





# Taking stock of global commitments on antimicrobial resistance

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## ABSTRACT

Over the last six years, antimicrobial resistance (AMR) has generated an unprecedented amount of global attention. This global attention has coincided with an increase in discussion around AMR at various multilateral organisations and international fora. This study catalogues and analyses AMR-related commitments made by the global community following the implementation of the AMR Tripartite's Global Action Plan (GAP) in 2015. In examining these commitments, we elucidated emergent themes and gaps in AMR discourse through a qualitative content analysis of global political resolutions, declarations and statements made by members of the United Nations, the World Health Assembly, Food and Agriculture Organization Conferences, World Organisation for Animal Health General Sessions, and the G7 and G20 summits and ministerial meetings between the years 2015 and 2021. Emergent themes included AMR research, surveillance and stewardship. Across sectors, fewer commitments were made for specific action on AMR in the environment. The themes and types of commitments were found to be consistent across time and fora but did not evolve into more concrete or nuanced pledges to action between 2015 and 2021. GAP objectives relating to infection prevention and efforts to address the root drivers of AMR appeared the least frequently in our analysis, indicating a lack of global commitment to take a proactive prevention-focused approach to AMR.

## INTRODUCTION

Antimicrobial resistance (AMR) has generated an unprecedented amount of global attention over the last six years focused on its far-reaching global health, economic and social implications. This increase in attention around AMR has coincided with a rise in focus on this topic at various multilateral organisations and international fora. In May 2015, the international community signalled its commitment to a coordinated global AMR response through the Global Action Plan (GAP) developed by the AMR Tripartite—an ongoing partnership between the World Health Organisation (WHO), the Food and Agriculture Organization (FAO) of the United Nations and the World Organisation for Animal Health (OIE).<sup>1 2</sup> The GAP

## WHAT IS ALREADY KNOWN ON THIS TOPIC

- ⇒ The global threat of antimicrobial resistance (AMR) has led to an increase in discussion of the issue at various multilateral organisations and international fora.
- ⇒ No study has catalogued or assessed the scope of AMR-related commitments made by the global community to date, which is necessary in order to measure the progress on these goals.

## WHAT THIS STUDY ADDS

- ⇒ We found that the themes and types of commitments across time and fora have been consistent, focusing on key areas including research, surveillance and antimicrobial stewardship.
- ⇒ Fewer commitments have been made on AMR education and training, sanitation, hygiene and infection prevention measures, and sustainably investing in AMR.
- ⇒ Commitments have not become more concrete or actionable over time or across fora.

## HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE AND/OR POLICY

- ⇒ This study indicates that there has been a lack of high-level global commitment on prevention-focused approaches to AMR.
- ⇒ The global community would do well to concretise ambition into action by transforming ideas and recommendations into specific and measurable action with appropriate indicators to measure success.

calls on member states to take action against AMR in accordance with five key objectives that integrate human, animal and environmental health, also known as a One Health approach.<sup>1</sup> These objectives include AMR education and training (GAP 1); research and surveillance (GAP 2); sanitation and infection prevention measures (GAP 3); optimising the use of antimicrobials (GAP 4); and sustainably investing in new medicines, diagnostic tools and vaccines (GAP 5). Since then, international agencies, including the AMR Tripartite organisations, the G7 and the G20, have adopted resolutions and made declarations



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that commit their members to take action in line with these objectives.<sup>3 4</sup>

The GAP objectives represent a positive step towards sustainable progress on addressing AMR. However, for these calls to action to achieve their intended impact and reverse the current trajectory of AMR, they must be accompanied by effective commitments, accountability standards, coordinated efforts across sectors and concrete operational mechanisms.<sup>5-9</sup> As a global challenge, AMR needs to be addressed collectively. One strategy that has previously been adopted by international bodies to address other global governance challenges is a goal-based approach that allows countries to unite around a common goal<sup>6 10</sup> while maintaining the freedom to act in accordance with their national contexts. These commitments tend to be broad in nature and lack both synergy and a clear foundation, making them challenging to implement.<sup>6</sup>

Although many global commitments have been made on AMR, no study, to our knowledge, has attempted to measure the progress on these goals. One challenge is that no efforts have been made to catalogue the AMR-related commitments made by the global community. In order to identify concrete actions that have been proposed to address AMR, we reviewed documents and resolutions in which AMR was a primary focus over the six-year period following the adoption of the GAP.

## METHODS

We conducted a search of political resolutions, declarations and statements made at the United Nations (UN), World Health Assembly (WHA), FAO Conferences, OIE General Sessions, as well as multilateral organisations including the G7 and G20 ministerial meetings and summits between May 2015 and June 2021. We obtained these documents from official, publicly available WHO, OIE and FAO websites as well as the G7 and G20 information centre websites provided by their respective research groups. A complete timeline of the AMR-related international fora and links to their corresponding documents can be found in online supplemental file S1. Within the UN system, each of the AMR Tripartite organisations have the mandate to lead and coordinate the global response to AMR in their sector, coordinating their activities with each other through an AMR Secretariat. Each document was searched for keywords such as antimicrobial resistance, AMR, antimicrobials and antibiotics. We focused our analysis on resolutions or declarations where AMR was a primary focus, excluding documents where AMR was mentioned as part of a long list of health topics or in passing. We exclusively focused on global-level commitments; commitments made in national action plans or by regional bodies were excluded.

