

Governing Global Antimicrobial Resistance: 6 Key Lessons From the Paris Climate Agreement

Isaac Weldon, MSc, Susan Rogers Van Katwyk, PhD, Gian Luca Burci, Dr Giur, Thana C. de Campos, DPhil, Mark Eccleston-Turner, PhD, Helen R. Fryer, DPhil, Alberto Giubilini, PhD, Thomas Hale, PhD, Mark Harrison, DPhil, Stephanie Johnson, PhD, Claas Kirchhelle, DPhil, Kelley Lee, DPhil, Kathleen Liddell, DPhil, Marc Mendelson, PhD, Gorik Ooms, PhD, James Orbinski, MD, MSc, MA, Laura J. V. Piddock, PhD, John-Arne Røttingen, MD, PhD, Julian Savulescu, PhD, Andrew C. Singer, PhD, A. M. Viens, PhD, Clare Wenham, PhD, Mary E. Wiktorowicz, PhD, MSc, Shehla Zaidi, MD, PhD, and Steven J. Hoffman, JD, PhD, LL.D

ABOUT THE AUTHORS

Isaac Weldon, Susan Rogers Van Katwyk, A. M. Viens, and Steven J. Hoffman are with the Global Strategy Lab, York University, Toronto, Ontario, Canada. Gian Luca Burci is with the Graduate Institute of International and Development Studies, Geneva, Switzerland. Thana C. de Campos is with the School of Government, Pontificia Universidad Católica de Chile, Santiago, Chile. Mark Eccleston-Turner is with the Department of Global Health and Social Medicine, King's College London, United Kingdom. Helen R. Fryer is with the Big Data Institute, Li Ka Shing Centre for Health Information and Discovery, Nuffield Department of Medicine, University of Oxford, Oxford, United Kingdom. Alberto Giubilini and Julian Savulescu are with the Oxford Martin School and the Uehiro Centre for Practical Ethics, University of Oxford. Thomas Hale is with the Blavatnik School of Government, University of Oxford. Mark Harrison is with the Faculty of History and Oxford Martin School, University of Oxford. Stephanie Johnson is with the Wellcome Centre for Ethics and Humanities and Ethox Centre, University of Oxford. Claas Kirchhelle is with the School of History, University College Dublin, Dublin, Ireland. Kelley Lee is with the Faculty of Health Sciences, Simon Fraser University, Burnaby, British Columbia, Canada. Kathleen Liddell is with the Centre for Law, Medicine and Life Sciences, Faculty of Law, University of Cambridge, Cambridge, United Kingdom. Marc Mendelson is with the Division of Infectious Diseases & HIV Medicine, Groote Schuur Hospital, University of Cape Town, Cape Town, South Africa. Gorik Ooms is with the Department of Public Health and Primary Care, Ghent University, Ghent, Belgium. James Orbinski and Mary E. Wiktorowicz are with the Dahdaleh Institute for Global Health Research, York University. Laura J. V. Piddock is with the Global Antibiotic Research and Development Partnership, Geneva, Switzerland. John-Arne Røttingen is with the Ministry of Foreign Affairs, Oslo, Norway. Andrew C. Singer is with the UK Centre for Ecology & Hydrology, Wallingford, United Kingdom. Clare Wenham is with the Department of Health Policy, London School of Economics and Political Science, London. Shehla Zaidi is with the Department of Community Health Sciences, Aga Khan University, Karachi, Pakistan.

Antimicrobial resistance (AMR) is among the most urgent global health challenges of our time. AMR can develop with each use of an antimicrobial, regardless of the setting. The ongoing use of the same antimicrobials

across sectors and the ability of microbes to transfer among people, animals, food, and environments; spread across borders through global trade and travel; and bring entire economies to a halt means that every

antimicrobial consumed has global implications. Some microbes have already developed resistance to all known antimicrobials, meaning previously curable diseases have become untreatable. If immediate action is not taken, the effectiveness of these vital medicines will continue to diminish, further undermining modern medicine's ability to treat infectious diseases and perform essential medical procedures.¹

