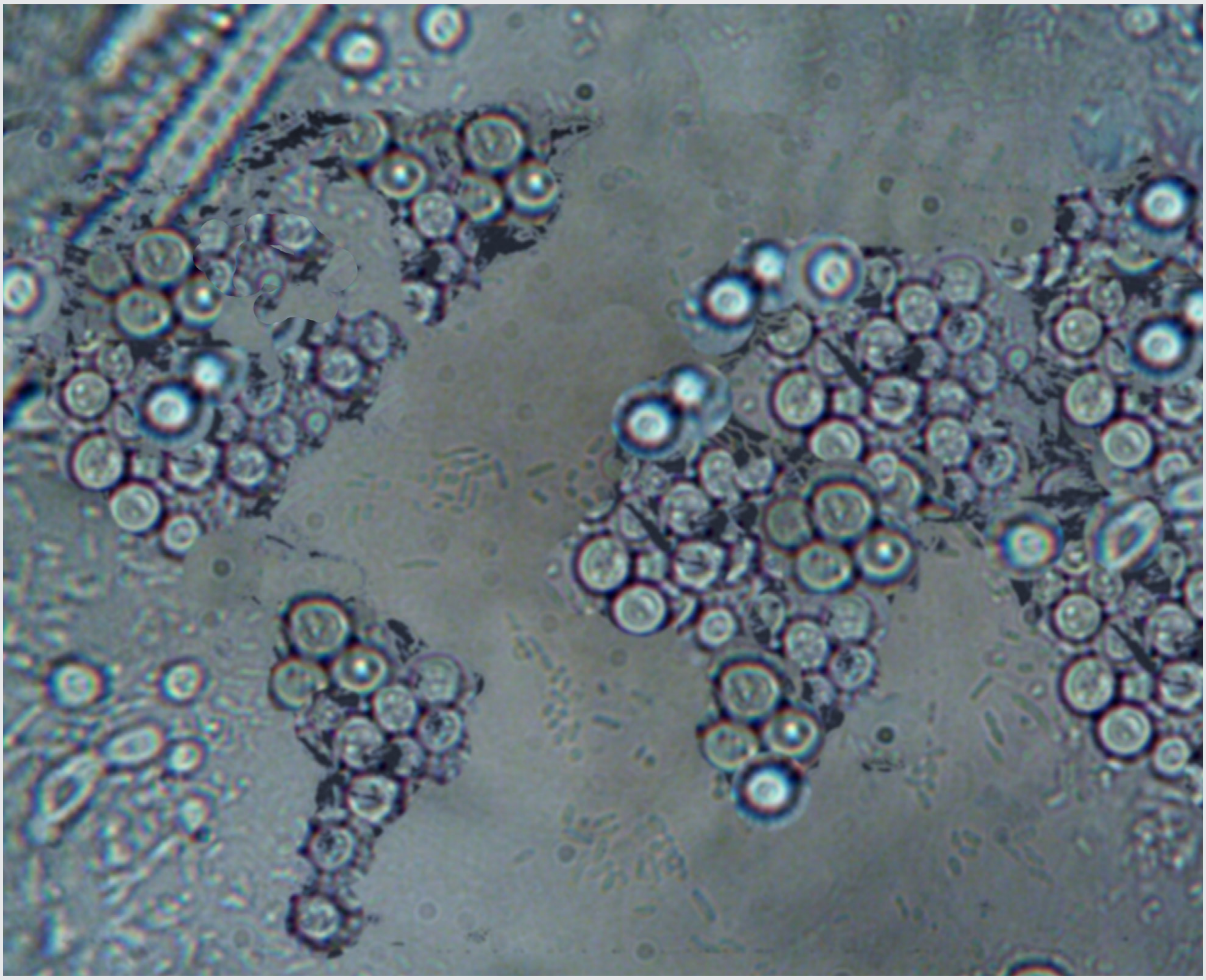
Annual Report on Antimicrobial Agents Intended for Use in Animals

9th Report



World Organisation for Animal Health

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Foreword

Dr Emmanuelle Soubeyran
Director General
World Organisation for Animal Health

Throughout my first year as Director General for the World Organisation for Animal Health (WOAH), I have had the privilege of witnessing remarkable milestones for the Organisation. Not only did we celebrate our centenary in 2024, marking 100 years since the establishment of WOAH; we also saw several critical advancements in the animal health sector for the containment of antimicrobial resistance (AMR). In September 2024, I participated in the High-Level Meeting on AMR during the United Nations General Assembly (UNGA). This pivotal event culminated with the second political declaration on AMR; among other goals, governments pledged to strengthen their surveillance of antimicrobial use data in the animal health sector, and to subsequently improve the quality of data reported to the **ANI**mal Anti**M**icrobial **USE** Global Database (**ANIMUSE**). Building on these commitments, in November 2024, I attended the fourth Global High-Level Ministerial Conference on AMR, where the Jeddah Declaration was adopted by more than 40 countries. These commitments emphasise key areas for the successful implementation of the United Nations (UN) Political Declaration, with governments reaffirming their support for the accurate and regular reporting of antimicrobial use data to ANIMUSE, in line with national legislation.

This is WOAH's ninth *Annual Report on Antimicrobial Agents Intended for Use in Animals* (*AMU*), a testament to our ongoing commitment to build and maintain a global database on the use of antimicrobial medicines in animals, in alignment with the Global Action Plan on Antimicrobial Resistance. Since its first edition in 2016, the data collections linked to this annual report have consistently observed high levels of participation by Members. This year's edition showcases the progress achieved by 154 Members: a tribute to the efforts of Delegates, National Focal Points for Veterinary Products and other national authorities, particularly those from the aquaculture sector, who have all contributed to this extraordinary undertaking. The report continues to offer critical global and regional analyses of antibiotic use in animals over time. I would like to highlight the following findings:

First, 2020 to 2022 saw a downward trend in AMU, with a decrease of 5% at the global level. Second, there was a 6% increase in the animal biomass coverage, based on data from 107 participants in 2022, representing 71% of the global animal biomass. For the first time ever, this expanded coverage has enabled a regional analysis for the Middle East region, as well as a global comparison of AMU by antimicrobial class in terrestrial and aquatic food-producing animals, covering 47% and 64% of their respective animal biomass.

Third, a quarter of our Members still report the use of antimicrobial agents for growth promotion in animals, particularly the continued use of colistin, enrofloxacin and fosfomycin. This report serves as a reminder to all that the use of antimicrobials must never replace proper animal care, and I am confident that these figures will improve as nations work towards full compliance with our international standards, as reiterated in the 2024 UN Political Declaration.

As we mark nine years of sustained progress and commitment, WOAH looks ahead to its next steps. These include equipping our Members with the tools and knowledge to analyse their own data at the national and local level, establishing trend analyses and taking action to optimise the use of antimicrobials. In September 2024, we launched our first regional workshop to institutionalise AMU data collection in selected countries, facilitating the development of national AMU reports. The first cohort of trained Members, primarily from the Africa region, will release their first AMU reports by May 2025.

WOAH remains committed to supporting all Members in implementing our international standards and guidance on the responsible and prudent use of antimicrobials. We stress the importance of adequately resourcing surveillance systems and using data to inform decision-making at both national and regional levels. As part of the Quadripartite alliance, WOAH will continue to support all its Members in maintaining their ownership of data collection, analysis and reporting – despite the competing priorities they may face. It is essential to strengthen our data-gathering systems and integrate them with other AMR data sources.

Finally, I would like to stress the importance of prevention as a cornerstone of our collective efforts to curb AMR. Prevention begins with proper animal husbandry practices, upholding basic animal welfare principles, and continues with enhanced biosecurity to prevent the occurrence of disease in animals. In addition, vaccination plays a crucial role in reducing the need for antimicrobials, thereby lowering the risk of AMR development and spread. By prioritising immunisation, we can prevent disease, safeguard animal and public health and ensure the sustainability of our food systems.

I hope this report encourages Members and non-Members alike to continue their participation. Your ongoing support and engagement enhance both the accuracy and robustness of global data on the use of antimicrobial agents in animals, while also providing a solid evidence base to guide the successful implementation of your National Action Plan on AMR.

Executive summary

The World Organisation for Animal Health (WOAH) *Annual Report on Antimicrobial Agents Intended for Use in Animals* compiles data provided voluntarily submitted data – primarily from national or local authorities – on antimicrobials use in animals. This ninth edition of the report is structured into three main sections: (1) interpretation of the global and regional situation, based on data collected between September 2023 to May 2024 (ninth data collection round); (2) detailed analyses for 2022 (total amount of antimicrobial agents, normalised using an estimated animal biomass indicator); (3) trend analyses for 2020 to 2022, adjusted for the estimated animal biomass indicator.

Methods

In September 2023, WOAH invited its 183 Members and 11 non-Members to participate in the ninth annual round of data collection on antimicrobial agents intended for use in animals. A Microsoft Excel form, designed for direct upload onto the online **ANI**mal Anti**M**icrobial **USE** Global Database (**ANIMUSE**), was sent to participants by email along with a series of guidance documents. This template included four worksheets for participants to provide baseline information for quantitative data. Participants could report data by type of use[1], animal group[2] and route of administration[3]. A complementary tool, previously used by some participants[4], was also provided to facilitate the reporting of comprehensive quantitative data sets. This support was also available in ANIMUSE via its Calculation Module.

Analysed data were primarily based on sales and import figures of antimicrobial agents, reported at the class or subclass level, in accordance with recommendations given in Chapter 6.9. of the *Terrestrial Animal Health Code* (*Terrestrial Code*) [1] and Chapter 6.3. of the *Aquatic Animal Health Code* (*Aquatic Code*) [2].

For consistent reporting and comparison across participants, sectors and over time, antimicrobial quantities are normalised using an estimated animal biomass indicator. This indicator, which can vary in size and composition over time, represents the total mass of live domestic animals within a given population and area over the course of a year. It serves as a proxy to represent the animals potentially exposed to the reported quantities of antimicrobial agents. For the 2022 data, animal biomass was calculated for food-producing species using data from the WOAH World Animal Health Information System (WAHIS) and the Food and Agriculture Organization of the United Nations Statistical Database (FAOSTAT). Normalised results are expressed in milligrams (mg) of antimicrobial quantities reported per kilogram (kg) of estimated animal biomass. Additional methodological details used in this report are available in the references [3-4].

It is important to note that all submitted information belongs to the respective national or local authorities and is shared with WOAH to improve understanding of global and regional antimicrobial use. While no country-specific data are disclosed in this report, all validated data are returned to participants for national monitoring and surveillance purposes. These data may support the evidence-based development in suggested areas of their National Action Plans on AMR. For participants who opt for public disclosure, as per Chapter 6.9. of the *Terrestrial Code* [1], their data are available in the ANIMUSE Interactive Report [5].

Comparisons with previous reports are only possible for the section summarising the overall findings of the ninth data collection round, as it focuses on participation rates and types of reported data. Other comparisons should be made with caution, as participants may differ from year to year, even if the number of participants per year looks similar. For example, while 27 participants may have been included in both the 2021 and 2022 analyses, they are not necessarily the same entities in each report. When examining data across different years, it is better to refer to the 'Trends from 2020 to 2022' section. For insights that include additional years beyond those featured in this edition, readers should consult the ANIMUSE Interactive Report, which offers visualisation of additional years for the trends over time not covered here.

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[1] 'Veterinary medical use' refers to the treatment, control or prevention of disease; 'non-veterinary medical use' includes use for growth promotion.
[2] Terrestrial food-producing, aquatic food-producing or companion animals.
[3] Oral, injection and other routes.
[4] In this report, 'participants' refers to national or local authorities in charge of the official collection, analysis and reporting of data regarding antimicrobials intended for use in animals. This includes WOAH Members, non-WOAH Members and non-contiguous territories.

Key findings of the ninth data collection round

A total of 157 reports were submitted during the ninth round of data collection (157 out of 194 or 81%), including 154 from WOAH Members, one from a non-Member invitee, and two from non-contiguous territories. Among the 183 WOAH Members alone, the participation rate was 84%.

Of the 157 participants, 46 (30%) provided baseline information only – 23 more than the previous report. Additionally, 40 participants described barriers to collecting and reporting quantitative data. The first reported barrier to data submission in this ninth round was the struggle to align national data with WOAH's target year to ensure harmonised global datasets. This alignment, while challenging, does not impede data collection at national or local levels, but rather aids global coordination, improving both national and global analyses. Participants also benefited from having more time to analyse 2023 data, ensuring higher-quality submissions for the future round. Therefore, the apparent decrease in the number of participants reporting antimicrobial quantities should not be interpreted as a lack of national interest in providing data. Instead, it reflects participants' commitment to adhering to WOAH's instructions aimed at improving the consistency and quality of global data analysis.

The next two most common barriers to data collection at a national level were lack of funding and human resources, as well as weak inter-agency coordination/cooperation, especially with local Ministries of Health. Strengthened coordination with WOAH regional and subregional offices, together with combined action from other Quadripartite partners, including the World Health Organization (WHO), aim to support governments to overcome these barriers and increase reporting and subsequent data accuracy and quality. Additionally, it is expected that WOAH Members will strengthen their surveillance of antimicrobial use data in the animal health sector while continuing to report quality data to ANIMUSE, in line with commitments made to the Political Declaration of the High-level Meeting on Antimicrobial Resistance, during the 79th United Nations General Assembly (UNGA) in September 2024.

Of the 157 participants, 111 (71%) reported quantitative data for at least one year between 2022 and 2023. Of these, 38 (34%) made their reports public; the vast majority of these (25 out of 38; 66%) were European Members. This figure has remained steady over the years, despite the best practice guidance given in WOAH's international standards recommending that Members produce transparent data reports. Eighty-three participants out of 111 (75%) reported antimicrobial quantities by type of use and route of administration (Reporting Option 3), with 55% of these utilising the ANIMUSE Calculation Module. While all WOAH regions showed improvement in reporting antimicrobial quantities and the use of Reporting Option 3, the Americas and Africa have shown the most significant progress over five years, with increases in Reporting Option 3 of 26% and 19% respectively.

In 2022, nearly one quarter of Members (34 out of 157; 22%) continued to report the use of antimicrobial agents in animals for growth promotion, with 80% of those concentrated in two regions: the Americas and Asia and the Pacific. Conversely, nearly three quarters of Members (112 out of 157; 71%) now report that this non-veterinary medical use is no longer authorised, with or without legislation/regulation, thus complying with the newly adopted Chapter 6.10. of the *Terrestrial Code* on responsible and prudent use of antimicrobial agents in animals.

Thirty-three participants submitted lists of antimicrobial agents used as growth promoters. The three molecules most frequently reported were bacitracin (n = 19 participants), tylosin (n = 15 participants) and avilamycin (n = 14 participants). While flavophospholipol is listed as not used in humans, according to the *WHO Medically Important Antimicrobials List (MIAs)* [6], bacitracin and tylosin are classified as important for use in humans. Notably, colistin – a highest priority critically important antimicrobial for human health – is still reported by eight participants, despite the commitment made by all WOAH Members ten years ago to phase out this practice. It is also concerning that such reporting varies from year to year due to inconsistencies in the number of participants, emphasising the need for stable national or local surveillance systems with proper resources. Fosfomycin, recently classified as highest priority in the MIA list, was mentioned by two participants, and enrofloxacin was reported by two other participants.

Focused analyses for 2022

The ninth report presents analyses with a focus on the antimicrobial quantities reported as used in 2022 by 107 participants. Based on the data reported (in most cases from sales and imports), WOAH estimates total antimicrobial agents used in animals in 2022 at 70,648 tonnes. Acknowledging the different data sources, and bearing in mind that these data covered an average of 91% of the total amount of antimicrobials present in the field (as estimated by each participant), WOAH estimates that the adjusted total amount could be as high as 74,035 tonnes.

Tetracyclines and penicillins comprised nearly half the agents used across the globe – 28.29% and 17.75% of the total amount, respectively. While both are classified as Veterinary Critically Important Antimicrobial (VCIA) agents in the *WOAH List of Antimicrobials of Veterinary Importance* [7], they are not listed among the highest priority critically important antimicrobial agents for human health per WHO [6]. Among those that are listed by WHO in this category are fluoroquinolones (3.7%), polymyxins (1.8%) and third- and fourth-generation cephalosporins (0.9%).

Normalisation by estimated animal biomass was conducted on data provided by 107 participants, covering 71% of global animal biomass, for both terrestrial and aquatic food-producing animals, with companion animals excluded from the analysis. This saw an increase of 6% of animal biomass coverage compared to the previous analysis for 2021. Bovine species accounted for 42% of the total coverage, followed by swine (20%) and poultry (18%). Aquatic animals accounted for 8% of the total coverage, with fish representing almost two-thirds of aquatic use. Based on this, estimated use in 2022 ranged from a total of 89 to 93 milligrams of antimicrobial agents per kilogram of animal biomass, depending on how coverage estimates were adjusted among the 107 participants.