We conducted a qualitative content analysis using NVivo (QRS International V.12). A coding framework was created using both deductive and inductive approaches. Qualitative line-by-line analysis of each of the identified

key documents was completed by ST, and the final coding was discussed with SRVK and LW to identify any misalignments. An initial set of thematic codes was developed in advance based on sector (ie, One Health, human health, animal health and environmental health) and WHO GAP objectives.<sup>1</sup> We additionally coded commitment type inductively in three categories from most abstract to most concrete: *ideas*, *recommendations* and *intended actions*. Ambiguous or implied references to a theme were not assigned that code. Disagreements were resolved by consensus and the final coding framework is presented in table 1. We did not involve patients or members of the public in the design of this study.

## RESULTS

We identified 163 global commitments to action on AMR across 19 key documents from May 2015 to June 2021. The majority of commitments were merely ideas (n=60, 37%), defined as statements upholding or supporting a principle, action or commitment. The more concrete commitments, categorised as recommendations (n=54, 33%), urged or requested member states to take action. The most concrete commitments were coded as intended actions (n=49, 30%) and committed member states to action. These intended actions were less common in our analysis. Of the various health sectors, One Health, which incorporates human, animal and environmental health, was most commonly discussed (n=42, 26%). AMR education and training (GAP 1; n=17, 10%), sanitation, hygiene and infection prevention measures (GAP 3; n=14, 9%), and sustainable investment in AMR (GAP 5; n=27, 17%) were discussed the least among the five GAP objectives (figure 1). Further details on member states' commitments categorised by international forum and frequency of statement type and theme can be found in online supplemental files (table S2). The distribution of the level of commitments varied by GAP objective (table 2), although roughly a third of the commitments on GAP objectives 1, 3, 4 and 5 were categorised as intended actions. GAP 4 saw the largest absolute number of concrete intended actions (n=12). GAP 2 had the lowest proportion of concrete actions (n=8, 19%), with most commitments on GAP 2 categorised as recommendations (n=18, 43%).

### Commitment type

Commitments categorised as ideas were the least concrete but were consistent across fora and reiterated themes including taking action against AMR, supporting efforts to conserve antimicrobials and reinforcing the need to adopt the GAP. Some examples of these commitments included member states 'reiterat[ing] the need to address the challenges associated with the development of new antimicrobial products',<sup>11</sup> 'reiterat[ing] the importance of combatting AMR as a global threat through a One Health approach',<sup>12</sup> 'support[ing] initiatives that strengthen infection prevention within [their]

**Table 1** Thematic codes for commitments made by all member states at an international forum

Dimension	Thematic codes	Definition
Commitment type	Ideas	A statement that upholds or supports a principle, action or commitment.
	Recommendations	A statement urging, recommending or requesting actions to be taken by member states.
	Intended actions	A statement that commits member states to engage in a specified action.
GAP objective	GAP objective 1	A commitment to improve the awareness and understanding of AMR through effective communication, education and training.
	GAP objective 2	A commitment to strengthen the knowledge and evidence base on AMR through surveillance and research.
	GAP objective 3	A commitment to reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures.
	GAP objective 4	A commitment with the goal of optimising the use of antimicrobial medicines in human and/or animal health.
	GAP objective 5	A commitment to develop an economic case for sustainable investment in AMR (eg, new medicines, vaccinations, diagnostic tools, other interventions).
Sector	Animal health	A commitment to act on the animal health or agricultural implications of AMR.
	Environmental	A commitment to act on the environmental implications of AMR.
	Human health	A commitment to act on the human health implications of AMR.
	One health	A commitment to action that integrates human, animal and environmental health.

AMR, antimicrobial resistance; GAP, Global Action Plan.

countries',<sup>13</sup> and 'stress[ing] the need...to enhance capacity building, including through developing and strengthening programmes and national systems for detection, surveillance and monitoring antimicrobial resistance'.<sup>14</sup>