The global spread of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and its variants that cause COVID-19 has sparked new discussions on the need for an international pandemic treaty,² presenting a unique opportunity to reflect on AMR as one pathway through which new cross-border global health threats emerge. Similar to zoonoses such as COVID-19, AMR can lead to untreatable infectious diseases in humans with the potential to become deadly pandemics. AMR diminishes the global common pool of antimicrobial effectiveness—a nonexcludable but rivalrous resource—meaning that maintaining the viability of antimicrobial therapy is a global common-pool resource challenge.³ Overcoming this challenge will require global mechanisms to coordinate interests and investments, limit free riding, and steer cooperation toward preserving the common pool. This aspect of AMR enables us to draw lessons from other common-pool resource challenges, such as climate change, in building collective action to target the pathways by which AMR may emerge, maximize the antimicrobial commons for everyone's benefit, and avoid further descending into this tragedy-of-the-commons scenario.

Building global collective action while accommodating varying national

circumstances is a monumental but, in our view, achievable task. The 2015 Paris Agreement under the United Nations Framework Convention on Climate Change, for example, successfully mobilized substantial collective action to protect a shared global common-pool resource similar enough to antimicrobial effectiveness that it can provide lessons for advancing global action in this area. While countries struggle to meet their specific climate targets, the Paris Agreement has stimulated global cooperation by engaging countries in an ongoing effort to mitigate greenhouse gas emissions and adapt to the impacts of climate change. AMR lacks an equivalent global vehicle for building cooperation and would benefit from a Paris Agreement-style coordinating structure. The Paris Agreement offers 6 key lessons relevant to managing the global antimicrobial commons (Table 1).

6 KEY LESSONS FOR AMR

First, AMR needs a unifying global target to mobilize political attention and benchmark global progress. For the Paris Agreement, the world united behind the politically memorable, albeit scientifically ambiguous goal of keeping global average temperatures below 1.5°C above preindustrial levels or at least well below 2°C.⁴ For AMR, the world still needs to develop, agree to, and unite behind a quantifiable goal that resonates with nonexperts.

Second, effectively mitigating the threat posed by AMR requires a recognition of how embedded social structures and incentives drive antimicrobial use across sectors. AMR efforts over many decades have largely focused on the behavior of individual health care providers and patients, emphasizing education and personal

choice as the dominant strategies to reduce global antimicrobial use.^{5,6} These strategies, which are reminiscent of climate change mitigation strategies that offload the responsibility for action from governments to individuals, are now acknowledged as insufficient. Antimicrobials have become such widely used tools that they are effectively invisible infrastructure underpinning our health and food systems and paper over shortcomings in basic hygiene, equality, and labor systems.⁶ Individuals are therefore ill-placed to address AMR through more informed decision-making. Instead, addressing AMR requires a commitment to social and economic transformation similar to the one in the Paris Agreement's call to action.

Third, escalating commitments through national AMR action plans, which outline each country's AMR goals and planned actions, will likely increase the effectiveness of global AMR efforts. Ongoing international monitoring of national AMR action plans by the World Health Organization provides a key starting point, but more extensive and ambitious global legal commitment mechanisms are imperative.⁷ In their nationally determined contributions under the Paris Agreement, countries are legally required to specify their level of ambition, regularly monitor progress to that goal, and ratchet up their commitments every five years. Escalating national commitments over time makes it easier for countries to commit to action early, shape future policy directions, and signal their willingness to cooperate. Although not perfect, this model could increase the level of ambition in current AMR commitments.

Fourth, a permanent multistakeholder forum on AMR similar to the

Paris Agreement's annual Conference of the Parties to the United Nations Framework Convention on Climate Change could be highly effective in shaping consensus and action over a short time horizon.⁸ A high-profile AMR forum composed of countries and nongovernmental organizations would ensure ongoing and inclusive dialogue to build a culture of accountability, trust, and good faith among relevant actors. Crafting an inclusive process will be essential for shaping equitable goals and actions, especially because attempting to govern AMR globally requires confronting questions about universal representations of the global public and its objectives.^{9,10} Striking this forum, therefore, represents an important first step to ensure that future initiatives proceed fairly.

