support, an inexpensive, paper-based test card has shown potential for rapid screening of active pharmaceutical ingredients in drugs in resource-limited settings. These test cards could potentially spot not only a range of beta-lactam antibiotics and several first-line TB drugs, but also substitute pharmaceuticals commonly found in substandard or falsified drugs.⁶⁷ With the right quality checks in place, such tools might transform the way consumer groups, healthcare delivery systems or drug regulatory agencies identify the one in ten medical products that WHO estimates to be substandard or falsified on LMIC markets. Antimicrobials, including antibiotics and antimalarials, are among those most frequently reported as substandard and falsified products to WHO's Global Surveillance and Monitoring System for such drugs.⁶⁸

The way products are financed provides another strategic leverage point for collective action. By pooling drug procurement, the Global Drug Facility for TB drugs has supported national governments in their efforts to secure access to lower prices, especially for second-line TB drugs, and in the process, to develop effective programs for administering and scaling up use of these drugs.⁶⁹ The volume buys along with demand forecasting, provided by the procurement facility, help to assure drug manufacturers of stable demand and timely payment. The procurement facility provides a critical point for managing market supply and demand effectively.

People are connected today in ways, by technology, that offer new possibilities for collective action. Information technology can power new approaches and enlist new actors. For example, where there is a shortage of skilled healthcare workers, communication technology and citizen science can assist disease surveillance efforts and flag stock outs of healthcare commodities. U-Report is an example of how such a system can lead to collective action. In 2011, UNICEF and Uganda Telecom launched U-Report, a "free SMS social monitoring tool for community participation, designed to address issues that people care about."⁷⁰ The system tapped into a network of Ugandan youth to identify cases of nodding syndrome, an epileptic disorder affecting children in Uganda, to enable surveillance teams to follow up as they searched for a disease etiology. U-report was also used to control for banana bacterial wilt (BBW) disease. In 2013, a poll was sent out to nearly 200,000 U-reporters inquiring

⁶⁷ Weaver AA, Reiser H, Barstis T, Benvuti M, Ghosh D, Hunckler M, Brittney J, Koenig L, Raddell K, Lieberman M. Paper Analytical Devices for Fast Field Screening of Beta Lactam Antibiotics and Antituberculosis Pharmaceuticals. *Anal Chem* 2013; 85(13): 6453-6460. Available at: <https://pubs.acs.org/doi/abs/10.1021/ac400989p?prevSearch=%255BContrib%253A%2BLieberman%255D%2Band%2B%255BContrib%253A%2BLieberman%252CMarya%255D&searchHistoryKey=>

⁶⁸ WHO Global Surveillance and Monitoring System for substandard and falsified medical products. Geneva, Switzerland: World Health Organization, 2017. Available at: http://www.who.int/medicines/regulation/ssffc/publications/GSMS_Report.pdf?ua=1

⁶⁹ Matiru R, Ryan T. The Global Drug Facility: a unique, holistic and pioneering approach to drug procurement and management. *Bulletin of the World Health Organization* 2007; 85(5): 348-353. Available at: <http://www.who.int/bulletin/volumes/85/5/06-035402.pdf?ua=1>

⁷⁰ UReport. (n.d). About U-Report. Retrieved March 17, 2017 from <http://www.ureport.ug/about/>

about banana infection enabling the program to map the incidence and spread of the bacteria. Based on the responses, the Ministry of Agriculture, Animal Industry and Fisheries was able to extend to targeted agricultural services.⁷¹ As of 2015, there were about 1 million active users, and U-report was available in 34 countries.⁷² Tapping into such networks could open new doors for communicating on AMR.

Civil society networks also play an important role in enabling collective action. The Antibiotic Resistance Coalition (ARC) for example, is a network of over 25 civil society groups unified by the Antibiotic Resistance Declaration and tackling AMR North and South across the healthcare delivery system, the food production system and the environment. Together they have led a number of collective efforts globally, including submitting civil society input to the Tripartite on its Monitoring and Evaluation Framework^{73,74} and to the IACG.⁷⁵ Beyond such submissions, members of ARC have for the past four years participated in an annual WHO-NGO dialogue for an in-depth, open discussion around the AMR secretariat's ongoing work to tackle AMR. Such convenings enable civil society to share expectations, concerns and inputs to the WHO's ongoing efforts.⁷⁶

Civil society groups have also successfully mobilized networks of healthcare professionals to take action on AMR and advocate for change. Healthcare without Harm's Clinical Champions in Comprehensive Antibiotic Stewardship⁷⁷ and US Public Interest Research Group's (PIRG) Health Professional Action Network⁷⁸ are examples of such networks. Both have leveraged the voices of physicians, familiar with the problem of AMR in the healthcare delivery system, to raise concerns over the use of overuse of antibiotics in food production.