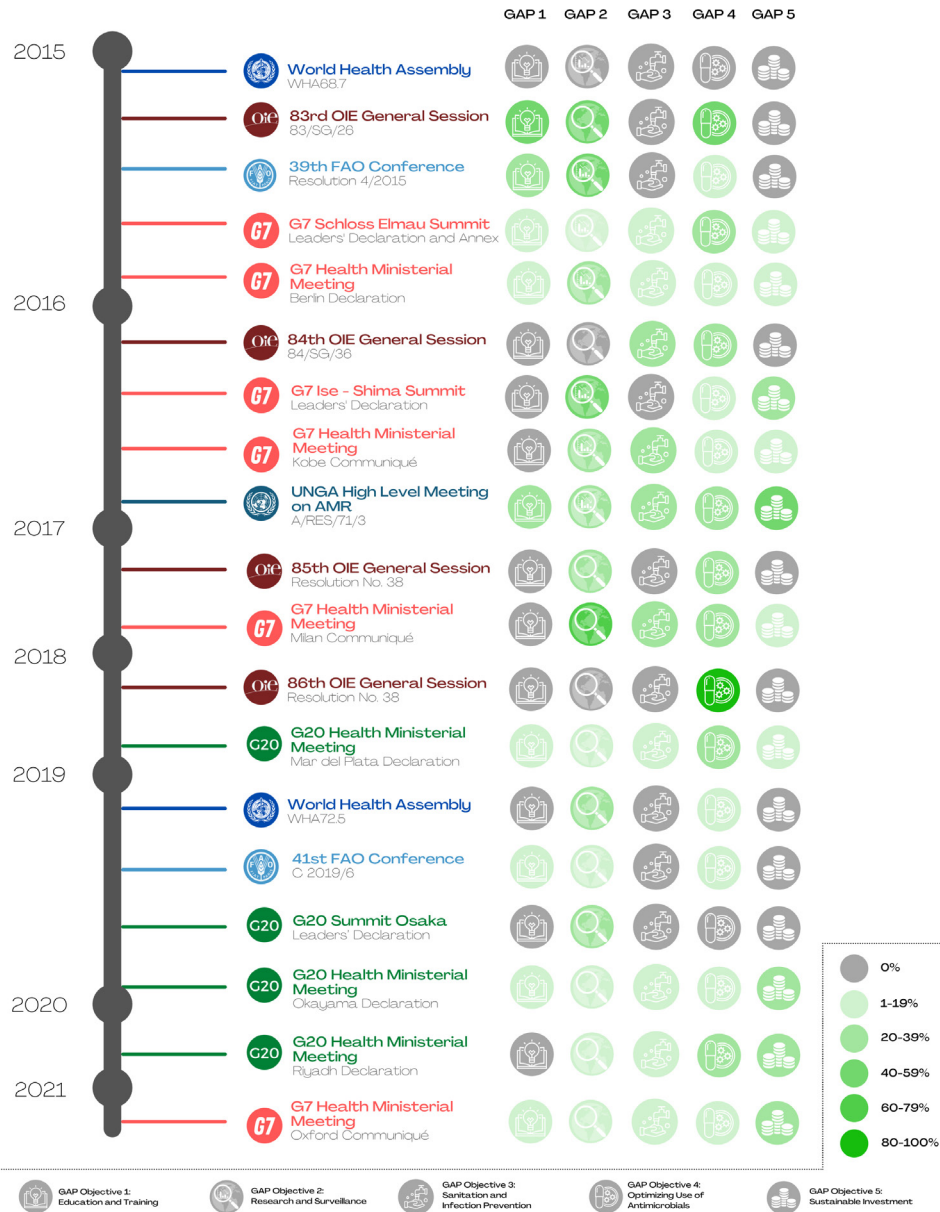
More concrete than ideas, recommendations urged member states to take general or specific action to address the threat of AMR through using antimicrobials appropriately, strengthening monitoring and surveillance, developing national action plans and increasing collaboration among member states. Some examples of these commitments included member states being urged to 'enhance cooperation at all levels for concrete action towards combating antimicrobial resistance, including through: health system strengthening; capacity-building, including for research and regulatory capacity; and technical support',<sup>15</sup> 'join the WHO Global Antimicrobial Resistance Surveillance System (GLASS) and strengthen their own One Health integrated surveillance systems in order to reach the monitoring indicator requirements',<sup>16</sup> and 'strengthen national monitoring of antimicrobial resistance and... regulation of their prescription and use and compliance with those regulations in cooperation with OIE, WHO and FAO in accordance with OIE and Codex standards'.<sup>17</sup>

Commitments categorised as intended actions were the most concrete, requiring countries to take action and containing the strongest implementation language. Some examples of these commitments included members of an international fora 'commit[ing]...to develop, in line with World Health Assembly resolution 68.7...multisectoral national action plans, programmes and policy initiatives,

in line with a One Health approach and the global action plan on antimicrobial resistance, including its five overarching strategic objectives',<sup>18</sup> committing 'to adopt the revised List of antimicrobial agents of veterinary importance presented as Appendix III of Annex 16 of the report of the meeting of the OIE Scientific Commission for Animal Diseases, February 2018',<sup>19</sup> and 'commit[ing] to share best practices and learn from the experiences and expertise of other G20 members to enhance [their] own national and regional One Health responses to AMR'.<sup>11</sup>

### Commitments at the WHA

We reviewed 12 AMR-focused commitments made from resolutions at the 68th and 72nd WHA, all of which were categorised as recommendations. In 2015, at the 68th WHA, all of the commitments urged member states to develop and implement their own national action plans. At the 72nd WHA in 2019, commitments focused on incorporating surveillance and antimicrobial conservation into national action plans. Many of the commitments at the WHA (n=8, 67%) did not focus on any one of the GAP objectives and instead urged member states 'to implement the proposed actions...in the global action plan on antimicrobial resistance, adapted to national priorities and specific contexts'.<sup>20</sup> None of the commitments focused on AMR education and training (GAP 1), sanitation, hygiene and infection prevention measures (GAP 3), or sustainable investment in AMR (GAP 5), while 25% focused on surveillance and research (GAP 2, n=3) and 9% on optimising the use of antimicrobial medicines (GAP 4, n=1).



**Figure 1** Timeline of international fora between the years 2015 and 2021 where AMR was a primary focus, and an indication of how frequently each of the GAP objectives appeared as a proportion of the total number of AMR-related statements in each corresponding resolution or declaration. Statements could have been coded under more than one theme and/or GAP objective, and not all commitments fell into every category; thus, the numbers may not sum to 100. AMR, antimicrobial resistance; FAO, Food and Agriculture Organization; GAP, Global Action Plan; OIE, World Organisation for Animal Health; UNGA, United Nations General Assembly.