Fifth, like the Intergovernmental Panel on Climate Change guiding the Paris Agreement, ongoing AMR action would be best informed by a regular and independent stock-taking to evaluate existing measures and advise on evidence-informed adjustments.^{11,12} This endeavor must (1) recognize that different ways of knowing constitute the global knowledge base, (2) ensure that using evidence to inform adjustments that work does not detract from the inherently political questions of *works for what purpose* and *for whose benefit*, and (3) come with a commitment to equitable evidence generation and prioritization. Striking a panel to assess the global knowledge base on these terms will ensure that global, regional, and national goals and policies are continually informed by the best available evidence and are in line with leading practices.¹²

Finally, an enduring international legal agreement could institutionalize

TABLE 1— Comparing the Paris Climate Agreement With Existing Global AMR Efforts

Essential Elements	Paris Climate Agreement	Current Global AMR Efforts
1. Collective global goal	Keep global temperature rise below 1.5°C above preindustrial levels or at least well below 2°C	No consensus on what a collective global goal could look like
2. A focus on social and economic transformation	Implementation of the Paris Agreement requires social and economic transformation to decarbonize national economies.	AMR discourse has historically emphasized individual behavior instead of social and economic transformation.
3. Nationally determined contributions pledged, reviewed, and ratcheted every 5 years	All parties must communicate their nationally determined contributions every 5 years and, during revisions, aim for maximally ambitious goals. Nationally determined contributions are reviewed to ensure the distribution of responsibilities is fair and that countries are ambitious in their goals. All parties must regularly provide information on activities and outcomes using methods that are articulated by the Intergovernmental Panel on Climate Change.	All WHO member states committed to having national action plans for AMR. Even though this commitment is not legally binding, more than 100 countries have published plans, and many are under development. However, there are no specified review, intensification, or accountability mechanisms, and little financial, technical, and infrastructural support is provided for achieving necessary policies. WHO, FAO, and OIE conduct self-assessment surveys on national AMR activities, but there is no regular reporting or standard methodology for reporting outcomes.
4. Annual multistakeholder forum	The annual Conference of the Parties to the UNFCCC serves as a multistakeholder meeting place for advancing the Paris Agreement.	AMR is normally discussed every 3 years at the World Health Assembly, but there is no formal or regular meeting focused on AMR and no permanent forum for multistakeholder discussions on AMR across sectors.
5. Global scientific stock taking every 5 years	Requirement to assess the best available science every 5 years; this stock-taking exercise will help ensure that the Paris Agreement's ongoing efforts are in line with scientific best practices.	No relevant comparison
6. International legal framework	The Paris Agreement is a legally binding instrument of the UNFCCC. The UNFCCC provides a broader legal framework for the Paris Agreement.	No international legal framework, although the constituting instruments of the WHO, FAO, OIE, or UN could serve as the broader legal framework for a legally binding AMR agreement

Note. AMR = antimicrobial resistance; FAO = Food and Agriculture Organization of the United Nations; OIE = World Organization for Animal Health; UN = United Nations; UNFCCC = United Nations Framework Convention on Climate Change; WHO = World Health Organization.

Source. Rogers Van Katwyk et al.¹⁵

these actions with a long-term vision and generate progress on AMR by charting a clear path forward, distributing responsibilities, and creating a sustainable system that makes countries active participants throughout the process. Treaties are appropriate for certain kinds of challenges only—hence, they are rare in global health. However, the escalating, transnational, and enduring AMR crisis means a strong international legal framework is required to hold actors accountable

and link strategies across sectors, countries, and time.¹³

Whether through a standalone agreement or within a new pandemic treaty, an international agreement on AMR could align incentives that switch the focus of AMR efforts toward prevention and preparedness and coordinate investments to generate social and economic transformation, especially because countries are unlikely to undertake these initiatives on their own. Such an agreement must unite

human health, animal, agricultural, and environmental sectors through a “One Health” approach to maximize the global antimicrobial commons for everyone’s benefit and simultaneously improve infection prevention measures while promoting access, conservation, and innovation for antimicrobials, alternative therapies, and diagnostic technologies.⁸ Coordinating a One Health approach that appropriately engages ministries of health, environment, agriculture, development, and finance

requires new legal mechanisms beyond those available through the World Health Organization, the Food and Agriculture Organization of the United Nations, the World Organization for Animal Health, and the United Nations Environment Program, which are limited to the area-specific mandates of each institution.