Policy through norm setting also can support collective action efforts. At the global level, professional societies can set norms for their members through codes of conduct. For example, the Declaration of Helsinki on the ethics of research on human subjects, first approved by the World Medical Association (WMA) in 1964, has been widely adopted since then.⁷⁹ Germane to AMR, the American Medical Association passed a One Health resolution calling for more research and educational ties with the American Veterinary Medical

⁷¹ Bujoreanu, L. (April 2013). The Power of Mobile: Saving Uganda's Banana Crop. Available at: <http://blogs.worldbank.org/ic4d/the-power-of-mobile-saving-ugandas-banana-crop>

⁷² UNICEF. (2015). UNICEF's U-Report social platform hits 1 million active users. Retrieved March 17, 2017 from https://www.unicef.org/media/media_82583.html

⁷³ ARC (September 2017). Tripartite M&E Human Healthcare Consultation. Available at: <http://abrcoalition.com/tripartite-me-human-healthcare-consultation-september-2017/>

⁷⁴ ARC (September 2017). Tripartite M&E Animal Use Consultation. Available at: <http://abrcoalition.com/tripartite-me-animal-use-consultation-september-2017/>

⁷⁵ Antibiotic Resistance Coalition and Civil Society Input to the Interagency Coordination Group on Antimicrobial Resistance (May 2018). Available at: <http://abrcoalition.com/wp-content/uploads/2018/06/civil-society-input-to-the-interagency-coordination-group.pdf>

⁷⁶ ARC (April 2017). Third Annual WHO-NGO Dialogue. Available at: <http://abrcoalition.com/3rd-annual-who-ngo-dialogue-report-april-2017/>

⁷⁷ Health Care Without Harm (July 2015). Clinical Champions in Comprehensive Antibiotic Stewardship. Available at: <https://noharm-uscanada.org/CCCAS>

⁷⁸ US PIRG. Save Our Antibiotics. Available at: <https://uspirg.org/feature/usp/save-our-antibiotics-0>

⁷⁹ WMA (2013). WMA Declaration of Helsinki – Ethical Principles for Medical Research Involving Human Subjects. Available at: <https://www.wma.net/policies-post/wma-declaration-of-helsinki-ethical-principles-for-medical-research-involving-human-subjects/>

Association in assessing, preventing and treating cross-species transmission of disease.⁸⁰ Recognizing the potential for collective action by professional societies, the Expert Commission on Addressing the Contribution of Livestock to the Antibiotic Resistance Crisis has proposed model approaches to introducing such resolutions in these circles.⁸¹ Templates for codes of conduct by professional societies engaged in antimicrobial use might help guide behaviors.

The professional credentialing process could be another effective tool to trigger behavior change. For example, the certification process for Basic Life Support and Advanced Cardiac Life Support (BLS/ACLS) is used by healthcare professionals around the world. Originally established to reduce death and disability due to cardiovascular disease, the BLS/ACLS training is now a credentialing requirement for many healthcare professionals, who are held accountable by their accrediting bodies. Each region or country establishes its own BLS/ACLS requirements, adapted from the international guidelines set by the International Liaison Committee on Resuscitation (Ilcor).^{82,83} By analogy, a clear set of evidence-based antibiotic stewardship guidelines and practices with broad applicability across settings could be developed and be made a part of professional credentialing requirements. The Essential Medicines Department at the WHO is in the process of developing guidelines for hospital antibiotic stewardship programs in LMICs.

Component 5: Monitoring for Accountability

Key Takeaways

1. Monitoring for accountability is not just a role for governments, but also can engage key stakeholders, from industry to civil society. Effectively monitoring processes and outcomes provides the necessary feedback loops to optimize approaches for maximum impact and resource efficiency.
2. Monitoring is particularly effective when implemented both top-down at national and regional levels, and bottom-up, by empowering and enabling individuals, consumers and civil society to track their own progress too. Transparency of data is key to enabling effective monitoring.
3. Benchmarking can help to initiate and sustain progress by evaluating changes against prior conditions, standards and future targets.