**Table 2** Level of commitments by GAP objective

	GAP 1 N=17 n (%)	GAP 2 N=42 n (%)	GAP 3 N=14 n (%)	GAP 4 N=35 n (%)	GAP 5 N=27 n (%)	None of the GAP Objectives N=62 n (%)
Intended actions	6 (35%)	8 (19%)	4 (29%)	12 (34%)	8 (30%)	21 (34%)
Recommendations	6 (35%)	18 (43%)	3 (21%)	13 (37%)	6 (22%)	18 (29%)
Ideas	5 (29%)	16 (38%)	7 (50%)	10 (29%)	13 (48%)	23 (37%)

GAP, Global Action Plan.



### Commitments at the OIE General Sessions

Twelve commitments were identified from four OIE resolutions, the majority of which (n=11, 92%) were categorised as recommendations. The most frequently discussed area was optimising the use of antimicrobial medicines (GAP 4; n=5, 42%), while none of the commitments pertained to sustainable investment in AMR (GAP 5). Calls for member states to implement policies, strategies and national action plans dominated discussions at the 83rd, 84th and 85th OIE General Sessions. Commitments at the 83rd General Session focused on improving veterinary legislation, education and use of antimicrobials. Implementing the OIE strategy on antimicrobials, including using antimicrobials responsibly and adopting best practices such as the OIE Terrestrial and Aquatic Code provisions for biosecurity to prevent disease, were the focus of the 84th General Session. A new theme on collecting data on the use of antimicrobial agents in order to contribute to the OIE database emerged at the 85th OIE General Session. At the 86th OIE General Session in 2018, only one statement was made around AMR, which was categorised as an intended action. This statement committed the Assembly to adopt a list of antimicrobial agents of veterinary importance.<sup>21</sup>

### Commitments at the FAO conferences

Eighteen commitments were identified at the 39th and 41st Sessions of the FAO Conference, 78% of which were recommendations (n=14). Many commitments related to surveillance and research (GAP 2; n=7, 39%). None of the identified commitments related to sanitation, hygiene and infection prevention measures (GAP 3) or sustainable investment in AMR (GAP 5). Animal health was a major theme among these commitments (n=12, 67%).

At the 39th Session of the FAO Conference in 2015, all of the commitments were recommendations, and 50% of commitments related to surveillance and research (GAP 2, n=6). Animal health (n=9, 75%) and the environment (n=7, 58%) were among the most common themes discussed. In one commitment, member states were urged to 'support developing countries to develop programmes and systems for detection, surveillance and monitoring of antimicrobial use and...to follow-up on their related policies established to achieve progressive management of antimicrobial resistance risks in food, agriculture and the environment'.<sup>17</sup> In 2019, at the 41st Session of the FAO Conference, the majority of commitments were ideas (n=4, 67%). These commitments underlined the need for increased public and political awareness around AMR and support for the work that the AMR Tripartite is carrying out. One statement emphasised 'the need for extrabudgetary resources to support FAO's AMR technical assistance provided to members for developing, implementing and monitoring their multi-sectoral national action plans on antimicrobial resistance'.<sup>14</sup> Between 2015 and 2019, there was an increase in discussion around One Health (n=1, 8%, to n=3, 50%)

and a decrease in discussion around animal health (n=9, 75%, to n=3, 50%). A decrease in discussion was also noted around research and surveillance (GAP 2; n=6, 50% to n=1, 17%) during this same period.

### Commitments at the G7 health ministerial meetings and summits

We analysed 76 commitments from six G7 health ministerial meetings and summits, most of which were categorised as ideas (n=35, 46%). Many commitments (n=26, 34%) did not relate to any of the GAP objectives but instead encouraged members to develop national action plans and to cooperate and share knowledge. Animal health (n=15, 20%), human health (n=15, 20%) and One Health (n=16, 21%) were all common themes at these meetings.

At the 2015 and 2016 G7 summits, member states emphasised the importance of taking 'a holistic approach and [taking] concrete measures to retain the effectiveness of antimicrobials'<sup>22</sup> and committed to taking 'concrete actions'<sup>23</sup> to address the threat of AMR. From 2015 to 2016 at the G7 summits, an increase in the frequency of a theme's discussion was only noted for research and surveillance (GAP 2) (n=2, 12%, to n=3, 43%). A decrease in discussions of animal health (n=5, 29%, to n=0, 0%) and human health (n=4, 24%, to n=0, 0%) were also found during this period. At the 2015 health ministerial meeting, discussions around developing national action plans, strengthening surveillance on antimicrobial consumption, and hastening the development of alternative therapies and diagnostic tools were common. One commitment at this forum indicated member states' willingness to 'explore the feasibility and need of setting up a global antibiotic product development partnership for new and urgently needed antibiotics, vaccine development, alternative therapies and rapid point of care diagnostics'.<sup>13</sup> Discussions around promoting clinical research and development, building capacities for the monitoring and surveillance of AMR, and antimicrobial use were common at the 2015, 2016 and 2017 health ministerial meetings. At the health ministerial meeting in 2021, discussions were more diverse in terms of sector as developing knowledge on AMR in the environment, strengthening supply chains in veterinary medicine and building capacity for surveillance of disease outbreaks in zoonotic diseases were noted. Discussions around the potential impact of the environment on AMR were also discussed more at the G7 discussions than any other international forum.