TOWARD AN INTERNATIONAL TREATY

Although a universal agreement involving all countries is desirable from the outset, an effective treaty can emerge from a small group of countries willing to act immediately, as long as it is designed to incentivize and allow other countries to join later. It only took 20 countries to launch negotiations for the 1985 Vienna Convention for the Protection of the Ozone Layer, which later delivered the 1987 Montreal Protocol—the first universally ratified and possibly the most effective agreement in the history of the United Nations. For AMR, we would only need a few global leaders to decide that bold action is needed to protect the countless lives threatened by AMR. Although some countries, such as those within the G20, may be better positioned than others to take this initiative, the COVID-19 pandemic has shown that our expectations for global health leadership can rapidly change.¹⁴ An AMR treaty—or provisions on AMR within the proposed pandemic treaty—could emerge from any group of countries ready to act quickly. With the future of antimicrobial effectiveness hanging in the balance, we cannot afford to wait any longer.

We have known about AMR for as long as we have had effective

antimicrobials. Without swift collective action now, though, AMR may undo one of humanity's greatest discoveries. This outcome would make AMR the epitome of the global tragedy of the commons. To avoid such a catastrophe, world leaders must take ambitious action—similar to the steps they took when setting up the Paris Agreement—to protect antimicrobials as a precious shared resource and prevent this looming emergency. These insights could be immediately relevant for informing emerging discussions on a potential international treaty on pandemics, which must also address AMR to be comprehensive.² *AJPH*

CORRESPONDENCE

Correspondence should be sent to Steven J. Hoffman, JD, PhD, LLD, Global Strategy Lab, York University, Dahdaleh Building, Suite 2120, 4700 Keele St, Toronto, ON, Canada, M3J 1P3 (e-mail: steven.hoffman@globalstrategylab.org). Reprints can be ordered at <http://www.ajph.org> by clicking the "Reprints" link.

PUBLICATION INFORMATION

Full Citation: Weldon I, Rogers Van Katwyk S, Burci GL, et al. Governing global antimicrobial resistance: 6 key lessons from the Paris Climate Agreement. *Am J Public Health*. 2022;112(4):553–557.

Acceptance Date: December 19, 2021.

DOI: <https://doi.org/10.2105/AJPH.2021.306695>

CONTRIBUTORS

The ideas and arguments in this analysis were generated at an expert dialogue attended by all authors at the Oxford Martin School, University of Oxford, in May 2019. The workshop was co-organized by A. Giubilini, M. Harrison, S. J. Hoffman, C. Kirchhelle, A. McLean, S. Rogers Van Katwyk, J. Savulescu, and I. Weldon as part of a larger research project on collective responsibility for infectious disease. I. Weldon wrote the first draft of this editorial with the workshop co-organizers. All authors provided critical edits and approved the final version.

ACKNOWLEDGMENTS

Funding was provided by the Wellcome Trust (WT 216476/Z/19/Z), the Social Sciences & Humanities Research Council of Canada (611-2018-0567), and the Oxford Martin School.

CONFLICTS OF INTEREST

S. J. Hoffman is Scientific Director of the CIHR's Institute of Population and Public Health and is CIHR's Scientific Lead for Global Health. The views expressed in this article are those of the authors and do not necessarily reflect those of the Canadian Institutes of Health Research (CIHR) or the Government of Canada. The other authors have no conflicts of interest to disclose.