For the first time, antimicrobial quantities (normalised by estimated animal biomass) were compared between terrestrial and aquatic food-producing animals by antimicrobial classes. Seventy-one participants reported data for terrestrial food-producing animals (47% of the global biomass), and 17 reported data for aquatic food-producing animals (64% of global aquaculture production). WOAH estimates that the mg/kg for terrestrial food-producing animals ranges from 95 to 98 mg/kg, and is 21 mg/kg for aquatic food-producing animals. Notably, fluoroquinolones ranked third in aquaculture, accounting for 15.8% of total quantities used in aquatic food-producing animals (representing 3.9 mg/kg). Given their critical importance for human health, WOAH will continue monitoring this trend.

Specific data for non-food-producing animals were provided by 61 participants (73% of the 84 able to report data by animal group). Animals reported in this category were primarily canines and felines, followed by equidae and ornamental fish. In 2022, the number of participants in this category has increased by 38 since 2015. Due to data gaps in animal populations and average weights of non-food-producing animals at a global level, WOAH is currently unable to analyse antimicrobial quantities normalised by estimated animal biomass. However, efforts are underway to address AMR and AMU data gaps for these animals, with the expectation that future reports will address the lack of biomass data.

Trends (2020–2022)

Trend analyses show antimicrobial data over time for 85 participants who consistently submitted quantitative data from 2020 to 2022, employing the normalised amount of milligrams of antimicrobials per kilogram of estimated animal biomass. Collected data represent 62% of the global animal biomass and show a 5% decrease in mg/kg at the global level (down from 102 mg/kg in 2020 to 97 mg/kg in 2022). Regional breakdowns showed decreases in Africa (20%), the Americas (4%), Europe (23%) and Asia and the Pacific (2%). However, the Middle East reported an increase of 43%. By antimicrobial class, it is worth noting the decrease in tetracycline use (26%, the most-used antimicrobial class in animal health), and an increase in the use of penicillins (18%).

Conclusions and perspectives

Despite ongoing resilience challenges and competing priorities faced by WOAH Members, overall participation in the ninth data collection round remained high and consistent over time. Nearly 80% of submitted reports contained quantitative data.

Tetracyclines remain the most-used antimicrobial class in animal health around the world. Although some highest priority critically important antimicrobials for human health are still in use, they account for a small fraction of the global picture in food-producing animals (8% according to the *WHO List of Medically Important Antimicrobials* published in 2024 [6]). Encouragingly, there is a shared commitment among Members to decrease antimicrobial consumption in the animal health sector, and this is evident with 55 participants reporting a decrease in antimicrobial quantities at the national level from 2020 to 2022.

Analysis over time shows a global 5% decrease in the indicator used to track trends among the 85 participants who have consistently provided data from 2020 to 2022. This year marks the first inclusion of data from the Middle East, which showed a 43% rise during this period, as opposed to decreases in Europe (23%), Africa (20%), the Americas (4%) and Asia and the Pacific (2%).

While this increase in the Middle East may seem significant, this region's AMU rate in mg/kg is actually the lowest, representing only 0.3% of the global biomass and 0.04% of the global quantities reported. It must be noted that this report's current participants only cover 17% of the region's animal biomass. Thus, broader participation is urgently needed to enhance the accuracy and reliability of regional estimates.

In Africa, the previously reported 179% increase (see the 8th annual report published in May 2024) has since been reviewed with the participants concerned. The hypotheses for the observed data fluctuations included improvements in data collection systems (suggesting underreporting in previous years), increased AMU driven by disease outbreaks in the animal health sector, or other factors related to the intensification of production systems. Investigating these fluctuations was complex and required Veterinary Services in participating countries to track historical data and sometimes field-level data, coordinate with various national agencies and engage with the private sector to determine the underlying causes. For the participants in question, it was eventually found that the discrepancies were due to issues in data collection systems and reporting processes. Identifying such errors is nevertheless a positive step, as it enables system corrections and fosters continuous improvements. Based on the most recent and validated data available at the time of this report, the Africa region shows a 52% increase in AMU in 2019–2022 and a decrease of 20% for the 2020–2022 period. For the most up-to-date and comprehensive data, readers should refer to the ANIMUSE Interactive Report, which offers present and historical data that is continuously verified by participating authorities.

While significant progress has been made to reduce the use of antimicrobials as growth promoters, nearly 25% of Members continue to report this practice. Of greater concern, 7% of WOAH Members still report the use of at least one highest priority critically important antimicrobials for human medicine – such as colistin, enrofloxacin and fosfomycin – for growth promotion. As adherence to WOAH's international standards remains a pillar of the Organisation's AMR Strategy, this report serves as an evidence-based reminder for all Members to restrict the use of antimicrobials to veterinary medical purposes. The ultimate goal is a total ban on the use of antimicrobials for growth promotion, and this process must start with those antimicrobials classified as having the highest critical importance for human health. In addition, WOAH encourages Members to report data with full transparency, as this enables stakeholders to assess trends, conduct risk assessments and support effective risk communication.

Thanks to the continued efforts of WOAH Members each year, ANIMUSE has evolved into the most comprehensive and reliable representation of global antimicrobial use in animals, covering almost 85% of global geography and 71% of the total global animal biomass. As of January 2025, 39 Members have made their antimicrobial use reports publicly available through the ANIMUSE portal, regardless of whether a national antimicrobial use report has been produced for the animal sector. That is three times more than in December 2023, and we commend these Members for taking this important step towards transparency and accountability.

As data collection systems continue to mature, this annual report will remain a key tool for tracking global and regional patterns in antimicrobial use in animals, and its changes over time. WOAH also aims to strengthen communication with other national agencies beyond Veterinary Services, particularly those involved in antimicrobial use data collection in the animal health sector, in collaboration with WHO. Success in tackling antimicrobial use and resistance will ultimately depend on sustained, interdisciplinary collaboration and shared commitment to responsible antimicrobial stewardship.

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WOAH would also like to thank all its Members, Delegates, National Focal Points for Veterinary Products and other government officials who contributed to the ninth annual collection of data on antimicrobial agents used in animals. Without their help, the knowledge and insight presented in this report would not have been possible.

Finally, WOAH would like to thank its Working Group on Antimicrobial Resistance for its guidance in the development of the global database and methodology for calculating animal biomass, used during the ninth round of global data collection on antimicrobial agents intended for use in animals.

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Acronyms and abbreviations

AMR	Antimicrobial resistance
AMU	Antimicrobial use
ANIMUSE	ANImal antiMicrobial USE Global Database
CIPARS	Canadian Integrated Program for Antimicrobial Resistance Surveillance
ESVAC	European Surveillance of Veterinary Antimicrobial Consumption
FAO	Food and Agriculture Organization of the United Nations
FAOSTAT	Food and Agriculture Organization of the United Nations Statistical Database
UNEP	United Nations Environment Programme
WAHIS	World Animal Health Information System
WHO	World Health Organization
WOAH	World Organisation for Animal Health

WOAH Glossary[5]

Antimicrobial agent: a naturally occurring, semi-synthetic or synthetic substance that exhibits antimicrobial activity (to kill or inhibit the growth of micro-organisms) at concentrations attainable *in vivo*. Anthelmintics and substances classed as disinfectants or antiseptics are excluded from this definition.

Aquatic Animal Health Services[6]: the combination of governmental and non-governmental individuals and organisations that perform activities to implement the standards of the *Aquatic Animal Health Code*.

Growth promotion, growth promoters[7]: the administration of antimicrobial agents to animals only to increase the rate of weight gain or the efficiency of feed utilisation.

Monitoring: the intermittent performance and analysis of routine measurements and observations, aimed at detecting changes in the environment or health status of a population.

Surveillance: the systematic ongoing collection, collation, and analysis of information related to animal health, and the timely dissemination of information so that action can be taken.

Veterinary Authority: the Governmental Authority of a Member Country having the primary responsibility in the whole territory for coordinating the implementation of the standards of the *Terrestrial Animal Health Code*.

Veterinary legislation: laws, regulations and all associated legal instruments that pertain to the veterinary domain.

Veterinary medicinal product: any product with approved claims to having a prophylactic, therapeutic or diagnostic effect or to alter physiological functions when administered or applied to an animal.

Veterinary medical use: the administration of an antimicrobial agent to an individual or a group of animals to treat, control or prevent infectious disease.

- To 'treat' means to administer an antimicrobial agent to an individual or a group of animals showing clinical signs of an infectious disease.
- To 'control' means to administer an antimicrobial agent to a group of animals containing both sick and healthy animals (presumed to be infected), to minimise or resolve clinical signs and to prevent further spread of the disease.
- To 'prevent' means to administer an antimicrobial agent to an individual or a group of animals at risk of acquiring a specific infection or in a specific situation where infectious disease is likely to occur if the drug is not administered.

Veterinary Services: the combination of governmental and non-governmental individuals and organisations that perform activities to implement the standards of the *Terrestrial Animal Health Code*.

[5] For the purposes of the WOAH *Terrestrial Animal Health Code* [8].
[6] For the purposes of this report, when Veterinary Services are mentioned, they include the definition for Veterinary Services and for Aquatic Animal Health Services.
[7] According to the *WOAH List of Antimicrobial Agents of Veterinary Importance* [7], the responsible and prudent use of antimicrobial agents does not include the use of antimicrobial agents for growth promotion in the absence of risk analysis.

1. Introduction

1.1. Background

WOAH activities on antimicrobial resistance

In May 2015, during the 83rd General Session of the World Assembly of World Organisation for Animal Health (WOAH) Delegates, WOAH Members officially committed to containing antimicrobial resistance (AMR) and promoting the responsible and prudent use of antimicrobials in animals. Moreover, they stated their full support for the Global Action Plan on AMR, developed by the World Health Organization (WHO) in close collaboration with WOAH and the Food and Agriculture Organization of the United Nations (FAO) [9]. One year later, during the 84th General Session, the World Assembly of Delegates directed WOAH to compile and consolidate all actions to combat AMR [10], leading to the establishment of WOAH's Strategy on AMR and the Prudent Use of Antimicrobials, which was published in November 2016 [11].

The structure of WOAH's Strategy on AMR and the Prudent Use of Antimicrobials supports the objectives established in the Global Action Plan, and reflects the mandate of WOAH as described in its Basic Texts and Strategic Plans through four main objectives:

- Improve awareness and understanding;
- Strengthen knowledge through surveillance and research;
- Support good governance and capacity building;
- Encourage the implementation of international standards.

To achieve these objectives, WOAH engages with its Members through National Focal Points for Veterinary Products, who are responsible for providing technical assistance to improve and harmonise national policies to control veterinary products at the national level. Moreover, WOAH regularly organises seminars to support good governance and capacity building, as well as the harmonised implementation of its international standards on the responsible and prudent use of antimicrobials. More information can be found in the following sources:

- The *Terrestrial Animal Health Code* (*Terrestrial Code*), Chapter 6.8., 'Harmonisation of national antimicrobial resistance surveillance and monitoring programmes', includes examples of target animal species and animal bacterial pathogens that may be included in resistance surveillance and monitoring programmes [12].
- The *Aquatic Animal Health Code* (*Aquatic Code*) includes a corresponding section, Chapter 6.4., 'Development and harmonisation of national antimicrobial resistance surveillance and monitoring programmes for aquatic animals' [13].
- The *Manual of Diagnostic Tests and Vaccines for Terrestrial Animals*, Chapter 2.1.1., 'Laboratory methodologies for bacterial antimicrobial susceptibility testing', provides the laboratory methods that support surveillance and monitoring [14].

WOAH activities on antimicrobial use

Monitoring antimicrobial use is crucial to understanding potential risk areas that can contribute to the development of antimicrobial resistance. This effort aligns with Objective Four of the Global Action Plan on AMR: 'Optimize the use of antimicrobial medicines in human and animal health' [9].

In 2012, WOAH developed a questionnaire (the WOAH template), aiming to strengthen its role in the global effort to prevent AMR. This tool allows the Organisation to:

- understand Members' implementation of the WOAH *Terrestrial Code* Chapter 6.9. on 'Monitoring of the quantities and usage patterns of antimicrobial agents used in food-producing animals' [1];
- raise awareness among Members about antimicrobial use in animals; and
- identify the actions WOAH needs to take to develop its strategy in this field.

At the time of the tool's launch, only 27% of respondents had an official system for collecting quantitative data on antimicrobial agents intended for use in animals.

The results were presented at the first WOAH Global Conference on the Responsible and Prudent Use of Antimicrobial Agents for Animals, held in March 2013 in Paris, France. The recommendations to WOAH Members that resulted from the conference included establishing an official harmonised national system for collecting data on quantities of antimicrobial agents used in food-producing animals and contributing to WOAH's initiative of collecting data on antimicrobial agents used in animals, with the ultimate aim of creating a global database hosted by WOAH.

In response, WOAH's 2015 World Assembly unanimously adopted Resolution No. 26 during the 83rd General Session, officially mandating the Organisation to collect data on the use of antimicrobial agents in animals worldwide [15]. As a result, this global database was created in line with the relevant chapters of the *Terrestrial Code* [1] and the *Aquatic Code* [2].

Since 2015, WOAH has led this global database initiative under the framework of the Global Action Plan on AMR [9], supported by FAO, WHO and – more recently – the United Nations Environment Programme (UNEP), as part of the Quadripartite collaboration.

In September 2022, WOAH transitioned from spreadsheet-based data collection to an automated system called the **ANI**mal anti**M**icrobial **USE** Global Database (**ANIMUSE**)[8].

1.2. Scope

This report presents the results of the ninth round of the annual collection of data on antimicrobial agents intended for use in animals. For participants, this initiative updates the status of veterinary antimicrobials governance and includes submissions of quantitative data when participants are able. The report also highlights the barriers that countries face in collecting, analysing and reporting these data.

In addition to a qualitative analysis of the ninth round of data collection, this report provides a global analysis of quantitative data on antimicrobial agents intended for use in animals, adjusted by animal biomass. The focus year of this quantitative analysis is 2022; for data sets from previous years, readers should refer to the ANIMUSE Interactive Report[9], which presents the latest comprehensive historical data.

Participants primarily report data from sales or imports of antimicrobial agents included on the *WOAH List of Antimicrobial Agents of Veterinary Importance* [7], which prioritises antimicrobials crucial to maintaining animal health and welfare worldwide. The data collection template and resulting report were developed with consideration for the varying levels of governance and surveillance capacity of veterinary antimicrobials among WOAH Members. The first ANIMUSE Interactive Report, released in May 2023, introduced a user-friendly interface to explore the results presented in this report. Please note that some charts in this document may differ from those in ANIMUSE, as the latter is continuously updated in real time to reflect the latest data. Data used in this report were extracted in October 2024 for Section Two, and in December 2024 for Sections Three and Four.

For participants reporting quantitative data, the amounts of antimicrobial agents intended for use in animals that were sold, purchased or imported were provided to WOAH in kilograms (kg) of antimicrobial agent (chemical compound as declared on the product label). These reported figures were calculated in accordance with the guidance provided to Members via the ANIMUSE public portal.

All information provided remains the property of the source country and is reported to WOAH in confidence to support a better understanding of the global and regional use of antimicrobial agents in animals. As such, this report does not present data at the national level. WOAH encourages all participants to produce national reports for their own use when implementing and adapting their National Action Plans on AMR, and it underscores the value in publishing national reports. The list of publicly available national reports on veterinary antimicrobial usage can be found in the ANIMUSE Interactive Report. In addition, a list of participants that have made their reported data publicly available through ANIMUSE – regardless of whether a national report was produced – is accessible in the ANIMUSE Country Data[10].

[8,9] https://amu.woah.org
[10] https://amu.woah.org/amu-system-portal/amu-data

2. Results of the ninth round of data collection

2.1. General information

WOAH activities on antimicrobial resistance

The ninth round of data collection was launched in September 2023 to gather data on antimicrobial agents intended for use in animals for the year 2022, with the option to include data from 2023. During this round, 157 reports were submitted to WOAH (*n* = 194; 81%) (**Figure 1**). One of the non-Member invitees and two of the non-contiguous territories took part in this round of data collection. When considering only the contributions from the 183 WOAH Members, the participation rate was 84%. The proportion of responses received from WOAH Members in the different WOAH regions varied from 74% to 100% (**Table 1**). The data presented in Section Two of this report were extracted and analysed from ANIMUSE in October 2024. The most up-to-date figures at global and regional levels can be found at the ANIMUSE public portal.

Table 1. Number of Members who reported to WOAH in the ninth round of data collection, by WOAH region

WOAH region	Number of Members who submitted reports, by WOAH region	Number of WOAH Members*	Proportion of response (%)
Africa	40	54	74%
Americas	32	32	100%
Asia and the Pacific	24	32	75%
Europe	49	53	92%
Middle East	9	12	75%
Total	**154**	**183**	**84%**

*Distribution of Members by WOAH region is in accordance with the WOAH Note de service 2010/22 (available in the Annex to this report).