### Commitments at the UN High-Level Meeting on AMR

We identified four intended actions and one recommendation in the resolution adopted by the 71st General Assembly of the UN at the UN High-Level Meeting in 2016. Many commitments (n=2, 40%) related to sustainable investment in AMR (GAP 5). Common themes included animal health (n=2, 40%), human health (n=2, 40%) and One Health (n=2, 40%). Many of the

commitments at this forum committed members to develop national action plans.

### Commitments at the G20 health ministerial meetings and summits

Forty commitments were identified at G20 discussions, half of which fell under the ideas category. Nearly half of the commitments (n=19, 48%) did not relate to any of the GAP objectives and instead recognised the work that had been done to address AMR and reaffirmed efforts to collaborate with member states. Many commitments reinforced and renewed previous commitments or reiterated the importance of taking action against AMR. Some commitments also highlighted general principles such as the need to address barriers to the development of new antimicrobial therapies, stewardship of new and existing antimicrobial drugs, and accelerating research and development initiatives. At the 2018 G20 health ministerial meeting, commitments focused on a variety of themes including conserving antimicrobials, sharing best practices, and building capacity in order to effectively address AMR. At the 2019 health ministerial meeting, one statement reinforced the idea that a gap in knowledge exists regarding the role of the environment on AMR. At this forum, members committed to ‘engage... environmental counterparts to work towards effectively addressing the issue of antimicrobials in the environment, urg[ing] UN Environment Programme (UNEP) to step up and collaborate fully with the Tripartite’.<sup>16</sup> At the 2020 health ministerial meeting, many of the commitments acknowledged the progress that had been made in terms of research and development as well as in financing and implementing AMR national action plans. Commitments made through this forum focused on investigating and preventing the development of secondary AMR infections as a result of the COVID-19 pandemic.<sup>12</sup>

At the 2019 G20 Summit, 67% of commitments were intended actions (n=2). Although a majority of these commitments illustrated member states’ intention to take action, the content primarily focused on general principles rather than concrete action. For example, member states committed to ‘accelerate efforts based on the One-Health approach to tackle antimicrobial resistance’ and ‘to promote [research and development] to tackle AMR’.<sup>24</sup>

Further details on member state’s commitments categorised by international forum, year, and frequency of statement type and theme can be found in online supplemental file S3.

## DISCUSSION

After analysing the global AMR commitments made between 2015 and 2021, it is evident that many of the commitments are neither concrete nor specific and have not become more actionable over time. These commitments have consistently focused on the five GAP objectives; however, some commitments have been

preferentially discussed, while others have received substantially less focus. Across sectors, fewer commitments have been made to act on AMR in the environment than in other sectors. Although international commitments, political declarations and international agreements are a powerful signal of countries’ intentions to act, build consensus and foster cooperation on global challenges such as AMR, they cannot guarantee compliance.<sup>25</sup> To successfully address the global threat of AMR, the global community would do well to concretise ambition into action by transforming ideas and recommendations into specific and measurable required action with appropriate indicators to measure success.

### Primary findings

#### Areas of focus

We noted a lack of commitment on AMR education and training (GAP 1), sanitation, hygiene and infection prevention measures (GAP 3), and sustainably investing in AMR (GAP 5) compared with both research and surveillance (GAP 2) and optimising the use of antimicrobials (GAP 4). While a commitment to sustainable investment was unsurprisingly a greater focus at G7 sessions, these commitments were repetitive and solely encouraged members to explore economic incentives to enhance the research and development of new antibiotics, rapid point of care diagnostic tools and alternative therapies. The overall lack of attention given to some GAP objectives at global-level fora suggests that surveillance and stewardship are being prioritised over more proactive efforts to prevent the spread of infection and address key underlying drivers of AMR such as poor sanitation, healthcare infrastructure and lack of antibiotic knowledge.<sup>26</sup> For example, studies have shown that developing a general understanding of AMR at the grassroots level can influence the responsible use of antimicrobials among the public, slowing the development of AMR.<sup>27–29</sup> Taking a proactive prevention-focused approach at the global level could help bolster efforts to intervene and mitigate the danger posed by AMR at an earlier stage.

Among the different health sectors, the environment has received substantially less focus than either human or animal health, or a combination of the three, One Health. The difficulty in tracing AMR pathways in the environment is one likely reason for this limited focus; beyond pharmaceutical manufacturing, human wastewater and agricultural run-off, the G7 health ministerial meeting in 2021 highlighted the significant role that environmental drivers such as metals, biocides and micro-organisms play in the possible development of AMR. However, both the 2019 G20 and 2021 G7 health ministerial meetings have called attention to the need for greater collaboration with the UNEP in order to understand this area and develop long-term and sustainable solutions.<sup>28</sup> As such, a larger leadership and agenda setting role for UNEP would help improve commitments for addressing the environmental AMR challenges that are difficult to address within the mandates of WHO, FAO and OIE.