⁸⁰ Nolen RS. AMA adopts one-health policy. Physicians' association supports ties with AVMA. AVMA News, August 1, 2007. Available at: <https://www.avma.org/News/JAVMANews/Pages/070801b.aspx>

⁸¹ Expert Commission on Addressing the Contribution of Livestock to the Antibiotic Resistance Crisis. COMBATING ANTIBIOTIC RESISTANCE A Policy Roadmap to Reduce Use of Medically Important Antibiotics in Livestock. 2017. Washington, D.C. Available at: <http://battlesuperbugs.com/sites/battlesuperbugs.com/files/Final%20Report%208.25.17.pdf>

⁸² Perkins, Gavin D., et al. (2015). Part 3: Adult basic life support and automated external defibrillation. Resuscitation, 95, e43-e69.

⁸³ Soar, Jasmeet, et al. (2015). Part 4: advanced life support: 2015 international consensus on cardiopulmonary resuscitation and emergency cardiovascular care science with treatment recommendations. Resuscitation, 95, e71-e120.

As key stakeholders begin to take collective action, monitoring for accountability adds another important dimension to communicating AMR. Such monitoring can not only hold stakeholders accountable to commitments made and outcomes, but also ensure sustainability of these actions. The Tripartite agencies have fielded a questionnaire that enables countries to assess their progress in addressing the multi-sectoral challenge of AMR through developing and implementing a One Health National Action Plan. They are also jointly developing a Monitoring and Evaluation (M&E) Framework for benchmarking AMR progress. Building on this, FAO is developing a Progressive Management Pathway tool for countries to use as a benchmarking and M&E device covering the focus areas of the Global Action Plan.

Data becomes actionable when it allows for comparisons and trend analysis, flags outliers in performance, or benchmarks against standards. Such approaches enable data analysis to serve as a trigger for policy action. Change can result from continuous quality improvement, carrot or stick enforcement, and effective governance structures. This process of monitoring for accountability can be conceptualized in several stages, such as the 3C's (**C**ollecting data, **C**omprehending these findings, and **C**ompelling policymakers with the findings).⁸⁴

The WHO-Health Action International's Medicine Prices project fielded a simple, standardized instrument that captured information on price components, affordability and availability of a core list of essential medicines.⁸⁵ By sampling across settings (urban vs. rural and public, private and mission sectors), it provided a snapshot of essential medicine access in a country. It benchmarked retail prices against the MSH reference index, and affordability, against the number of days' wages of the lowest paid government worker for a defined treatment course for a sentinel condition. A partnership between civil society and an intergovernmental agency, the Medicine Prices project methodology has been applied in over 120 countries. By focusing on the price components of drugs, the project has enabled governments and civil society to raise important concerns about the efficiency of local procurement, the affordability of essential medicines, and the appropriateness of pharmacy mark-up incentives. Elements of both the measures used and the methodological approach might be emulated for assessing outpatient availability of key antibiotics and adapted for gauging hospital access to second-line antibiotics.

In 2004, the U.S.-based Institute for Healthcare Improvement embarked on the 100,000 Lives campaign. Several of the targeted practices to avoid preventable deaths in the hospital setting involved infection control and prevention, notably ventilator-associated pneumonia as well as infections of central lines and surgical sites. Hospitals made commitments to make measurable differences against their baseline practices by targeting these causes of patient deaths. Championed by a charismatic leader, Don Berwick, the campaign declared: "Some is not a number. Soon is not a time." By 2006, the 100,000 Lives campaign became the 5 Million Lives campaign, focused on a bundle of defined interventions, from preventing pressure ulcers and reducing methicillin-resistant *Staphylococcus aureus* to tackling surgical

⁸⁴ Offenhuber D, Schechtner K (editors). Accountability Technologies: Tools for Asking Hard Questions. AMBRA Publishing, 2013.

⁸⁵ WHO and Health Action International. Measuring medicine prices, availability, affordability and price components, 2nd edition. Geneva, Switzerland: WHO, 2008. Available at: http://www.who.int/medicines/areas/access/OMS_Medicine_prices.pdf

complications. Some would criticize this campaign approach for overstating the potential prevention gains of “Lives Saved,” for the incomplete accounting by the participating hospitals, and for relying on an unproven intervention like rapid response teams.⁸⁶ But in the end, over 4000 hospitals enrolled, with 2000 reporting efforts to address each of the 12 interventions.⁸⁷ In eighteen states, over 90% of hospitals enrolled. From hand hygiene to infection control practices, a campaign that monitors for accountability may have potential in communicating for AMR change.