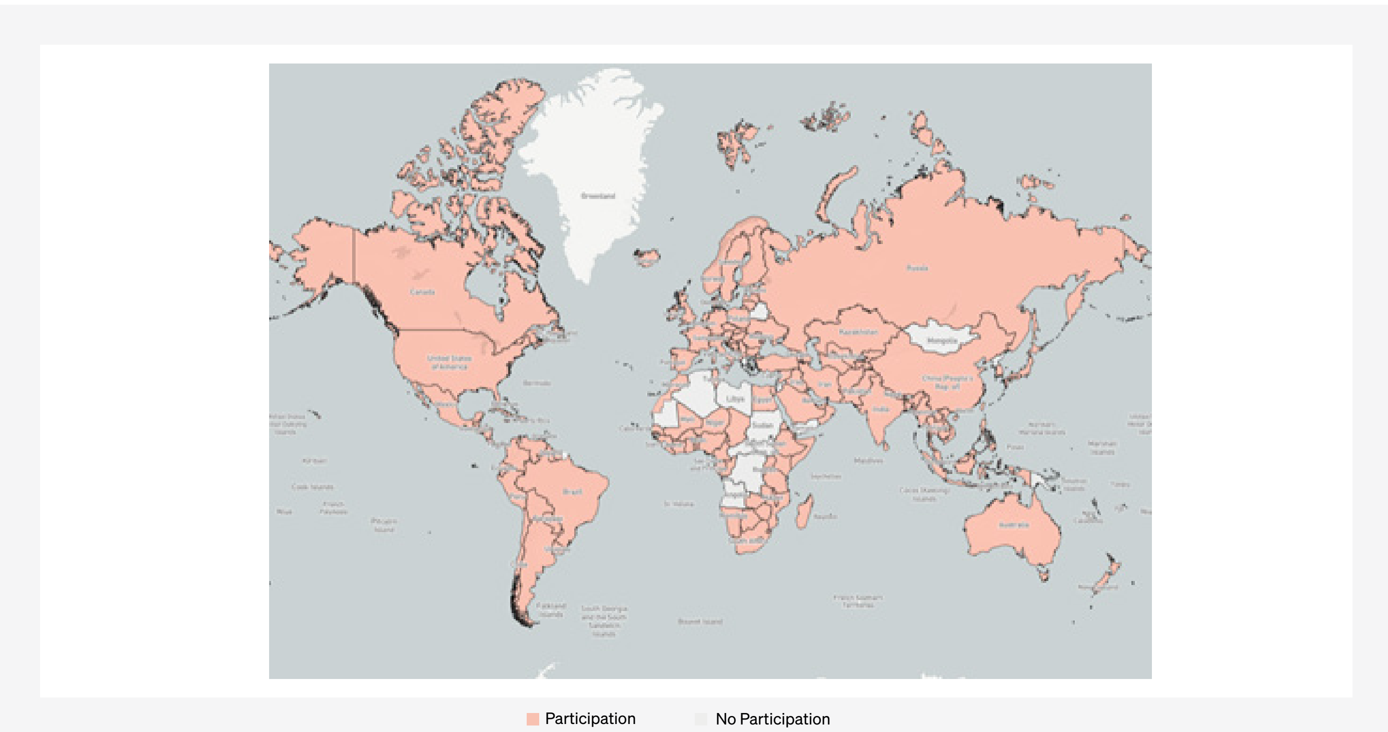


Figure 1. Geographical distribution of participants who reported to WOAH in the ninth round of data collection

2.2. Reporting options

In the ninth round of data collection, 'Baseline Information' (Parts A and B of WOAH's template) was completed by 157 participants.

A participant's ability to provide quantitative information reflects their capacity to collect detailed data on antimicrobial agents intended for use in animals. In this ninth round, 111 participants (*n* = 157; 71%) submitted quantitative data, demonstrating their commitment to developing monitoring systems for veterinary antimicrobial agents (**Figure 2**). For additional information on the decline in the number of participants providing antimicrobial quantities, please refer to Section 2.4 'Administrative WOAH directive – target year alignment'. Of the 111 Members providing quantities, 83 (*n* = 111; 75%) used Reporting Option 3, giving the highest level of detail in the WOAH template. This indicates that most Members were able to report data by type of use (veterinary medical use versus growth promotion), animal group and route of administration. Furthermore, 46 Members (*n* = 83; 55%) used the Calculation Module when reporting in Option 3. This tool enabled them to conduct further analysis at the molecule level and by veterinary product. WOAH is supporting these Members by providing training and skills in data visualisation, helping them prepare reports for key national stakeholders. Of these 46 Members, 48% were from Africa, 20% from the Americas, 15% from Asia and the Pacific, 13% from Europe and 2% from the Middle East.

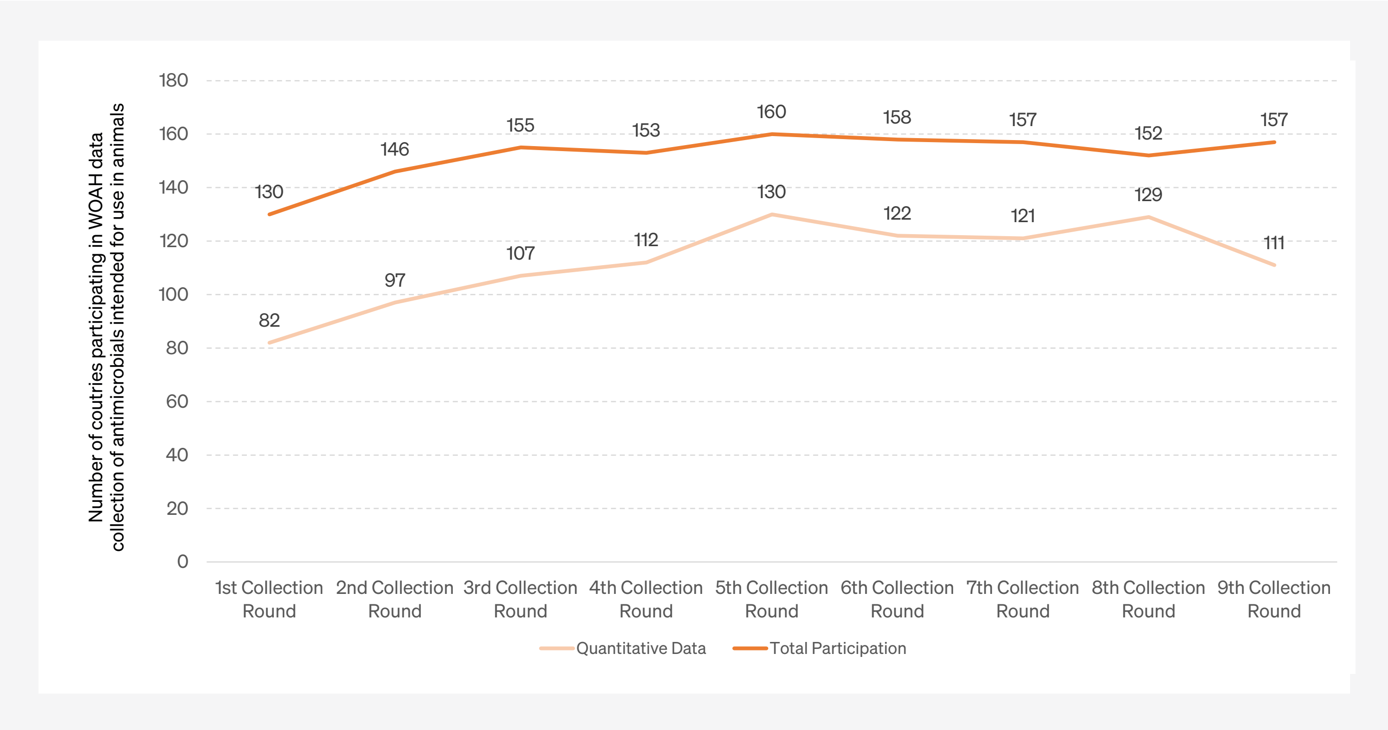


Figure 2. Number of participants over different data collection rounds

2.3. National reports available online

The WOAH template asks participants if a national report on the antimicrobial agents used in animals is available online. In the ninth round of data collection, 73 participants (*n* = 111; 66%) indicated that they had not published online national reports (**Figure 3**). After nine years of data collection, Europe remains the only region where more than 50% of Members have made their national reports publicly available online.

WOAH continues to encourage all participants to publish their own national reports on the sales or use of antimicrobial agents in animals, to promote transparency and assess trends. Following the ninth round, WOAH launched a series of workshops focused on supporting selected WOAH Members in drafting AMU national reports. As a result, it is anticipated that more Members – particularly those outside Europe – will begin producing their first national reports in the coming years.

The list of participants with publicly available national reports on antimicrobial agents intended for use in animals is accessible through the button 'National Reports' in the ANIMUSE Interactive Report, along with the relevant links.

The list of participants who have made their data publicly available on the ANIMUSE public portal – regardless of whether a national report has been produced – can be found here: https://amu.woah.org/amu-system-portal/amu-data.

Figure 3. Number of participants in all rounds of WOAH data collection with national reports available online

2.4. Barriers to participants providing quantities of antimicrobial agents in animals

Some participants who had previously reported barriers to submitting quantitative data during the eighth round showed progress in the ninth round. Six of these participants advanced from reporting only baseline information to submitting antimicrobial quantities.

In the ninth round, 46 of the Members (*n* = 157; 30%) provided baseline information only. Of these, 40 participants (*n* = 46; 87%) outlined specific barriers that prevented them from reporting antimicrobial quantities. These barriers have been grouped into six categories (**Figure 4**).

Thirty-five participants reported one main barrier, while five reported two. The relative significance of each barrier category may vary when results are analysed on a regional level. Of the 40 Members who reported barriers, 11 were from Africa, 13 from the Americas, 4 from Europe, 7 from Asia and the Pacific and 5 from the Middle East.

A description of the barrier categories can be found in the following explanatory section.

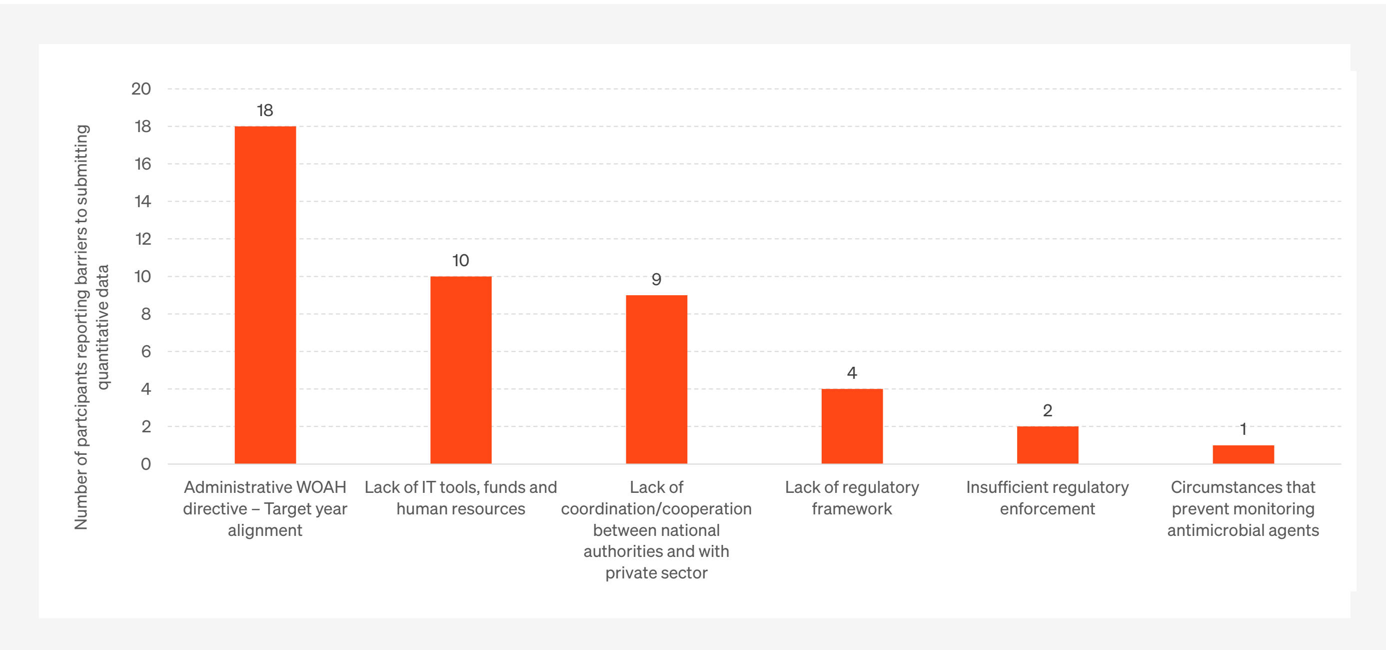


Figure 4. Barriers to reporting quantitative data on antimicrobial agents intended for use in animals reported by 40 participants during the ninth round of data collection

Administrative WOAH directive – target year alignment

The ninth round of data collection was launched in September 2023, targeting the year 2022 for data submission. Eighteen participants initially attempted to submit data for the year 2023; however, these submissions were often late, incomplete or lacked sufficient national-level analysis. Following WOAH's invitation letter for the ninth round – which encouraged Members to align their submissions with the target year 2022 – these participants adjusted their submissions accordingly. Since the first round of data collection in 2015, WOAH has allowed flexibility for participants to submit data from additional years. This approach has enabled Members to contribute data for years they were able to report on. However, over time, WOAH has progressively narrowed the acceptable range of reporting years to improve consistency and the overall quality of analyses.

These 18 participants complied with WOAH's directive, with most storing their 2023 data in the ANIMUSE Calculation Module in preparation for the next round. This adjustment does not hinder national-level data collection; rather, it supports global coordination and enhances both national and global analyses. Additionally, participants benefit from having more time to analyse their 2023 data, ensuring higher-quality submissions in future rounds.

Lack of IT tools, funds and human resources

Five participants reported that additional staff resources were needed to support the collection and collation of data.

Another five participants identified a lack of digitised records (mainly imports of veterinary products and information related to their authorisation) as a key barrier to data collection. In some cases, ongoing transitions to new electronic platforms hindered efficient data collection. Of these five participants, three also reported staff shortages.

Additionally, five national authorities cited limited financial resources as a constraint, noting the lack of dedicated budgetary support to establish robust data collection systems.

Most of these participants had previously identified staffing as their key constraint. This suggests that their Veterinary Services may be unable to prioritise antimicrobial monitoring due to other competing demands within the veterinary sector.

Lack of coordination/cooperation between national authorities and with the private sector

In this category, seven participants reported challenges when working with entities outside the Veterinary Services. Five of them noted that, for many years, the legal authority over antimicrobial quantities intended for use in animals has rested with the Ministry of Health. They explained that the Ministry holds legal competency for the authorisation and importation of veterinary medicinal products, but does not share these data with the Veterinary Authority – despite the latter being charged with their responsible use in the field, and repeated attempts to collaborate.

Two Members reported difficulties working with the pharmaceutical industry. In the absence of a mandatory requirement for data submission of antimicrobial quantities, these stakeholders are reluctant to share their data with Veterinary Services.

Lack of regulatory framework

Four participants reported the absence of an appropriate regulatory framework as a key barrier. Among them, two also cited challenges related to insufficient budget and staffing within Veterinary Services. Three of the four participants in this category were from Africa.

Insufficient regulatory enforcement

Two participants explained that although their countries have a National Action Plan on AMR that addressed AMU, the plan was not being implemented. As a result, there is a lack of data collation.

Circumstances that prevent the monitoring of antimicrobial agents

One participant reported political instability as the main reason for not reporting antimicrobial quantities in animals.

Summary of barriers

In the ninth round, one of the most reported barriers was the challenge of aligning submissions with WOAH's designated target year. While this alignment allows more time for data analysis and supports consistency in participants reporting one single year, it presented an initial hurdle to 18 participants. Beyond this group, the majority of participants cited staffing shortages within the Veterinary Services that collate AMU data. This was followed or compounded by budgetary constraints and lack of appropriate IT tools or digitised records, which are essential for data collection on sales or imports of veterinary products.

Another recurring barrier arises when the Ministry of Health holds legal authority over the registration of veterinary products but does not share these data with Veterinary Services. To address this challenge, WOAH has initiated discussions with WHO to improve collaboration between national authorities. This lack of cooperation should not hinder countries, as combating antimicrobial resistance falls within the realm of the One Health approach and demands unified solutions. Moreover, it is often a specific objective of a country's AMR National Action Plan.