### Consistency in commitments between fora

Our analysis suggests that the content of AMR commitments has been consistent across both time and forum, which indicates a level of coordination and synergy among the Tripartite organisations and the global community. Multilateral organisations have continued to encourage their members to build capacity by developing knowledge, policies and surveillance systems; conserve current antimicrobial medications; and coordinate human and financial resources to address this global health threat. However, it is important that commitments are not simply carried forward from one international forum to the next, but instead, made more concrete and specific to each fora's agenda and area of focus.

### Consistency in commitments over time

More concerning than the consistency of the content of the commitments is the consistency of the commitments, in general, over time. Although commitments have remained focused on the objectives of the GAP framework, the same objectives have continued to be neglected, and similar commitments with often a lower level of ambition have been made over time. For example, at the 68th WHA in 2015, a commitment was made 'to have in place, by the Seventieth World Health Assembly, national action plans on antimicrobial resistance that are aligned with the global action plan on antimicrobial resistance', while four years later, in 2019, at the 72nd WHA, a commitment was made 'to develop, implement, monitor, and update adequately resourced multisectoral national action plans'. Previous studies have shown that a mechanism by which the international community can hold states accountable with measurable goals and appropriate indicators for success is more effective at creating change.<sup>6 9 26</sup> Without accountability mechanisms in place or support for national action plan development, many countries still lack a national action plan four years past the initial deadline for their implementation.

Another example of the consistency in commitments over time was the 2015 G7 summit where a commitment was made to 'foster the prudent use of antibiotics by committing to use them for therapeutic reasons under supervision in compliance with national and or jurisdictional legislation and after individual diagnosis'. Three years later at the G20 health ministerial meeting, member states 'acknowledge[d] the need for the prudent and responsible use of all antimicrobials',<sup>11</sup> and again in 2019, at the 72nd WHA, member states were urged 'to further enhance the prudent use of all antimicrobials'.<sup>15</sup> Disproportionate focus on particular areas of the GAP contributes to essential components being missed in the effort to address the challenge of AMR.

In order to effectively address the root causes of AMR and to mitigate its impacts, countries should commit to taking concrete and measurable action on AMR, address both the stewardship and infection prevention components of the GAP, and be held accountable for building regulatory frameworks, infection control infrastructure

and surveillance systems that are suited to their national context, capacity and resources.<sup>8 30 31</sup>

### Strengths and limitations

Our study is the first to identify which sectors and areas of AMR action are being neglected in global commitment-setting discussions and meetings. Our study captures commitments made at all the major multilateral fora where AMR was a primary focus dating back to the release of the GAP in 2017. Our study focuses on global commitments and does not attempt to catalogue or analyse commitments made at the regional or national level. While we recognise the important agenda setting of international organisations, our analysis is also specifically focused on commitments agreed to by countries through resolutions and statements. Our previous research has focused on national government-level policymaking for AMR, and we recognise that many national and regional governments have committed to increased action on AMR despite a lack of actionable global commitments<sup>32</sup>; however, given the importance of global goals as an agenda-setting mechanism in other sectors (eg, climate change), we believe the current focus on global commitments is warranted.

### Policy implications

Although global commitments are only a signal of a country's intention and willingness to act, they are essential to the progress of policy, health, innovation and change. While the success of global health agreements is often hindered by what is known as the 'commitment-compliance gap' (the gap between what states promise to do and what they actually deliver), commitments represent an important first step in the global response to AMR.<sup>9</sup> Without these commitments, it is unlikely that national actions will follow.<sup>5</sup> By taking stock of the existing commitments as well as the gaps, we can work towards effectively addressing AMR.<sup>33-35</sup> Our exploration of emergent themes and persistent gaps within commitments offers a unique window into opportunities for action. Themes that appeared frequently within commitments may benefit from political awareness and be easier to act on, while the neglect of other themes may indicate a knowledge gap within the science of AMR or the influence of politics and global context. Global commitments should support national action, and it is vital that national policies are not solely a routine response to global frameworks designed to produce surface-level compliance,<sup>36</sup> but rather are aligned with national contexts and have measurable indicators for success for each of the AMR-related targets.

### Future research direction

Analysis of the current global commitments to AMR has allowed us to identify areas of focus as well as trends across time and fora, which could be useful in supporting future research efforts in this area. Looking temporally and causally at the language used in these global



commitments and the language that appears in a country's national action plans can aid in assessing the level of influence of global commitments and how global commitments are used in national contexts. National action plans may also be looked at in comparison to commitments made by geopolitical regional bodies to determine whether countries are committing to actions that align with their UN regional groups. We also recognise that after only six years, it may be too soon to tell whether these global commitments have translated into action. Moving forward, it will be important to assess whether there have been improvements in sanitation and hygiene practices, development of diagnostic tools and therapies, and enhancements in the regulation of antimicrobial use at the national and international levels. The recent establishment of the Global Leaders Group and the forthcoming Independent Panel on Evidence are positive steps at the global level, and it will be important to monitor whether these groups usher in opportunities for new and more concrete AMR commitments at international fora.