REFERENCES

1. Interagency Coordination Group on Antimicrobial Resistance. No time to wait: securing the future from drug-resistant infections. Published online 2019. Available at: https://cdn.who.int/media/docs/default-source/documents/no-time-to-wait-securing-the-future-from-drug-resistant-infections-en.pdf?sfvrsn=5b424d7_6&download=true. Accessed May 1, 2019.
2. Bainimarama JV, Chan-o-cha P, Santos da Costa AL, et al. COVID-19 Shows Why United Action Is Needed for More Robust International Health Architecture. Geneva, Switzerland: World Health Organization; March 30, 2021. Available at: <https://www.who.int/news-room/commentaries/detail/op-ed—covid-19-shows-why-united-action-is-needed-for-more-robust-international-health-architecture>. Accessed April 2, 2021.
3. Kesselheim AS, Outterson K. Improving antibiotic markets for long term sustainability. *Yale J Health Policy Law Ethics*. 2011;11(1):101–167.
4. Bodansky D. The Paris Climate Change Agreement: a new hope? *Am J Int Law*. 2016;110(2):288–319. <https://doi.org/10.5305/amerjintlaw.110.2.0288>
5. Rogers Van Katwyk S, Grimshaw JM, Nkangu M, et al. Government policy interventions to reduce human antimicrobial use: a systematic review and evidence map. *PLoS Med*. 2019;16(6):e1002819. <https://doi.org/10.1371/journal.pmed.1002819>
6. Chandler CIR. Current accounts of antimicrobial resistance: stabilisation, individualisation and antibiotics as infrastructure. *Palgrave Commun*. 2019;5(1):53. <https://doi.org/10.1057/s41599-019-0263-4>
7. World Health Organization. Global Antimicrobial Resistance and Use Surveillance System (GLASS) report: early implementation 2020. Geneva, Switzerland: World Health Organization; 2020. <https://apps.who.int/iris/bitstream/handle/10665/332081/9789240005587-eng.pdf?ua=1>. Accessed April 2, 2021.
8. Rogers Van Katwyk S, Balasegaram M, Boriello P, et al. A roadmap for sustainably governing the global antimicrobial commons. *Lancet*. 2019;394(10211):1788–1789. [https://doi.org/10.1016/S0140-6736\(19\)32767-9](https://doi.org/10.1016/S0140-6736(19)32767-9)
9. Tripartite Joint Secretariat on Antimicrobial Resistance. AMR Multi-Stakeholder Partnership Platform - creating a movement for change through engaging multiple actors and voices. Rome, Italy: Food and Agriculture Organization of the United Nations; August 18, 2021. Available at: <https://www.fao.org/antimicrobial-resistance/news-and-events/news/news-details/en/c/1417587>. Accessed November 5, 2021.
10. Kirchhelle C, Atkinson P, Broom A, et al. Setting the standard: multidisciplinary hallmarks for structural, equitable and tracked antibiotic policy.

BMJ Glob Health. 2020;5(9):e003091. <https://doi.org/10.1136/bmjgh-2020-003091>

11. Woolhouse M, Farrar J. Policy: an intergovernmental panel on antimicrobial resistance. *Nature*. 2014;509(7502):555–557. <https://doi.org/10.1038/509555a>
12. World Health Organization. Advisory Group for the Independent Panel on Evidence for Action Against Antimicrobial Resistance. Geneva, Switzerland: World Health Organization; March 23, 2020. Available at: <https://www.who.int/news/item/23-03-2020-advisory-group-independent-panel>. Accessed November 5, 2021.
13. Hoffman SJ, Røttingen JA, Frenk J. International law has a role to play in addressing antibiotic resistance. *J Law Med Ethics*. 2015;43(suppl 3):65–67.
14. Yamey G, Wenham C. The U.S. and U.K. were the two best prepared nations to tackle a pandemic—what went wrong? *Time*. Published online July 1, 2020. Available at: <https://time.com/5861697/us-uk-failed-coronavirus-response>. Accessed July 14, 2020.
15. Rogers Van Katwyk S, Giubilini A, Kirchhelle C, et al. Exploring models for an international legal agreement on the global antimicrobial commons: lessons from climate agreements. *Health Care Anal*. 2020. <https://doi.org/10.1007/s10728-019-00389-3>



2021, SOFTCOVER
230 PAGES, 9780875533117

 APHABOOKSTORE.ORG

Gun Violence Prevention: A Public Health Approach

Edited By: Linda C. Degutis, DrPH, MSN,
and Howard R. Spivak, MD

Gun Violence Prevention: A Public Health Approach acknowledges that guns are a part of the environment and culture. This book focuses on how to make society safer, not how to eliminate guns. Using the conceptual model for injury prevention, the book explores the factors contributing to gun violence and considers risk and protective factors in developing strategies to prevent gun violence and decrease its toll. It guides you with science and policy that make communities safer.

 **APHA PRESS**
AN IMPRINT OF AMERICAN PUBLIC HEALTH ASSOCIATION