2.5. Antimicrobial agents used for growth promotion

During the 2016 WOAH General Session, WOAH Members adopted Resolution No. 36, 'Combating Antimicrobial Resistance through a One Health Approach: Actions and OIE Strategy', agreeing to the following recommendation:

> 'OIE [WOAH] Member Countries fulfil their commitment under the Global Action Plan to implement policies on the use of antimicrobials in terrestrial and aquatic animals, respecting OIE [WOAH] intergovernmental standards and guidelines on the use of critically important antimicrobial agents, and the phasing out of the use of antibiotics for growth promotion in the absence of risk analysis'. [10]

The *WOAH List of Antimicrobial Agents of Veterinary Importance* also states that the '**responsible and prudent use of antimicrobial agents does not include the use of antimicrobial agents for growth in the absence of risk analysis**' [7]. Risk analysis is defined as the 'process composed of hazard identification, risk assessment, risk management and risk communication' and should follow the procedure specified in Chapter 6.11. of the *Terrestrial Animal Health Code* [16].

In this ninth round of data collection, as presented in **Figure 5**, a total of 112 (*n* = 157; 71%) participants report not using antimicrobial agents for growth promotion in animals, either with or without legislation or regulations. Thirty-four participants (*n* = 157; 22%) reported the use of antimicrobials for growth promotion. Eleven remaining participants indicated that they were unsure if antimicrobials were being used in the field. Of these 11, ten reported having no legislation related to growth promotion. Notably, in the last three rounds, five participants that previously reported no use of growth promoters with no related legislation or regulation are now indicating that the use of growth promoters is uncertain. This shift suggests gaps in regulatory oversight that warrant further investigation.

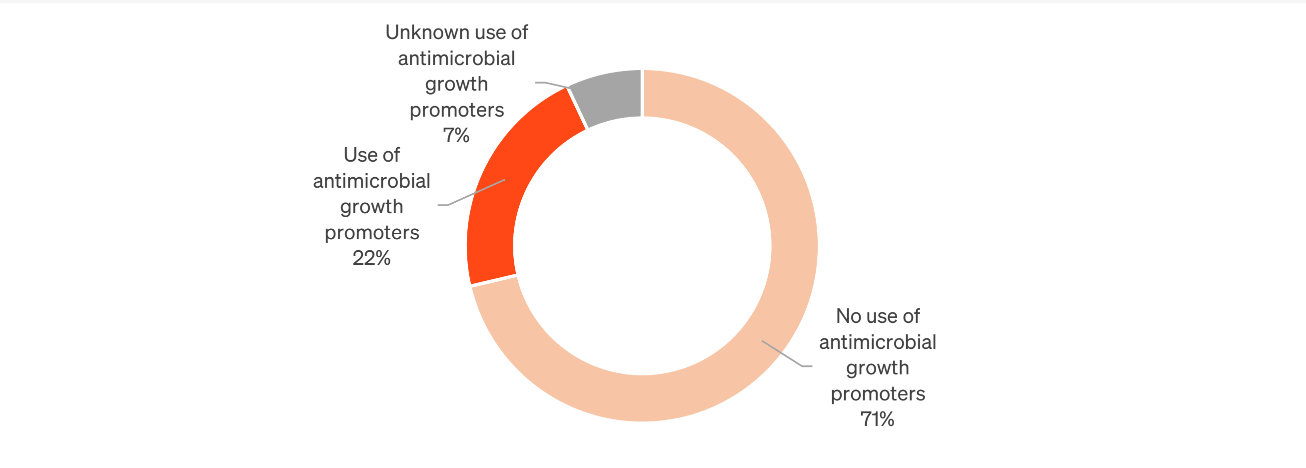


Figure 5. Use of antimicrobial growth promoters by 157 participants in 2023

When differentiated by WOAH region, the Americas had the highest proportion of participants using antimicrobials as growth promoters (**Figure 6**). In contrast, the European Union has banned growth promoters since 2006, a policy reflected in the response from Europe, where no use or authorisation of antimicrobial growth promoters was reported.

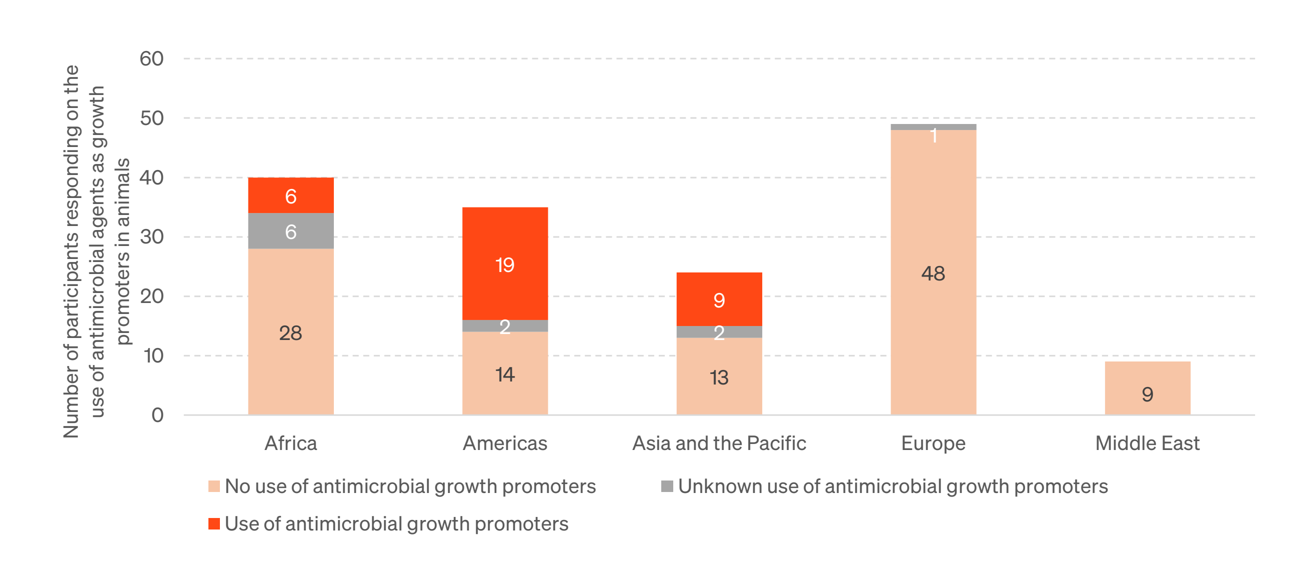


Figure 6. Number of participants using antimicrobial agents for growth promotion in animals in 2023, of 157 participants, by WOAH region

Regulatory framework for antimicrobial agents used as growth promoters

In the WOAH template and guidance, all participants – regardless of their response on the use of antimicrobials as growth promoters – were asked the following question: 'Does your country have legislation/regulations on the use of antimicrobial growth promoters in animals?'

Of the participants, 91 responded 'Yes' and were then asked to specify the type of legislation or regulations in place. In most of these cases, the regulatory frameworks explicitly ban the use of antimicrobials as growth promoters (**Figure 7**).

As presented in **Figure 7**, 37 participants stated that they do not use antimicrobials as growth promoters, even though no regulatory framework is in place. Notably, 18 of these 37 Members (49%) are from Africa.

Conversely, more than half of the participants reporting the use of antimicrobials as growth promoters do not have a regulatory framework; of these 19 participants, 13 (68%) are from the Americas.

Of the 15 participants using antimicrobials as growth promoters within a regulatory framework (*n* = 34; 44%), the legislation in place either provides a list of molecules that should not be used as growth promoters (*n* = 9), or a list of antimicrobials that can be used (*n* = 3). In three cases, both lists have been established (**Figure 8**).

For specific information on WOAH regions, please refer to the ANIMUSE Interactive Report.

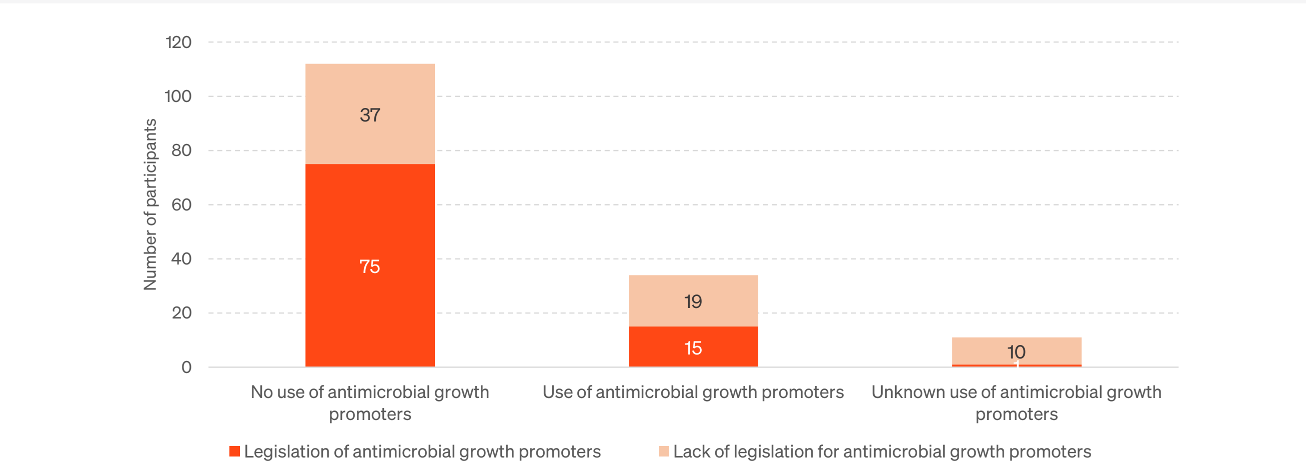


Figure 7. Use of antimicrobial growth promoters by legislation among 157 participants in 2023

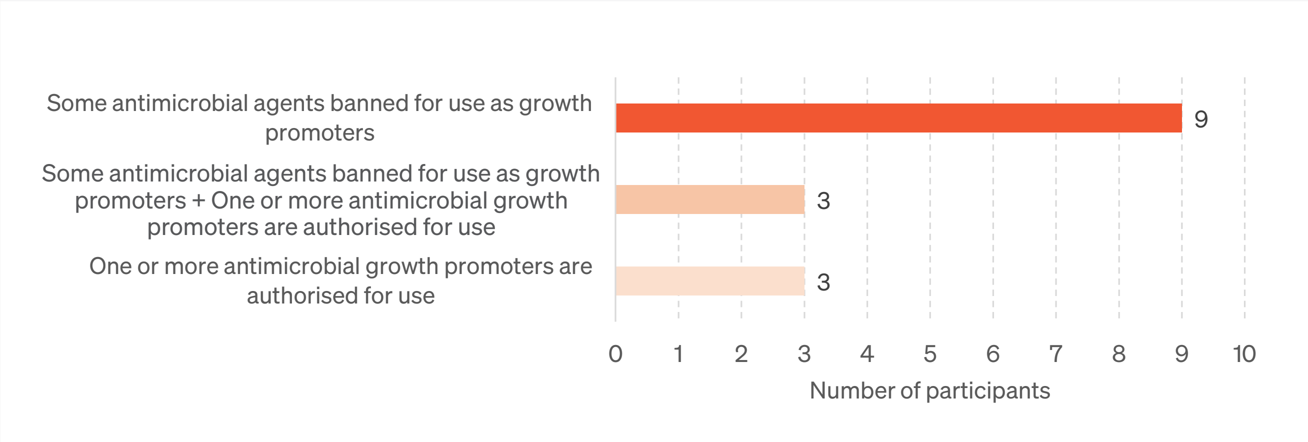


Figure 8. Type of availability of growth promotion for 15 participants who reported the use of growth promoters in 2023

List of antimicrobial agents used for growth promotion

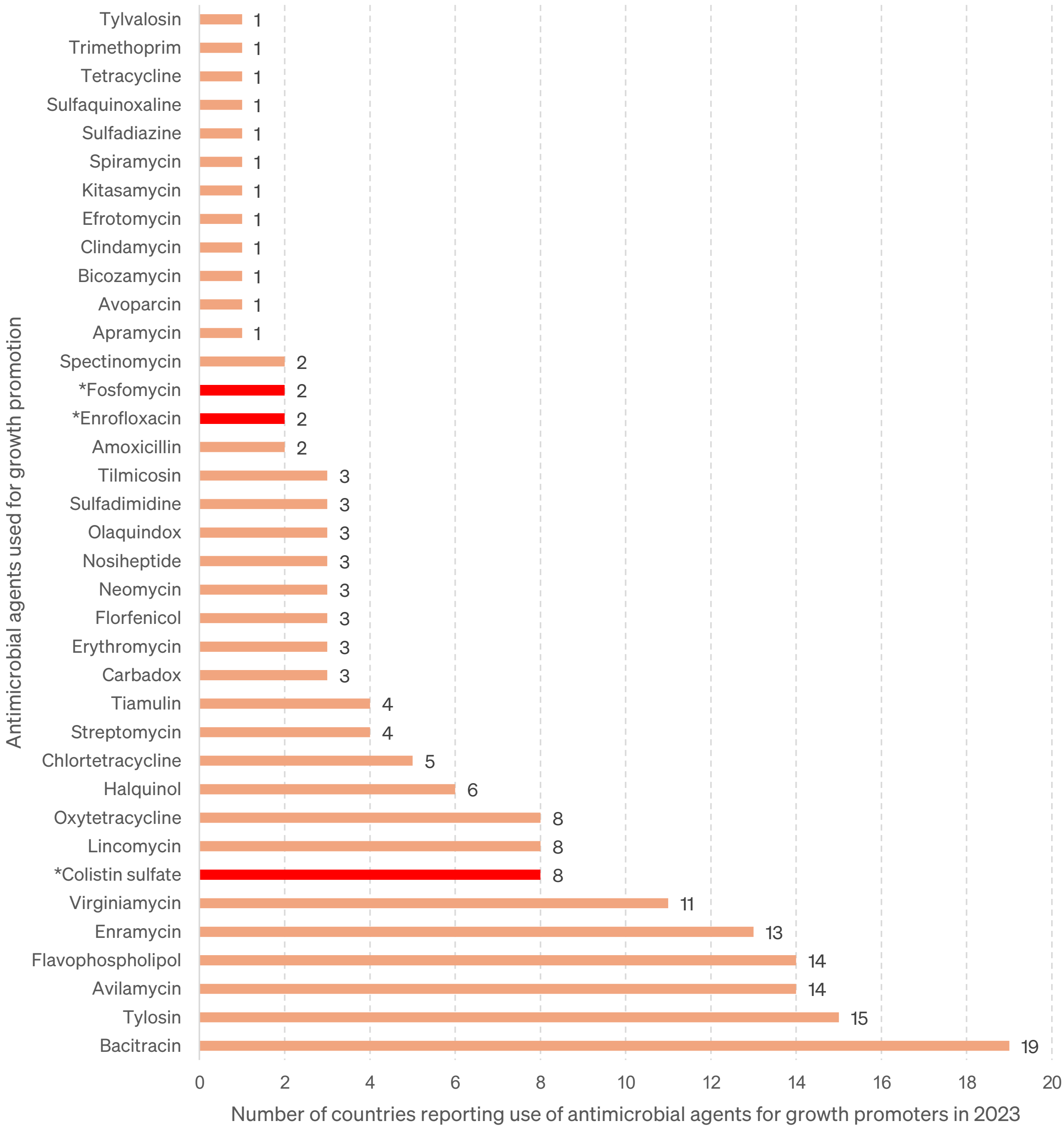
The 'Baseline Information' section of the WOAH template includes a question asking participants to report any antimicrobial agents authorised or used in animals as growth promoters. Ionophores were excluded from reporting, as they are mostly used for parasite control and have different regulatory classifications across countries. However, 12 Members reported the use of ionophores as growth promoters, in addition to antibiotic molecules. Among these, the ionophores monensin and salinomycin were mentioned by nine and eight Members, respectively. According to the *WHO List of Medically Important Antimicrobials*, ionophores are not used in humans [6].

The 34 participants reporting the use of antimicrobial agents for growth promotion were further asked to list antimicrobial agents (by active ingredient) either authorised as growth promoters or known to be used in the absence of relevant legislation.

Of these, 33 participants (*n* = 34; 97%) provided a list of antimicrobial agents used for growth promotion. The most frequently listed antimicrobial agent was bacitracin, followed by tylosin and flavophospholipol. While flavophospholipol is not used in humans, bacitracin is classified as important for use in humans, and tylosin belongs to a category that includes macrolides, which are classified as critically important for use in humans in the *WHO List of Medically Important Antimicrobials* [6].

Colistin was mentioned by eight participants. Compared to the second round of data collection in 2016, when 13 participants reported using colistin, this reduction suggests progress by national authorities in phasing out its use. Overall, 12 Members (n = 34; 35%) reported the use of antimicrobials classified in the highest priority category of the *WHO List of Medically Important Antimicrobials* (**Figure 9**).

Twenty-two participants using antimicrobial agents as growth promoters (*n* = 34; 65%) also provided quantitative data on antimicrobial agents intended for use in animals. Fourteen of these were able to differentiate quantities by intended use (i.e. for growth promotion or veterinary medical purposes). In the ninth round, most participants who used the Calculation Tool and growth promoters indicated that veterinary products were used for both veterinary medical use and growth promotion purposes. These dual-indication products provided different dosage instructions depending on the type of use. As participants largely relied on sales and import figures as data sources, it remains difficult to distinguish quantities by type of use unless additional field-level data collection is conducted.