By supporting institutions that enable the 3C’s, monitoring for accountability can serve the critical function of benchmarking progress towards the future vision laid out by the IACG’s recommendations. These institutions might be governmental or non-governmental, each with strengths and limitations, but collectively, these might comprise a global watch for AMR. Different institutions have different roles to play in ensuring accountability. Two examples—each with different stakeholders—serve to illustrate these points.

The May 2015 Changing Markets report, *Bad Medicine*, exposes how some of the largest global pharmaceutical manufacturing plants, particularly in China and India, are fueling antibiotic resistance by discharging active pharmaceutical ingredients into the environment. The report calls on pharmaceutical corporations to change their procurement practices to stop buying antibiotics from polluting manufacturers and on policy-makers to demand transparency and incorporate environmental criteria in the Good Manufacturing Practices (GMP). Meeting GMP standards is important to procurement agents, particularly in EU and U.S. markets.⁸⁸

In 2018, the Changing Markets Foundation, European Public Health Alliance (EPHA), European Environmental Bureau (EEB), Health Care Without Harm (HCWH) Europe and Pesticide Action Network (PAN) published a [joint statement](#) with recommendations for a strong European response to the threat of active pharmaceutical ingredients (APIs) in the environment, highlighting its contribution to antimicrobial resistance. The organizations called for increased publicly available information and transparency on environmental impacts of APIs, mandatory and routine data collection on antimicrobials and AMR microorganisms in the environment, and legally binding concentration limits and standards for antimicrobial residues in water. The statement also asks the European Commission (EC) to improve the Good Manufacturing Practices (GMP) and implement a “monitoring system for the mandatory, routine collection of data on antimicrobials and AMR microorganisms in the environment.”⁸⁹

⁸⁶ Wachter RM, Provonost PJ. The 100,000 Lives Campaign: A Scientific and Policy Review. *Journal on Quality and Patient Safety* 2006; 32(11): 621-627.

⁸⁷ Institute for Healthcare Improvement. Protecting 5 Million Lives from Harm: Some is Not a Number. Soon is Not a Time. Available at: <http://www.ihl.org/Engage/Initiatives/Completed/5MillionLivesCampaign/Pages/default.aspx>

⁸⁸ Changing Markets (June 2015). *Bad Medicine: How the pharmaceutical industry is contributing to the global rise of antibiotic-resistant superbugs*. Available at: <http://changingmarket.wpengine.com/wp-content/uploads/2016/12/BAD-MEDICINE-Report-FINAL.pdf>

⁸⁹ EPHA, Changing Markets Foundation, Health Care Without Harm, EEB, PAN Germany (2018, May 17). Joint Statement | Europe must align policies to tackle Pharmaceuticals in the Environment and Antimicrobial Resistance. Available at: <https://epha.org/joint-statement-europe-must-align-policies-to-tackle-pharmaceuticals-in-the-environment-and-antimicrobial-resistance/>

At the national level, India can serve as an example as it has successfully integrated environmental standards into its National Action Plan, which will serve as a basis for monitoring and accountability. Environment is highlighted in three of the six overarching priorities, which include environment-specific interventions and target outputs. Specifically within the NAP strategic priority 3, *Reduce the incidence of infection through effective infection prevention and control*, reducing the environmental spread of AMR is one of four goals.⁹⁰ Groups like the Delhi-based Centre for Science and the Environment played a key role in advancing environmental concerns into NAPs on AMR.⁹¹

For its part, industry has taken initial steps towards collective action on this as well. In January 2016, over one hundred pharmaceutical companies and trade associations signed a declaration in Davos pledging to “reduce environmental pollution from antibiotics.”⁹² In September of that year, thirteen companies made more concrete commitments in an Industry Roadmap. They agreed to work towards a common framework for managing antibiotic discharges in their manufacturing supply chain, demonstrate compliance with these standards, and apply good practice approaches to reduce the impact of these discharges on the environment by 2020.⁹³ In 2018, the AMR Industry Alliance published a progress report noting that of the 36% of companies responding, all were reviewing operations of suppliers to reduce environmental discharge, a majority were improving oversight or setting standards into supplier contracts, and nearly forty percent were increasing public transparency of their findings regarding these suppliers.⁹⁴ At the same time, the Access to Medicines Foundation published its 2018 AMR Benchmark report which also evaluated 30 pharmaceutical companies’ action on AMR. Only eight companies had set limits on antibiotic residues in wastewater discharge, but none had published discharge levels.⁹⁵