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## Supplemental Files

**Table S1.** Timeline of key documents pertaining to antimicrobial resistance included in the analysis

	Date	AMR-Related International Forum or Event	Relevant Resolution or Declaration
1	May 18-26, 2015	68 <sup>th</sup> World Health Assembly	WHA 68.7 ( <a href="#">Link</a> )
2	May 24-29, 2015	World Assembly of OIE Delegates – 83 <sup>rd</sup> General Assembly	Resolution No. 26 ( <a href="#">Link</a> )
3	June 6-13, 2015	39 <sup>th</sup> Session of the FAO Conference	Resolution 4/2015 ( <a href="#">Link</a> )
4	June 7-8, 2015	G7 Summit	Leaders' Declaration ( <a href="#">Link</a> ) and Annex ( <a href="#">Link</a> )
5	October 8-9, 2015	G7 Health Ministerial Meeting	Berlin Declaration ( <a href="#">Link</a> )
6	May 22-27, 2016	World Assembly of OIE Delegates – 84 <sup>th</sup> General Assembly	Resolution No. 36 ( <a href="#">Link</a> )
7	May 26-27, 2016	G7 Summit	Leaders' Declaration ( <a href="#">Link</a> )
8	September 11-12, 2016	G7 Health Ministerial Meeting	Kobe Communiqué ( <a href="#">Link</a> )
9	September 21, 2016	High-Level Meeting on Antimicrobial Resistance of the UNGA	A/RES/71/3 ( <a href="#">Link</a> )
10	May 21-26, 2017	World Assembly of OIE Delegates – 85 <sup>th</sup> General Session	Resolution No. 38 ( <a href="#">Link</a> )
11	November 5-6, 2017	G7 Health Ministerial Meeting	Milan Communiqué ( <a href="#">Link</a> )
12	May 20-25, 2018	World Assembly of OIE Delegates – 86 <sup>th</sup> General Session	Resolution No. 21 ( <a href="#">Link</a> )
13	October 4, 2018	G20 Meeting of Health Ministers	Mar del Plata Declaration ( <a href="#">Link</a> )
14	May 20-28, 2019	72 <sup>nd</sup> World Health Assembly	WHA72.5 ( <a href="#">Link</a> )
15	June 22-29, 2019	41 <sup>st</sup> Session of the FAO Conference	Resolution 6/2019 ( <a href="#">Link</a> )
16	June 28-29, 2019	G20 Summit	Leaders' Declaration ( <a href="#">Link</a> )
17	October 19-20, 2019	G20 Health Ministerial Meeting	Okayama Declaration ( <a href="#">Link</a> )
18	November 19, 2020	G20 Health Ministerial Meeting	Riyadh Declaration ( <a href="#">Link</a> )
19	June 3-4, 2021	G7 Health Ministerial Meeting	Oxford Communiqué ( <a href="#">Link</a> )

**Table S2:** Member states commitments categorized by international forum and frequency of statement type and theme<sup>1</sup>

		Statements Unanimously Committed to By All Members at Key International Fora					
		No. (%)					
		World Health Assembly (n=12)	OIE General Sessions (n=12)	FAO Conferences (n=18)	UN High-Level Meetings (n=5)	G7 Health Ministerial Meetings and Summits (n=76)	G20 Health Ministerial Meetings and Summits (n=40)
Commitment Type	Ideas	-	1 (8%)	4 (22%)	-	35 (46%)	20 (50%)
	Recommendations	12 (100%)	11 (92%)	14 (78%)	1 (20%)	8 (11%)	8 (20%)
	Intended Actions	-	-	-	4 (80%)	33 (43%)	12 (30%)
GAP Objective	GAP Objective 1 (Education and training)	-	2 (17%)	4 (22%)	1 (20%)	8 (11%)	2 (5%)
	GAP Objective 2 (Research and surveillance)	3 (25%)	3 (25%)	7 (39%)	1 (20%)	22 (29%)	6 (15%)
	GAP Objective 3 (Sanitation and infection prevention measures)	-	1 (8%)	-	1 (20%)	9 (12%)	3 (8%)
	GAP Objective 4 (Optimizing the use of antimicrobials)	1 (9%)	5 (42%)	3 (17%)	1 (20%)	18 (24%)	7 (18%)
	GAP Objective 5 (Sustainably investing in new medicines, diagnostic tools, and vaccines)	-	-	-	2 (40%)	16 (21%)	9 (23%)

<sup>1</sup> GAP Objectives - 1: Education and training; 2: Research and surveillance; 3: Sanitation and infection prevention measures; 4: Optimizing the use of antimicrobials; 5: Sustainably investing in new medicines, diagnostic tools, and vaccines; Additionally, statements could include more than one theme and/or GAP Objective and not all commitments fell into every category, and thus the numbers may not sum to 100.



	<b>No Focus on Any GAP Objective</b>	8 (67%)	3 (25%)	6 (33%)	1 (20%)	26 (34%)	19 (48%)
<b>Sector Type</b>	<b>Animal Health</b>	-	8 (67%)	12 (67%)	2 (40%)	15 (20%)	1 (3%)
	<b>Environmental</b>	-	-	10 (56%)	-	3 (4%)	-
	<b>Human Health</b>	-	-	2 (11%)	2 (40%)	15 (20%)	6 (15%)
	<b>One Health</b>	3 (25%)	3 (25%)	4 (22%)	2 (40%)	16 (21%)	14 (35%)

**Table S3:** Member states commitments categorized by international forum, year, and frequency of statement type and theme<sup>2</sup>