* The classes in the *WHO Medically Important Antimicrobial List* should be the highest priority for Members when phasing out the use of antimicrobial agents as growth promoters.

Figure 9. Antimicrobial agents used for growth promotion in animals among 33 Members in 2023

3. 2022 analysis of antimicrobial quantities

This section provides an analysis of globally reported quantitative data on antimicrobial agents intended for use in animals, adjusted by animal biomass, focusing on 2022. Data from previous years can be found in the ANIMUSE Interactive Report.

It is important to note that many participants contributing to ANIMUSE are continuously advancing the development of their national monitoring systems for antimicrobial use in animals. Even in cases where participants can provide quantitative information, some data sources may be currently inaccessible. Calculation errors, where present, are still being resolved by the participants. Additionally, data collection on animal populations is progressing at the global level. Consequently, the estimates presented here are expected to be refined over time, and should be interpreted with caution. The data presented in Section Three of this report were extracted and analysed from ANIMUSE in December 2024. For the most up-to-date figures, please refer to the ANIMUSE public portal.

3.1. Antimicrobial quantities

Regional representation of participants included in the 2022 analysis

This section includes all 2022 data provided during the eighth and ninth round of data collection, validated by WOAH. As such, the results presented here differ from those in Section Two, which only includes data collected during the ninth round.

For the 8th and 9th rounds from which data were compiled, 107 participants provided validated antimicrobial quantities intended for use in animals for 2022.

Period covered

The average reporting period was 360 days for the 107 Members who provided antimicrobial quantities.

Impressively, 91% of these participants covered a full calendar year.

Quantitative data sources captured

According to the WOAH template guidance, participants were encouraged to provide data as close as possible to the point of use (i.e. administration). However, among the 107 participants who reported validated quantitative data, only two selected 'Antimicrobial use data – Farm records' (the category representing on-farm administration of antimicrobials) as a data source (**Figure 10**). All other data sources represent usage via antimicrobials sold, imported or manufactured for intended administration to animals.

For further details on the sub-categories of data sources, please refer to the ANIMUSE public portal or the guidance on how to complete WOAH's template[11]. The most-cited sources of quantitative data were sales, particularly from wholesalers (30 participants) and marketing authorisation holders (25 participants). Following sales data, the next most frequently reported source was import data declared by Customs Authorities regarding quantities of antimicrobial agents intended for use in animals.

Other data sources reported

Eleven participants (*n* = 107; 10%) selected 'Other' as their source of quantitative data from the list of provided options. When this response was chosen, participants were asked to describe these sources, and the responses were subsequently categorised and assigned to one of the groups presented in **Figure 10**.

The 'Other' sources most commonly reported included import control systems, apart from customs

In a few cases, data originated from manufacturers' reports. It must be noted that for participants who do not verify the importation of a product after issue of a permit, the reported quantities may not accurately represent the antimicrobial agents that were actually brought into the country or used in the animal population.

[11] Guidance for completing the questionnaire template for the collection of data on antimicrobial agents intended for use in animals

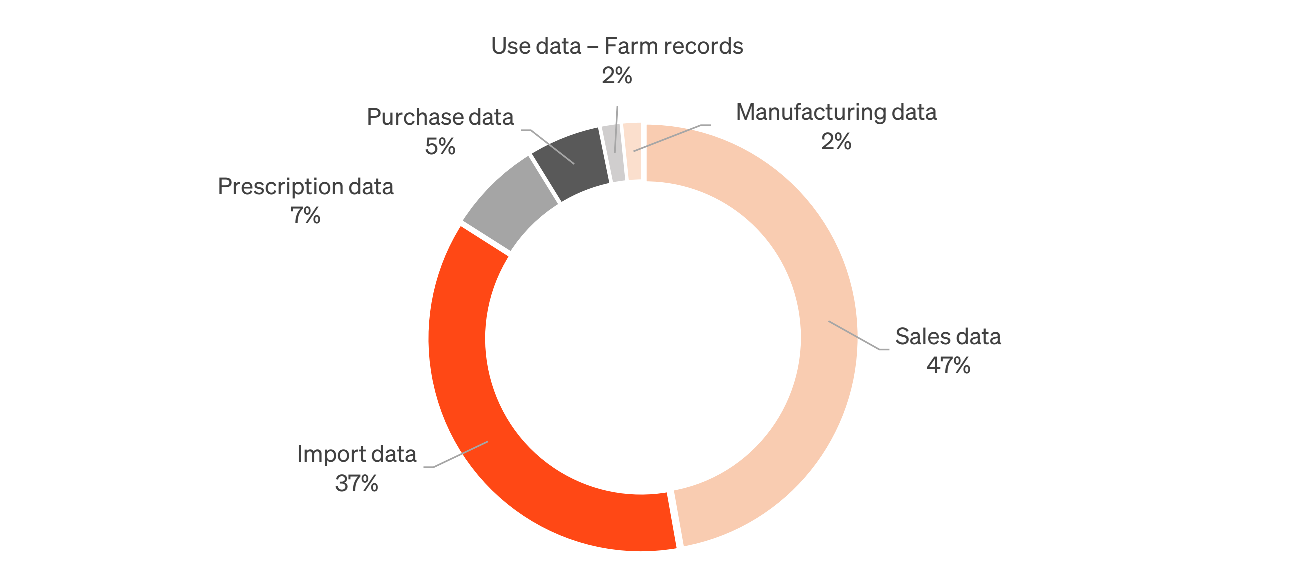


Figure 10. Validated data sources for 107 participants reporting quantitative data in 2022

Data coverage

In the WOAH template for quantitative data collection, participants were asked to estimate the extent to which their data represented overall sales of antimicrobial agents intended for use in animals, as a percentage of the total estimated sales in their country. For example, a hypothetical participant may report that the quantitative data reported covers only 80% of all estimated national sales of antimicrobial agents used in animals, based on known sources of missing data. All 107 participants with validated quantitative data responded to this question.

The global average for achieved quantitative data coverage was 91% (**Table 2**). This average quantitative data coverage shows that, for several participants, surveillance systems do not capture the full volume of antimicrobial agents intended for use in animals. **However, this figure should be interpreted with caution, as data coverage estimates are made subjectively by each participant.** By design, this question aims to identify gaps in accessible quantitative data; therefore, the estimates can vary in accuracy.

Table 2. Reported percentage of antimicrobial quantity coverage by WOAH region, 2022

WOAH region	Number of participants	Mean (%)	Median (%)	Standard deviation (%)	Minimum coverage by at least one participant in the region (%)	Maximum coverage by at least one participant in the region (%)
Africa	26	87	90	12	55	100
Americas	17	88	95	14	50	100
Asia and the Pacific	21	89	90	13	65	100
Europe	39	96	100	8	65	100
Middle East	4	84	85	6	75	90
Global	107	91	97	12	50	100

Sources not captured by the data

Of the 107 participants who estimated the coverage of their data using validated data sources, 45 stated that they covered 100% of the data sources. The remaining 62 participants, whose coverage was less than 100% of the available quantitative data, were asked to provide further information on uncaptured data sources.

Fifty-eight participants (*n* = 62; 94%) provided explanations regarding uncaptured data sources. Responses were grouped by category, and a single response could fall under multiple categories. All uncaptured data sources were analysed, and follow-up questions were asked as needed to clarify the participants' data collection systems. Following the analysis, uncaptured data sources were validated for all 58 participants.

The most significant gaps in data capture were related to import data (32 participants). These gaps were primarily due to unknown data on quantities associated with illegal or unofficial veterinary products entering countries, which can account for up to 45% loss in data coverage. The second most common issue was with sales data (28 participants), with partial responses from relevant stakeholders being a recurring problem, resulting in a maximum estimated data coverage loss of 35%. These data suggest a need to improve the surveillance systems on AMU in affected countries, focusing on reinforcing or implementing the regulatory frameworks on veterinary products and strengthening the collaboration with the private sector. More information on uncaptured data sources can be found on the ANIMUSE public portal.

Antimicrobial quantities reported in 2022

Table 3 shows the total tonnage of antimicrobial agents intended for use in animals in 2022, as reported to WOAH during the eighth and ninth rounds of data collection.

When these reported antimicrobial quantities were adjusted based on data coverage estimates (i.e. extrapolated to reflect full annual coverage from all data sources and compensated for partial temporal coverage or missing data sources), the quantities shown in **Table 3** were obtained. These coverage-adjusted figures should be interpreted with caution, as data coverage estimates are made subjectively by each participant. By design, this question aims to identify inaccessible quantitative data; therefore, estimates can vary in accuracy. Nonetheless, these coverage-adjusted quantities can be considered an upper-level estimate of antimicrobial use in animals.

To properly interpret the reported tonnage of antimicrobials, the size and composition of each participant's animal populations must be considered. For this reason, readers are referred to Section 3.3 'Antimicrobial quantities adjusted for animal biomass', for a more accurate interpretation of regional variations in the use of quantities of antimicrobial agents intended for use in animals.

These regional totals are based on data provided by 107 participants. **Table 3** does not represent the total amounts of antimicrobials consumed in any WOAH region, as not all participants provided data. It also should not be interpreted as reflecting the quantities used by any specific country within a given region.

Table 3. Reported quantity of antimicrobial agents intended for use in animals by WOAH region, 2022

WOAH region	Number of participants included in analysis of 2022 quantitative data	Quantities reported (in tonnes)	Quantities reported adjusted by estimated coverage* (in tonnes)
Africa	26	2,441	2,614
Americas	17	22,173	23,789
Asia and the Pacific	21	41,663	43,158
Europe	39	4,202	4,283
Middle East	4	169	191
Total*	**107**	**70,648**	**74,035**

* Estimated coverage: this refers to the subjective estimates participants made with respect to the extent to which their data represented overall sales of antimicrobial agents intended for use in animals. In this column, the figures were adjusted to represent 100% of the total estimated amount (as further explained in the section 'Data Coverage').

Among the 107 participants who provided quantitative data on antimicrobial agents intended for use in animals, tetracyclines were the most commonly reported antimicrobial class (**Figure 11**).

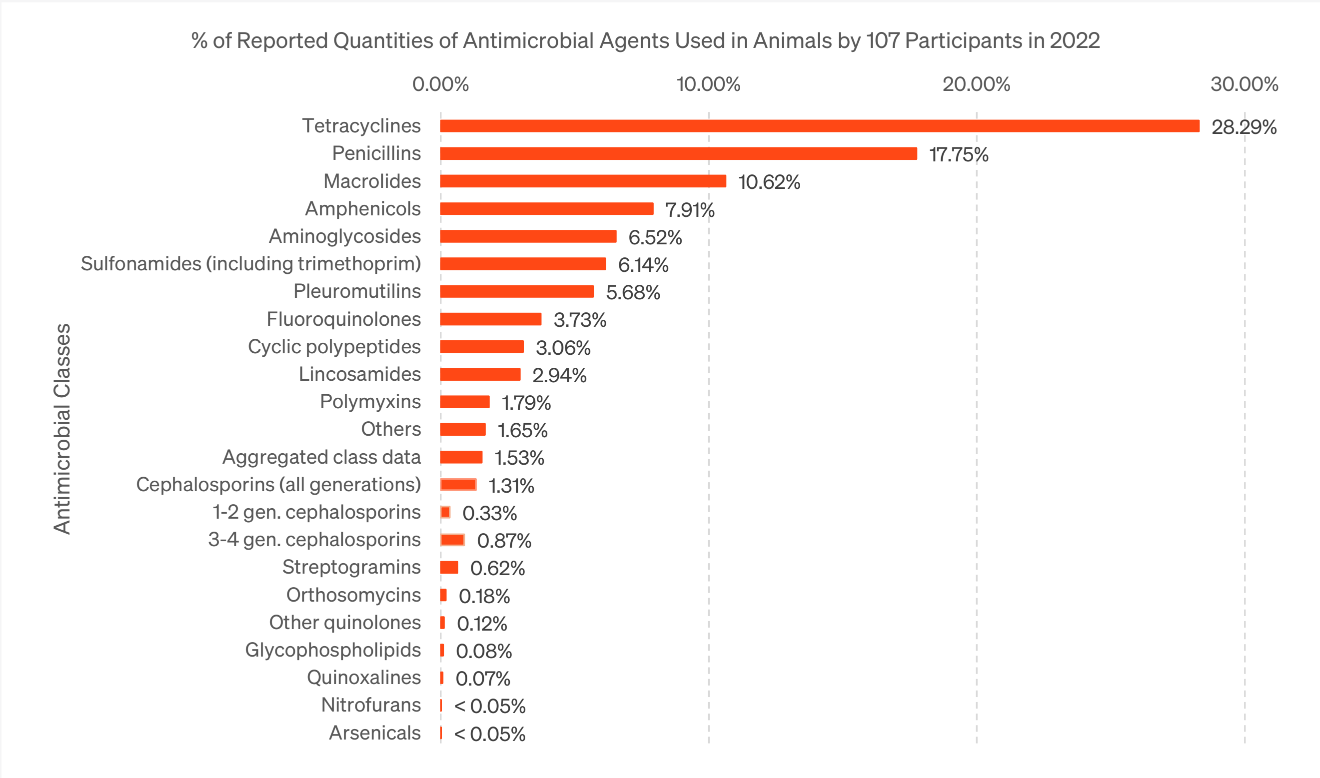


Figure 11. Percentage of antimicrobial classes* reported for use in animals by 107 Members in 2022

*Clarifications on the classes:
- Cephalosporins (all generations) are not represented as the sum total of all the sub-categories of cephalosporins as some Members did not provide their data by sub-category.
- Aggregated class data are used for confidential purposes.
- 'Others' includes all antimicrobials not otherwise covered.

Of the 107 Members, 62 used the ANIMUSE Calculation Module, which allows reporting by veterinary product. These 62 participants accounted for 29% of the total reported quantities. Among this group, the five most-reported molecules, in descending order, were oxytetracycline (17%), chlortetracycline (15%), amoxicillin (8%), bacitracin (7%) and tylosin (7%).

High relative reported quantities of specific antimicrobial classes

In the 2022 data, it was noted that nine participants (*n* = 107; 8%) allocated more than 70% of their total antimicrobial quantities intended for use in animals to a single antimicrobial class (Table 4). At the global level, participants with high usage of one antimicrobial class often shared the same economic status. Additionally, these elevated quantities for the class were principally linked to economic factors.

Seven of these participants (*n* = 9; 77%) were from Africa, and four of these were classified as low-income countries, according to World Bank figures for income groups effective for 2023 [17]. Participants reporting more than 70% of their antimicrobial use for a single class were asked to provide further explanation for this. Only six participants responded, citing tetracyclines as the preferred class due to their low cost, effectiveness against certain diseases or preference for use in specific animal species.

Table 4. Antimicrobial classes with more than 70% of the total amount of antimicrobials intended for use in animals, as reported by ten participants in 2022

Antimicrobial class	Number of Members with high reported quantities in a specific antimicrobial class	Antimicrobial quantities allocated in the antimicrobial class (tonnes)	Quantities of the antimicrobial class compared to the total amount reported for the participants (% – mean)
Tetracyclines	9	197	78.9%

Quantitative data differentiation by animal group

For the purposes of the WOAH template, animal groups are categorised as: 'Terrestrial food-producing animals', 'Aquatic food-producing animals' and 'Non-food-producing animals'. Participants could select multiple categories when reporting this data.

For 2022, 84 participants (*n* = 107; 79%) provided data differentiated by animal group (**Figure 12**).

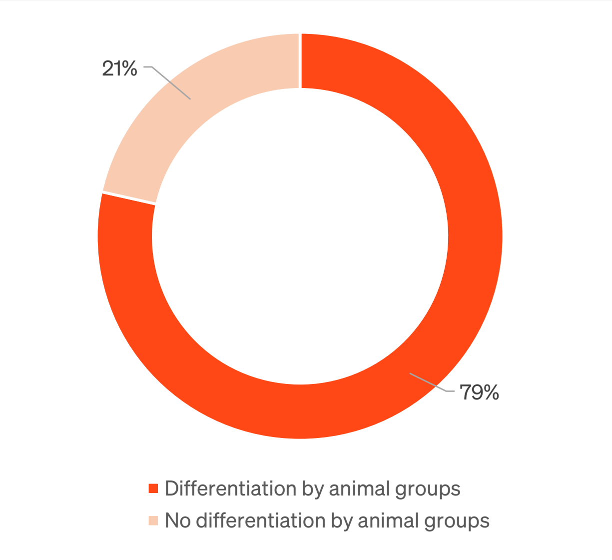


Figure 12. Differentiation by animal group for 107 participants reporting quantitative data in 2022

This level of detail corresponds to the number of participants reporting their antimicrobial quantities through Reporting Options 2 and 3, which enabled differentiation by animal group.