The second example focuses on the use of antimicrobials in the food production system, but shows how monitoring for accountability is leveraged through the food retail end. Together, Consumers Union, Food Animals Concerns Trust, Friends of the Earth, Natural Resources Defense Council, and U.S. Public Interest Research Group Education Fund have published three annual scorecards ranking the United States’ top 25 restaurant chains on their

⁹⁰ Government of India (April 2017). National Action Plan on Antimicrobial Resistance (NAP-AMR) 2017 – 2021. Available at: http://www.searo.who.int/india/topics/antimicrobial_resistance/nap_amr.pdf

⁹¹ Centre for Science and the Environment. National Action Plans on Antimicrobial Resistance: Need for Greater Focus on Environmental Spread, 2016. Available at: <https://cdn.cseindia.org/userfiles/factsheet-national-actionplan.pdf>

⁹² Declaration by the Pharmaceutical, Biotechnology and Diagnostics Industries on Combating Antimicrobial Resistance, January 2016. Available at: https://www.ifpma.org/wp-content/uploads/2016/01/Industry_Declaration_on_AMR.pdf

⁹³ Industry Roadmap for Progress on Combating Antimicrobial Resistance, September 2016. Available at: <https://www.ifpma.org/wp-content/uploads/2018/06/Roadmap-for-Progress-on-AMR-FINAL.pdf>

⁹⁴ AMR Industry Alliance (January 2018). Tracking Progress to Address AMR. Available at: https://www.amrindustryalliance.org/wp-content/uploads/2018/01/AMR_Industry_Alliance_Progress_Report_January2018.pdf

⁹⁵ Access to Medicines Foundation (January 2018). 2018 Antimicrobial Resistance Benchmark. Available at: <https://amrbenchmark.org/wp-content/uploads/2018/01/Antimicrobial-Resistance-Benchmark-2018.pdf>

antibiotic use policies for meat that they procure. This coalition of consumer, environmental and public health organizations has repeatedly called on the nation's largest food chains to adopt policies limiting antibiotic use in their meat and poultry production. Through social media, photo petitions, billboards, and stakeholder engagement, the coalition worked to build consumer demand for change and mobilized networks calling for collective action. When information about restaurant chains' antibiotic policies is made transparent and publicly available, then civil society could highlight issues, set benchmarks and compare companies, as they did in the antibiotic scorecards. Based on this information, mobilized networks can leverage their power as consumers to pressure those companies lagging behind to make a change. The 2017 Chain Reaction Report III shows that, in response, these companies are increasingly mandating changes in their supply chain, with fourteen companies taking steps to restrict the routine use of antibiotics, compared to only five and then nine the previous two years.⁹⁶ Transparency allows these actions to be reflected back in the information put forth to civil society and consumers, who can hold companies accountable for the promised change and encourage those making progress. As huge buyers of meat and poultry, fast food restaurant chains have substantial market power to influence the practices of food producers. This campaign provides a valuable example of how civil society groups and consumers can set targets for food procurement and, using collective action and effective monitoring strategies, call on public-facing food retailers to meet these goals and hold them accountable. And, in turn, this can start the cycle again of targeting policy priorities.

Communicating effectively could spell the difference between success and failure in meeting the challenges of AMR. This paper describes a broad range of approaches, but woven together by a unifying framework of five components — targeting priorities, raising awareness, supporting behavior change, enabling collective action, and monitoring for accountability. Intentionally, many of the examples show inspiring connection across the five components, which are neither linear nor compartments. Brought together, this framework seeks to enable communicating for change to reach fuller promise in meeting the challenge of AMR.

⁹⁶ Consumers Union, Food Animals Concerns Trust, Friends of the Earth, Natural Resources Defense Council and U.S. Public Interest Research Group Education Fund. Chain Reaction III: How Top Restaurants Rate on Reducing Use of Antibiotics in Their Meat Supply, September 2017. Available at: https://uspirgedfund.org/sites/pirg/files/reports/ChainReaction3_Report_final.pdf