Statements Unanimously Committed to By All Members at Key International Fora																				
No. (%)																				
Commitment Type	World Health Assembly (WHA)		OIE General Sessions				FAO General Assembly		United Nations High-Level Meeting (HLM)	G7 Health Ministerial Meetings (MM) and Summits						G20 Health Ministerial Meetings (MM) and Summits				
	68 <sup>th</sup> WHA (n=3)	72 <sup>nd</sup> WHA (n=9)	83 <sup>rd</sup> OIE (n=5)	84 <sup>th</sup> OIE (n=3)	85 <sup>th</sup> OIE (n=3)	86 <sup>th</sup> OIE (n=1)	39 <sup>th</sup> FAO (n=12)	41 <sup>st</sup> FAO (n=6)	HLM on AMR (n=5)	G7 Summit 2015 (n=17)	G7 MM 2015 (n=19)	G7 Summit 2016 (n=7)	G7 MM 2016 (n=9)	G7 MM 2017 (n=6)	G7 MM 2021 (n=18)	G20 MM 2018 (n=14)	G20 Summit 2019 (n=3)	G20 MM 2019 (n=11)	G20 MM 2020 (n=12)	
Commitment Type	<b>Ideas</b>	-	-	-	-	-	-	4 (67%)	-	9 (53%)	6 (32%)	3 (43%)	6 (67%)	2 (33%)	9 (50%)	8 (57%)	-	5 (46%)	7 (58%)	
	<b>Recommendations</b>	3 (100%)	9 (100%)	5 (100%)	3 (100%)	3 (100%)	-	12 (100%)	2 (33%)	1 (20%)	3 (16%)	-	2 (22%)	1 (17%)	1 (6%)	1 (7%)	1 (33%)	2 (18%)	4 (33%)	
	<b>Intended Actions</b>	-	-	-	-	-	1 (100%)	-	-	4 (80%)	7 (41%)	10 (53%)	4 (57%)	1 (11%)	3 (50%)	8 (44%)	5 (36%)	2 (67%)	4 (36%)	1 (8%)
GAP Objective	<b>GAP Objective 1</b> (Education and training)	-	-	2 (40%)	-	-	-	3 (25%)	1 (17%)	1 (20%)	3 (18%)	3 (16%)	-	-	2 (11%)	1 (7%)	-	1 (9%)	-	
	<b>GAP Objective 2</b> (Research and surveillance)	-	3 (33%)	2 (40%)	-	1 (33%)	-	6 (50%)	1 (17%)	1 (20%)	2 (12%)	7 (37%)	3 (43%)	3 (33%)	4 (67%)	3 (17%)	2 (14%)	1 (33%)	2 (18%)	1 (8%)
	<b>GAP Objective 3</b> (Sanitation and infection prevention measures)	-	-	-	1 (33%)	-	-	-	-	1 (20%)	2 (12%)	2 (10%)	-	2 (22%)	2 (33%)	1 (6%)	1 (7%)	-	1 (9%)	1 (8%)
	<b>GAP Objective 4</b> (Optimizing the use of antimicrobials)	-	1 (11%)	2 (40%)	1 (33%)	1 (33%)	1 (100%)	2 (17%)	1 (17%)	1 (20%)	6 (35%)	5 (26%)	1 (14%)	1 (11%)	2 (33%)	3 (17%)	3 (21%)	-	1 (9%)	3 (25%)
	<b>GAP Objective 5</b> (Sustainably investing in new medicines, diagnostic tools, and vaccines)	-	-	-	-	-	-	-	-	2 (40%)	2 (12%)	5 (26%)	2 (29%)	1 (11%)	1 (17%)	5 (28%)	2 (14%)	-	3 (27%)	4 (33%)
	<b>No Focus on Any GAP Objective</b>	3 (100%)	5 (56%)	-	2 (67%)	1 (33%)	-	2 (17%)	4 (67%)	1 (20%)	7 (41%)	4 (21%)	3 (43%)	3 (33%)	1 (17%)	8 (44%)	7 (50%)	2 (67%)	4 (36%)	6 (50%)

<sup>2</sup> GAP Objectives - 1: Education and training; 2: Research and surveillance; 3: Sanitation and infection prevention measures; 4: Optimizing the use of antimicrobials; 5: Sustainably investing in new medicines, diagnostic tools, and vaccines; Additionally, statements could include more than one theme and/or GAP Objective and not all commitments fell into every category, and thus the numbers may not sum to 100.

Sector Type	<b>Animal Health</b>	-	-	4 (80%)	2 (66%)	1 (33%)	1 (100%)	9 (75%)	3 (50%)	2 (40%)	5 (29%)	4 (21%)	-	3 (33%)	1 (17%)	2 (11%)	1 (7%)	-	-	-
	<b>Environmental</b>	-	-	-	-	-	-	7 (58%)	3 (50%)	-	-	-	-	1 (11%)	-	2 (11%)	-	-	-	-
	<b>Human Health</b>	-	-	-	-	-	-	2 (17%)	-	2 (40%)	4 (24%)	4 (21%)	-	3 (33%)	2 (33%)	2 (11%)	2 (14%)	-	1 (9%)	3 (25%)
	<b>One Health</b>	1 (33%)	2 (22%)	1 (20%)	1 (33%)	1 (33%)	-	1 (8%)	3 (50%)	2 (40%)	3 (18%)	4 (21%)	2 (29%)	1 (11%)	3 (50%)	3 (17%)	7 (50%)	1 (33%)	2 (18%)	4 (33%)