Figure 13 provides an overview of how participants chose to report data by animal group. The various combinations are outlined in the following paragraphs.

Terrestrial food-producing animals (71 participants)

- Nineteen participants provided data exclusively for terrestrial food-producing animals.
- Fifty-two participants provided data for terrestrial food-producing animals, along with data for other animal groups.

Aquatic food-producing animals (18 participants)

- All 18 participants provided data for aquatic food-producing animals in addition to data for other animal groups, mainly with terrestrial food-producing animals.

Non-food-producing animals (61 participants)

- All 61 participants provided data for non-food-producing animals in addition to data for other animal groups, mainly with terrestrial food-producing animals.

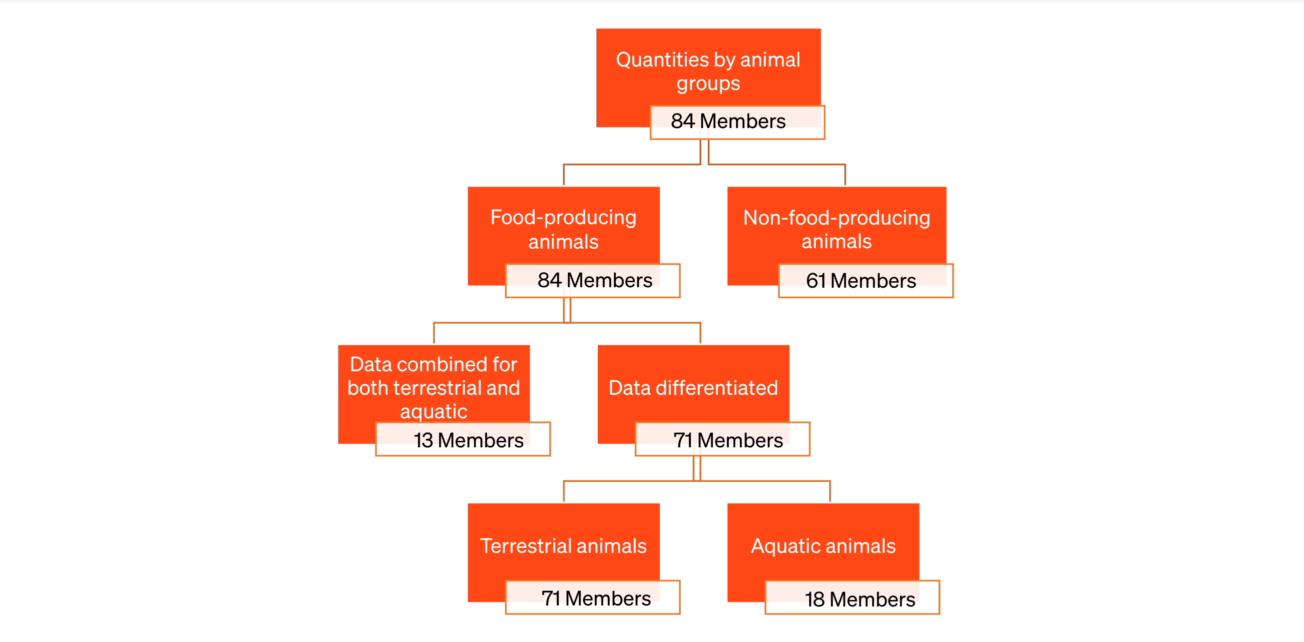


Figure 13. Number of participants providing data by animal groups among 84 participants reporting quantitative data in 2022[12]

[12] Please refer to the explanation of this figure to understand the different combinations of animal groups and sums.

Terrestrial food-producing animals

Of the 84 participants able to provide antimicrobial quantities by animal group, 71 (n = 84; 85%) reported specific quantities for terrestrial food-producing animals. All 71 were asked to list animals covered by those quantities, based on the veterinary product labels or known extra-label use. Most participants mentioned cattle, poultry (mainly broilers, mentioned by 65 participants) and small ruminants.

Figure 14 is not indicative of the species that consume the most antimicrobials, but rather which species are covered by the veterinary product labels, which – in several cases – could cover more than one species.

Among the 71 participants who provided quantities specific to terrestrial food-producing animals, the most-used antimicrobial classes were tetracyclines, followed by penicillins and macrolides (**Figure 15**).

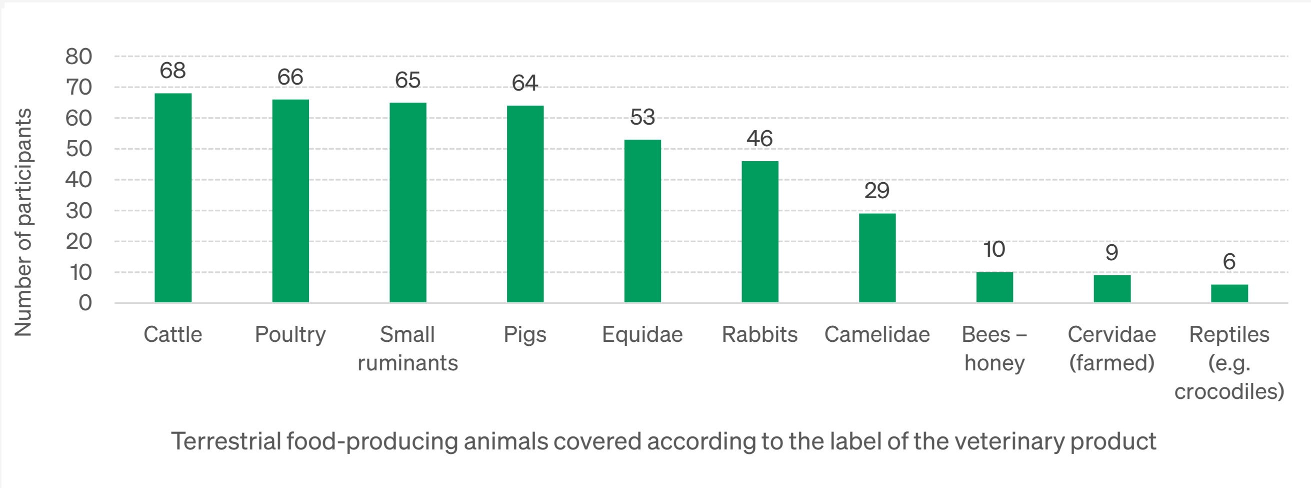


Figure 14. Terrestrial food-producing animal species included in quantitative data reported by 71 participants in 2022

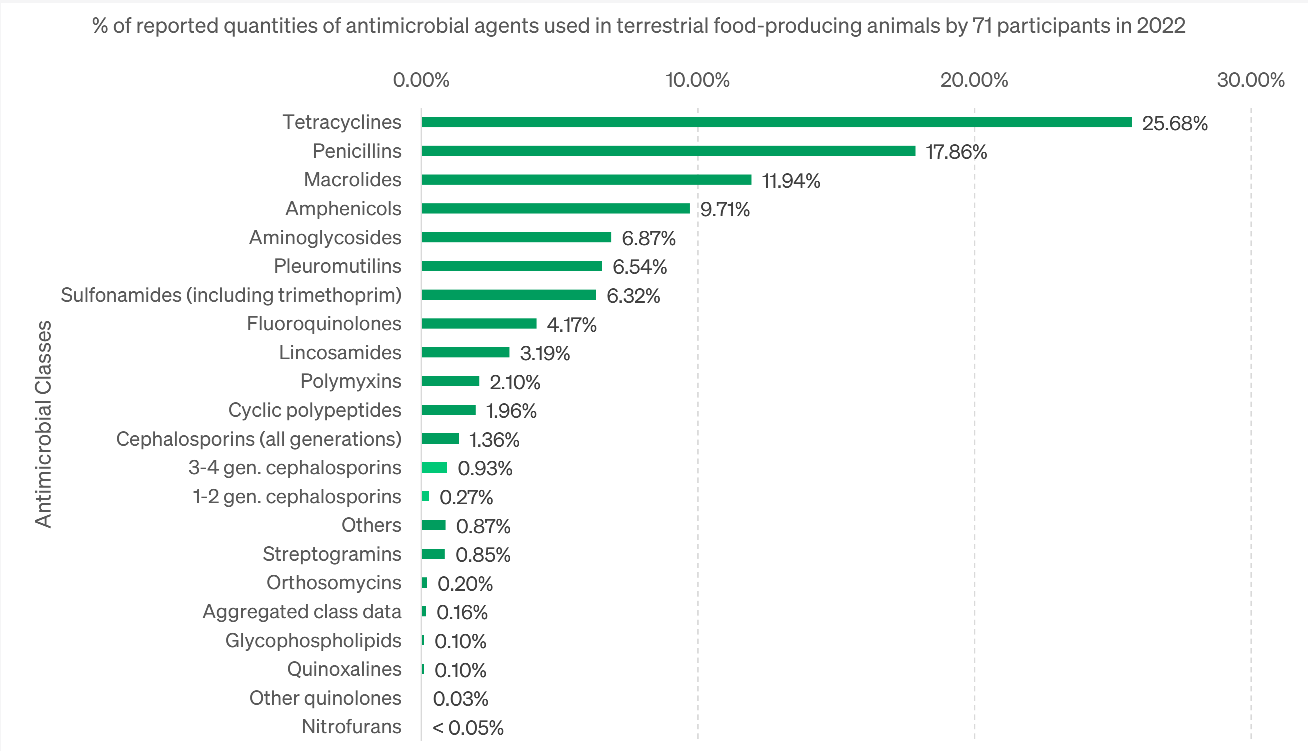


Figure 15. Proportion of antimicrobial classes by terrestrial food-producing animals as reported by 71 Members in 2022[13]

Of the 71 participants, 57 used the ANIMUSE Calculation Module, which allows reporting by veterinary product. Among these 57 participants, the five most-reported molecules, in descending order, were chlortetracycline (16%), oxytetracycline (16%), amoxicillin (8%), bacitracin (7%) and tylosin (7%).

[13] Please see notes from Figure 11.

Aquatic food-producing animals

Of the 84 participants who provided quantitative data by animal group in 2022, 18 (*n* = 84; 21%) provided specific quantities for aquatic food-producing animals. These participants also listed animals covered by the antimicrobial quantities based on the veterinary product labels or known extra-label use. Most commonly mentioned were fish, followed by crustaceans.

Figure 16 does not indicate the species that consumed the most antimicrobials, but rather which species were most frequently covered by veterinary product labels. In many cases, a single product label applies to multiple species. For aquatic animals, the most frequently cited sub-categories of fish were cichlids, followed by salmonids and siluriformes.

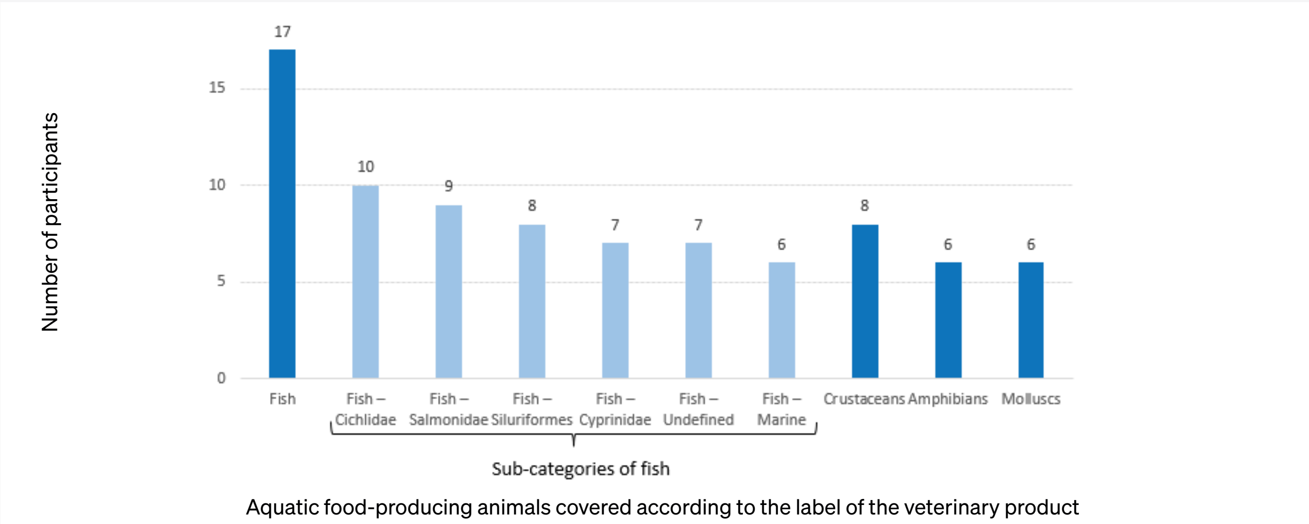


Figure 16. Aquatic food-producing animals covered in quantitative data reported by 18 participants in 2022

Among the 18 participants who reported quantitative data for aquatic food-producing animals, amphenicols were the most-reported antimicrobial class, followed by tetracyclines and fluoroquinolones (**Figure 17**).

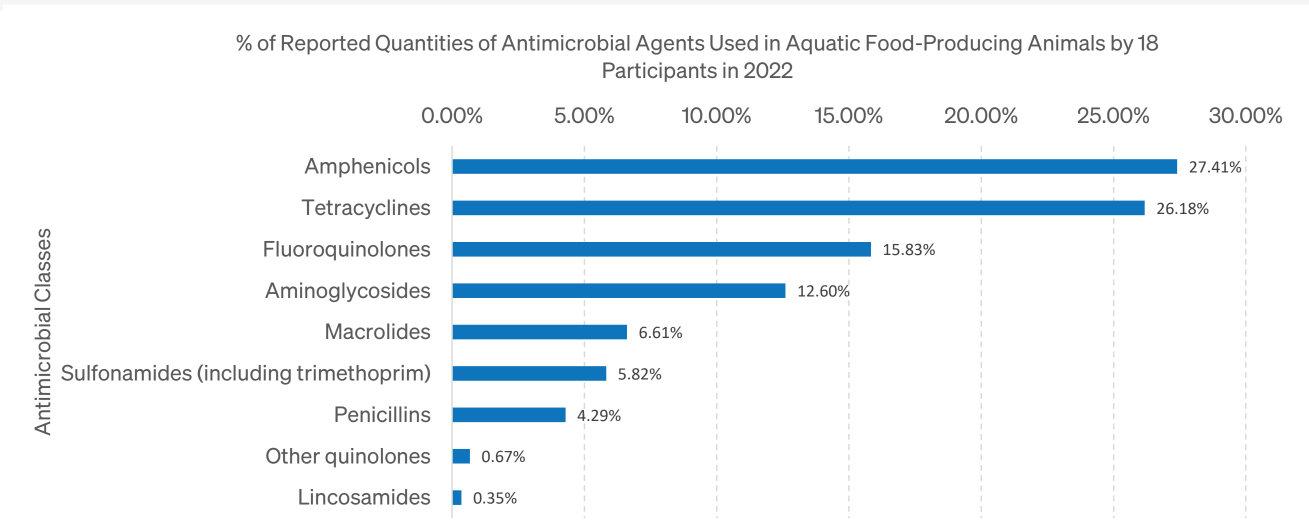


Figure 17. Proportion of antimicrobial classes by aquatic food-producing animals as reported by 18 participants in 2022

Of these 18 participants, 16 used the ANIMUSE Calculation Module, which allows reporting by veterinary product. For these 16 participants, the most-reported molecules, in descending order, were: oxytetracycline (32%), amoxicillin (24%), enrofloxacin (17%), florfenicol (16%) and doxycycline (5%).

Non-food-producing animals

Of the 84 participants able to provide antimicrobial quantities by animal group, 61 (*n* = 84; 73%) reported specific quantities for non-food-producing animals. All 61 were asked to provide a list of animals covered by those quantities, based on the veterinary product labels. Most participants listed canines and felines.

Figure 18 does not reflect which species consumed the most antimicrobials but instead shows which species were covered according to the veterinary product labels. In many cases, these covered more than one species.

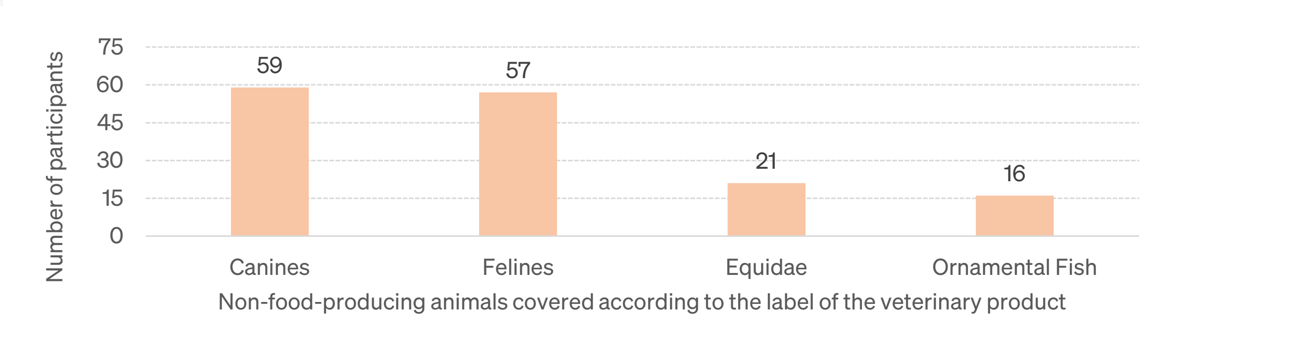


Figure 18. Non-food-producing animals covered in the quantitative data reported by 61 participants in 2022

Among these 61 Members reporting quantitative data for non-food-producing animals, penicillins were the most commonly reported class, followed by sulfonamides (including trimethoprim) and cephalosporins (**Figure 19**).

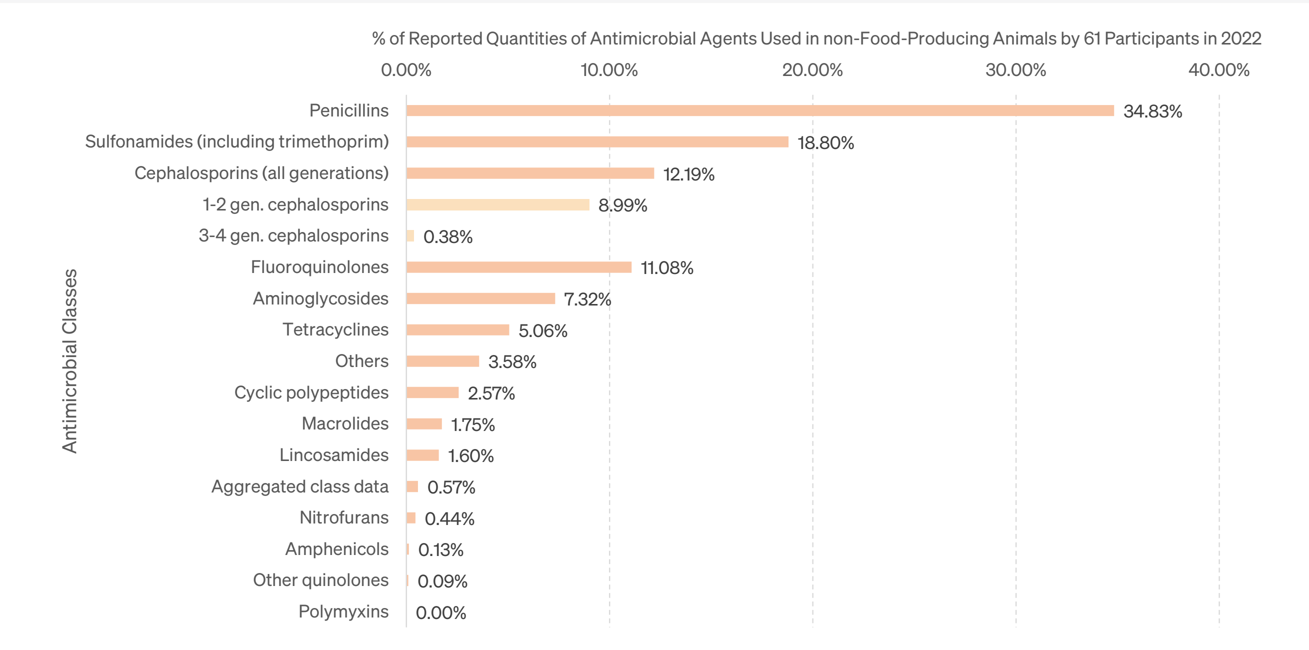


Figure 19. Proportion of antimicrobial classes in non-food-producing animals as reported by 61 Members in 2022[14]

Among these 61 participants, 46 used the ANIMUSE Calculation Module, which allows reporting by veterinary product. Of this group, the five most-reported molecules, in descending order of quantity, were: oxytetracycline (20%), fosfomycin (8%), sulfadiazine (7%), tylosin (7%) and amoxicillin (7%).

Routes of administration

For 2022, 89 participants chose to report their quantitative data using Reporting Option 3, the only choice that allows disaggregation of data by route of administration. Among these participants, 83% of the total antimicrobial quantities were administered orally, 15% by injection (e.g.

[14] Please see notes from Figure 11.

subcutaneous, intramuscular, intravenous, including intravenous infusion) and 1% through other routes of administration (e.g. intramammary preparations). For the oral route, tetracyclines accounted for 30% of the total quantities declared, making them the most frequently used class for this route. For injection, penicillins represented 33% of the total quantities, while other routes were dominated by first- and second-generation cephalosporins, comprising 26% of the quantities in this category. **Figure 20** shows the proportion of each route of administration across various antimicrobial classes, highlighting the variation in usage patterns.

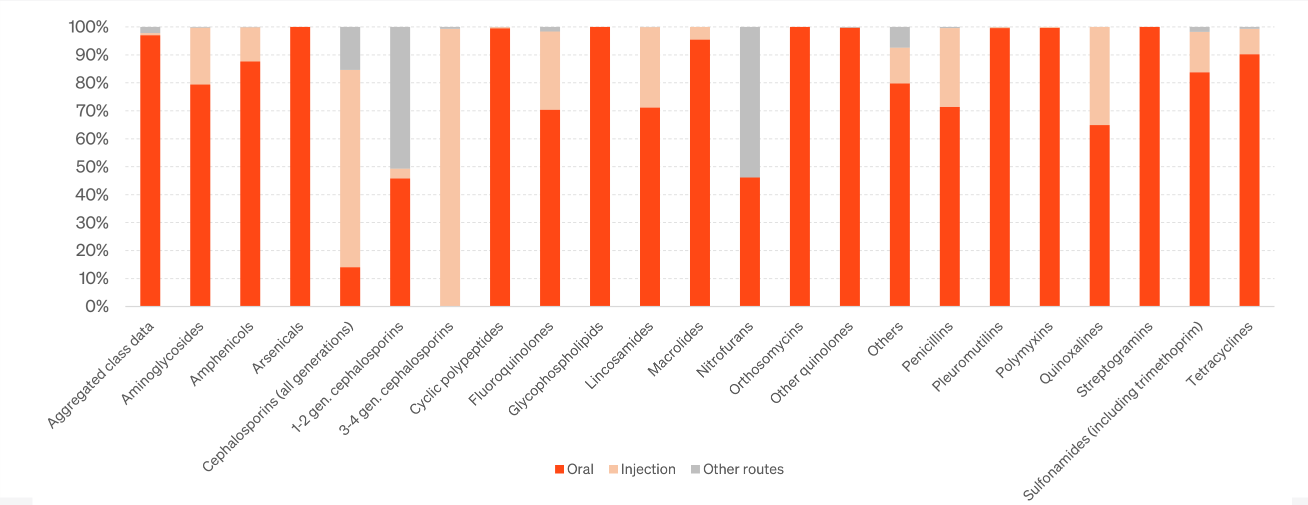


Figure 20. Proportion of antimicrobial quantities (by antimicrobial class) reported for use in animals by routes of administration, aggregated across 89 participants in 2022

Of the 89 participants, 60 used the ANIMUSE Calculation Module, which allows reporting by veterinary product. Of these 60, the main molecule administered orally was oxytetracycline (42%); for injections, it was chlortetracycline (15%); and for other routes of administration, it was cefacetrile (26%).

3.2. Animal biomass

Animal biomass was calculated for the 107 participants who submitted quantitative data for 2022 across different rounds of data collection, using animal population figures for 2018. The populations represented in this animal biomass analysis reflect the number, size and dynamics of the animal populations for the participants who reported data to WOAH for the given year of analysis.

Due to temporary limitations in the availability of timely animal population data, biomass estimates from 2020 to 2022 were calculated using animal population figures from 2018, the year for which the most reliable and up-to-date data were available. However, as of June 2024, an updated version of the Annual Report within the WOAH World Animal Health Information System (WAHIS) allows Members to report detailed animal population data for 2023 and beyond.

For earlier years, the use of animal population figures from 2018 serves as an interim solution to bridge data gaps for 2020, 2021 and 2022. Given the general global increase in food-producing animal populations, relying on 2018 data likely results in a global underestimation of animal biomass for 2020–2022. Despite this limitation, the animal biomass denominator is maintained to provide a continuous mg/kg analysis of antimicrobial quantities. Using 2018 animal population data as the denominator will overestimate antimicrobial use as mg/kg.

The following figures represent only those 107 participants who took part in reporting quantitative data on antimicrobial agents intended for use in animals. They may not be representative of global animal populations or biomass, or of any specific WOAH region.

Estimated coverage of animal biomass for Members providing 2022 data

For the 107 Members who submitted AMU data for 2022, it is estimated that their combined animal biomass represents 71% of the total global amount. Since the first *AMU Annual Report* in 2014 [8] – when participant biomass coverage was 30% – there has been a steady global growth, culminating in 71% coverage in this 2022 report. In future reports, greater coverage is expected to occur as participants improve their capacity to report data.

These estimates were calculated by comparing the animal biomass of reporting participants to the total estimated global animal biomass, including both participating and non-participating countries. In 2022, the Americas and Europe achieved particularly high animal population coverage, with responding participants representing 93% (Americas) and 70% (Europe) of their region's total animal biomass (**Figure 21**). Animal biomass coverage estimates were based on live animal population data from 2018 and calculated according to the animal biomass methodology described on the ANIMUSE public portal.

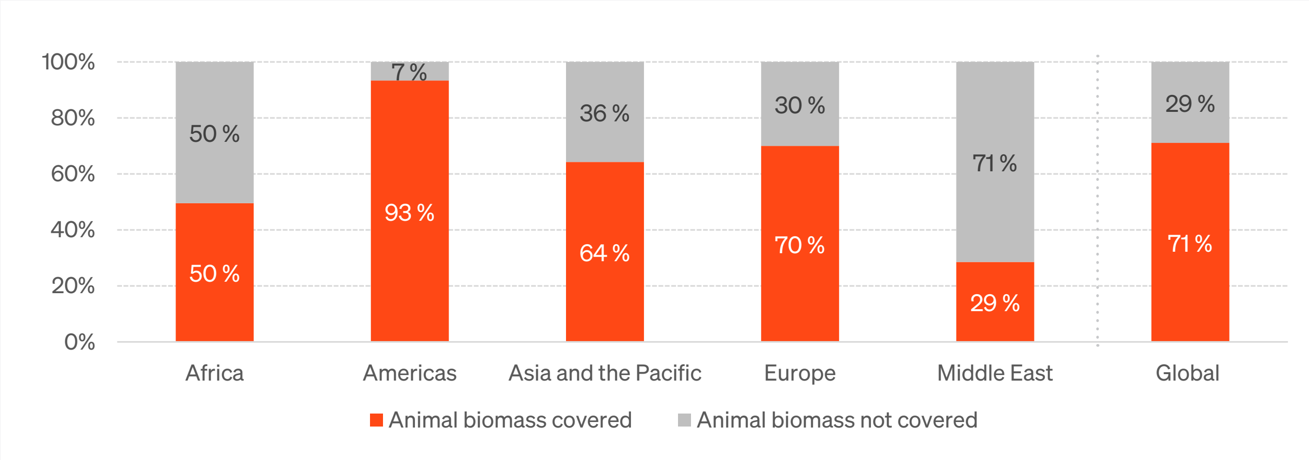


Figure 21. Regional percentages of estimated biomass covered by participants who reported quantitative data for 2022

Figure 22 illustrates the regional distribution of the estimated percentages of biomass covered by the 107 participants, compared to the total global biomass estimate. When analysed at a global level, the Americas and Asia and the Pacific contributed the largest proportion to the global estimated biomass.

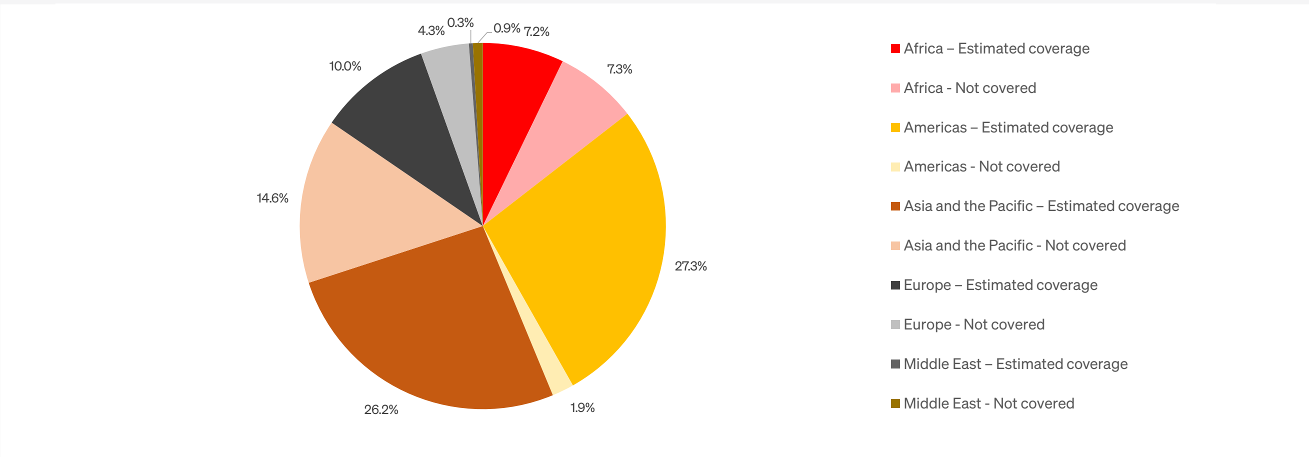


Figure 22. Regional percentages of estimated biomass covered by participants reporting quantitative data for 2022

Animal biomass composition for Members providing 2022 AMU data

Figure 23 shows the global composition of animal species potentially exposed to antimicrobial quantities, based on data reported by the 107 participants for 2022. These percentages are derived from each participant's reported animal population figures and the corresponding average weights, based on 2018 data. Among the five WOAH regions covered by the analysis, bovines (42%) accounted for the largest share of animal biomass. Swine (20%) and poultry (18%) also play a significant role, with sheep (6%), fish (5%), equines (2%), molluscs (2%) and goats (2%) playing relatively small roles in this analysis.

Minor contributions came from crustaceans (1%), camelids (0.4%), rabbits (0.2%) and cervidae (<0.05%), and are therefore globally negligible for the participants covered. The percentage of non-food-producing animal biomass is not available.

These percentages may vary slightly over time, depending on the number or composition of participants from each WOAH region. This is an expected change as participants improve their capacity to report data.

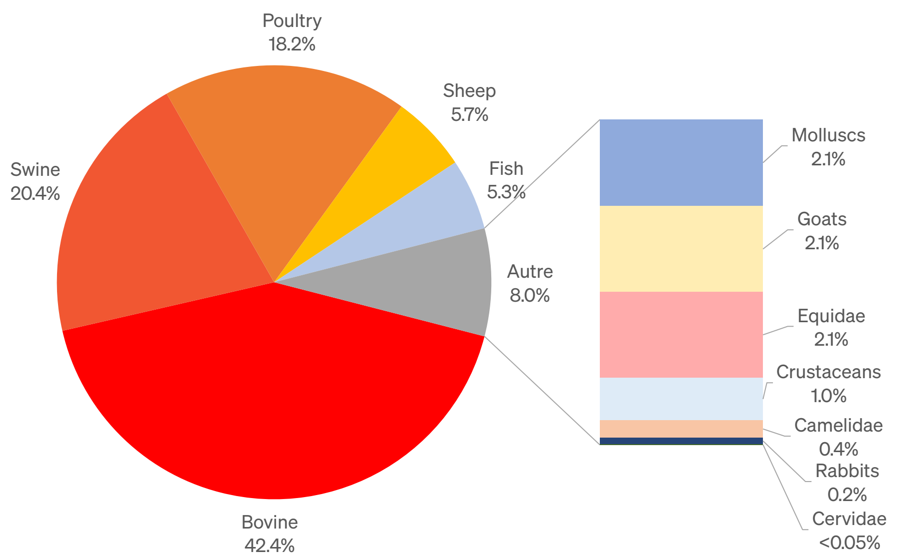


Figure 23. Species composition of animal biomass for the 107 participants included in the 2022 quantitative data analysis

These results should be interpreted with caution for species where slaughter data were the predominant contribution to the biomass calculation (swine, poultry, sheep and goats). In countries where animals are commonly slaughtered for personal consumption at places other than slaughterhouses, these percentages may underestimate the significance of these species in the data. The amount of slaughter undertaken elsewhere and the extent to which this data is captured are expected to vary between countries and regions.

3.3. Antimicrobial quantities adjusted by animal biomass

2022 antimicrobial quantities adjusted by animal biomass at the global and regional level

Figure 24 provides an overview of antimicrobial agents intended for use in animals, adjusted by animal biomass. The estimates compile data from 107 participants across all WOAH regions, who supplied information on food-producing animals in different rounds of data collection for 2022. Animal biomass for 2022 was calculated using animal population figures from 2018 (see Section 3.2 for further details).

The mg/kg rate is calculated as the antimicrobial agents reported (mg) divided by animal biomass (kg). It provides a meaningful indicator for comparison purposes (e.g. over time and between regions). The first global estimate of 89 mg/kg represents the total estimate of antimicrobial agents used in animals worldwide, adjusted by animal biomass.

The second estimate of 93 mg/kg represents the same quantitative data, adjusted by participant-reported estimates of the proportion (or coverage) of data on antimicrobial agents intended for use in animals, as obtained in 2022. These coverage-adjusted values are subjective for each participant but offer an upper-level estimate of global antimicrobials available for use in animals, including from unregulated sources. Estimates of data coverage were lowest in the Middle East, leading to the widest variation between reported antimicrobial quantities and those adjusted by participant estimates of data coverage. In contrast, participants in Europe and Asia were the most confident in their data coverage. For more details on coverage estimates, see Section 3.1 ‘Data coverage’.

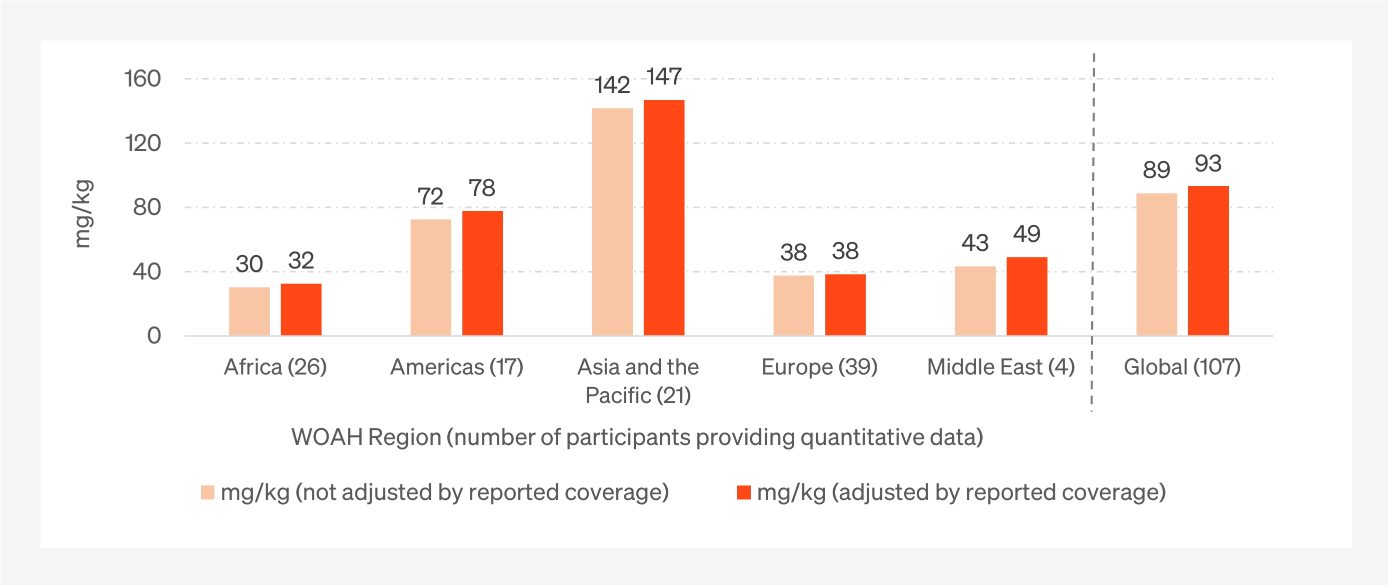


Figure 24. Global and regional quantities of antimicrobial agents intended for use in animals based on data reported by 107 participants for 2022, adjusted by animal biomass (mg/kg)

It is important to interpret the estimates of antimicrobial quantities adjusted by animal biomass (mg/kg) in the context of animal biomass coverage for the region (see **Figure 21**). Assessments of the total estimated regional animal biomass covered by the quantitative data reported for 2022 were calculated as outlined in Section 3.2. Changes in those participants who report data, as well as variations in regional animal biomass coverage from year to year, may significantly affect the results. WOAH continues to support participants in improving and maintaining data coverage to enable an evaluation of trends over time.

Furthermore, since antimicrobial usage varies by species (due to differences in disease burden and husbandry practices), the species composition of each region's animal biomass is an additional factor to consider when comparing data across regions. For more information on the regional animal biomass composition or data from previous years, please refer to the ANIMUSE public portal.

Antimicrobial quantities adjusted by animal biomass in 2022: distinctions between terrestrial and aquatic animals

Of the 107 participants who provided quantitative data for food-producing animals in 2022, 18 reported quantitative data for aquatic food-producing animals, while 71 provided data for terrestrial food-producing animals (**Figure 13**). The biomass coverage for these groups was 64% for aquatic and 49% for terrestrial animals.

This data enabled WOAH to conduct a separate analysis of mg/kg antimicrobial use by animal group. The aquatic animal analysis was based on data from 17 participants, as one participant had no available aquaculture biomass data. Table 5 presents key characteristics of the data distribution by animal group, including the median, standard deviation, minimum and maximum values (with the upper-level estimates adjusted by participant estimates of data coverage in parentheses). **These findings should be interpreted with caution and not be considered representative of global aquaculture production as refinements are expected to these initial figures in future rounds.**

Table 5. Antimicrobial quantities, adjusted by animal biomass, for terrestrial animals and aquatic animals in 2022

Animal group	Number of participants	mg/kg*	Median (mg/kg)*	Standard deviation (mg/kg)*	Minimum (mg/kg)*	Maximum (mg/kg)*
Terrestrial food-producing animals	71	95.37 (98.16)	11.87 (15.48)	73.68 (77.26)	0.001 (0.001)	470.53 (470.53)
Aquatic food-producing animals	17	20.64 (20.92)	12.71 (14.95)	232.99 (259.03)	0.08 (0.09)	895.40 (942.52)

*Adjusted estimated data coverage in brackets.

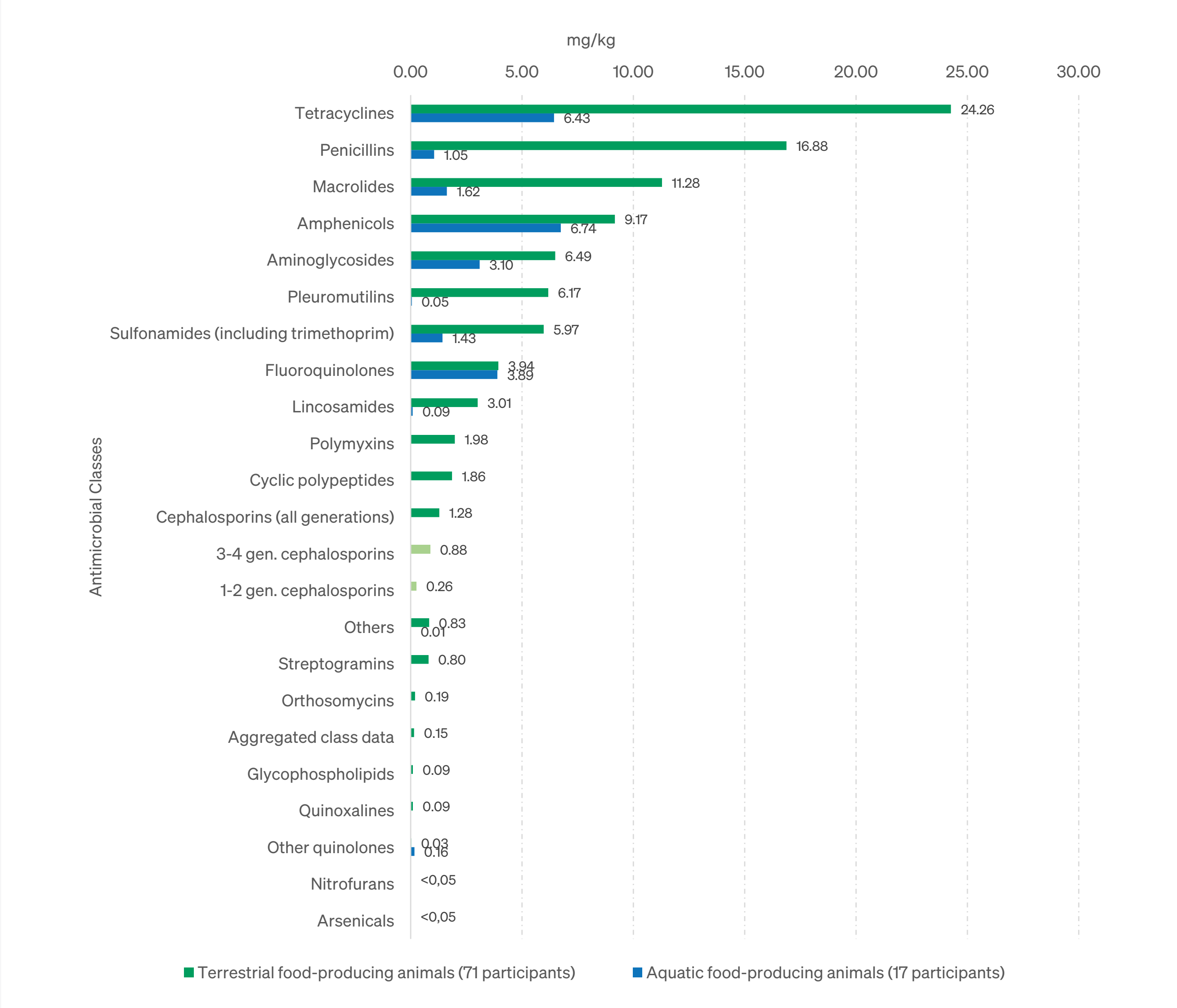


Figure 25. Antimicrobial classes adjusted by animal biomass in 2022 by aquatic food-producing animals and terrestrial food-producing animals* [15]

4. Trends from 2020 to 2022

This section presents the changes in mg/kg, antimicrobial classes and animal biomass based on data from 85 participants who reported to WOAH consistently from 2020 to 2022. Animal biomass for this period was calculated based on animal population figures from 2018 (for further details on this, please refer to Section 3.2).

Table 6 presents the number of participants by WOAH region included in this analysis. Earlier years are not covered in this section; however, historical trends from previous reporting periods are available via the ANIMUSE public interface.

Please note that trends from 2020 to 2022 should not be directly compared to those provided in previous WOAH annual reports, as the set of participants differs and new participants may have been added.

The data presented in Section Four of this report were extracted and analysed from ANIMUSE in December 2024. The most up-to-date figures can be found at the ANIMUSE public portal.

[15] Please see notes from Figure 11.

Table 6. Number of Members who reported data to WOAH for each year from 2020 to 2022

WOAH region	Number of participants who submitted quantities from 2020 to 2022	Number of WOAH Members	Members covered (%)
Africa	19	54	35%
Americas	11	32	34%
Asia and the Pacific	17	32	53%
Europe	35	53	66%
Middle East	3	12	25%
Global	85	183	62%

Due to temporary limitations in data availability, animal biomass for 2020 to 2022 is calculated using 2018 animal population figures. As of June 2024, an updated version of the Annual Report within WAHIS now enables Members to submit detailed animal population data for 2023 onward. For previous years, the interim solution uses 2018 animal population figures to bridge the data gap for 2020–2022, as 2018 remains the most reliable and up-to-date year for which data are available. However, because global animal biomass has generally increased in recent years, using animal population data from 2018 likely underestimates the actual global animal biomass for 2020–2022. As a result, this may lead to an overestimation of the mg/kg indicator.

For the 85 participants who reported data to WOAH consistently from 2020 to 2022, 62% of global animal biomass was covered (**Figure 26**) and an overall decrease of 5% in mg/kg was observed. From these 85 participants, the following situations were observed:

– A decrease in mg/kg in 55 participants: 45 reported a decline greater than 10% and ten ranged between 1–10%.

– An increase in mg/kg in 30 participants: 24 reported an increase greater than 10% and six ranged between 1–10%.

WOAH regions that showed a decrease were: 23% in Europe; 20% in Africa; 4% in the Americas; 2% in Asia and the Pacific. The only region that presented an increase was the Middle East, with 43%.

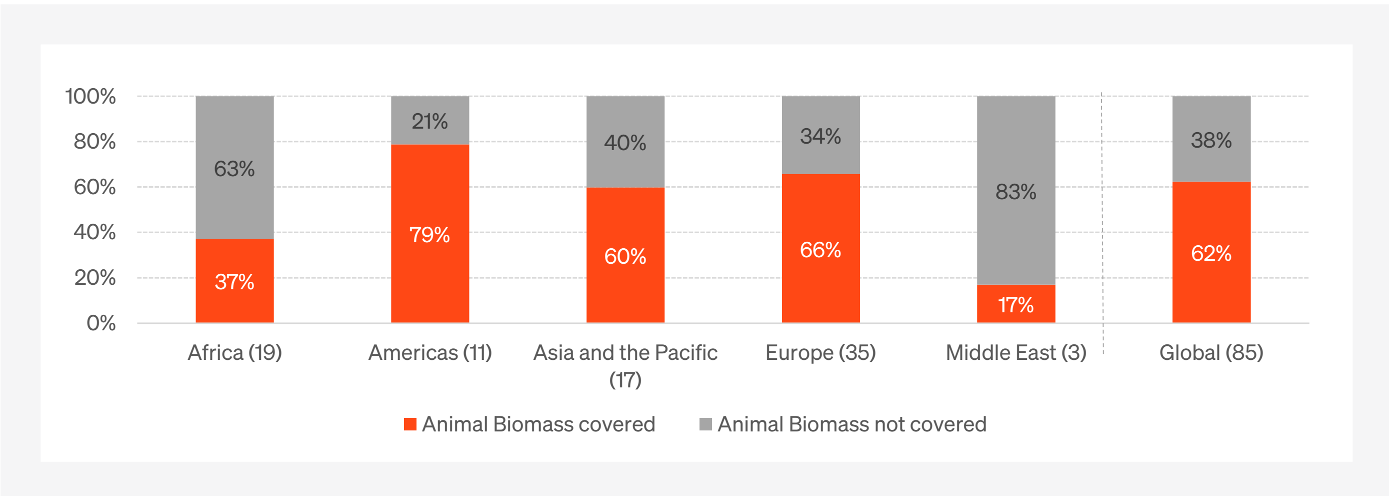


Figure 26. Regional percentages of biomass covered by 85 participants

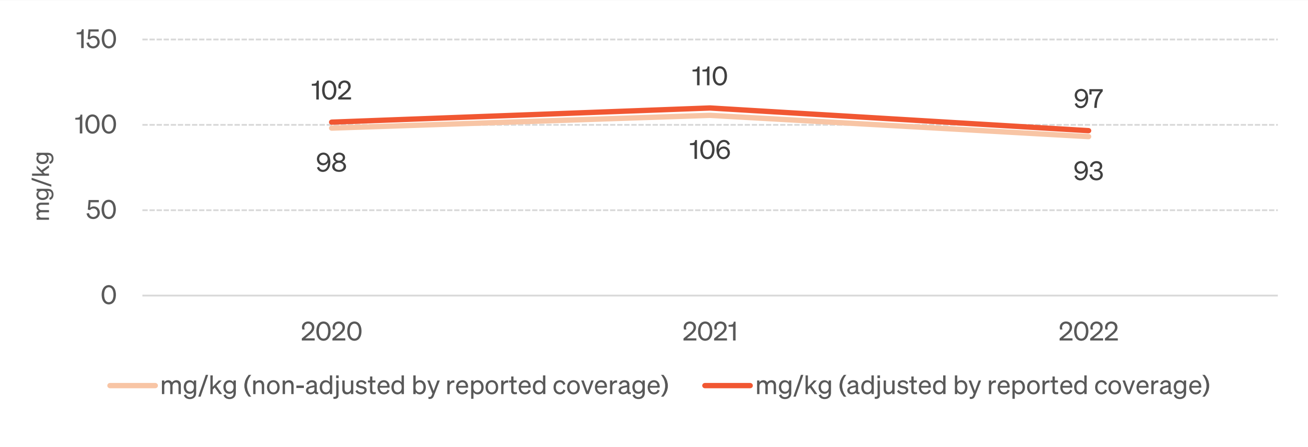


Figure 27. Trends over time for the global quantities of antimicrobial agents intended for use in animals, based on data reported by 85 participants from 2020 to 2022, adjusted by animal biomass (mg/kg)

Between 2020 and 2022, tetracyclines remained the most widely used antimicrobial in animals. However, their use declined by 26% during this period, while the use of penicillin increased by 18%. This trend was observed across all regions except Europe, with the most significant decreases in tetracyclines occurring in the Americas (28%) and Asia and the Pacific (13%). At the same time, penicillin use in these regions rose by 16% and 33%, respectively. The Americas and Asia and the Pacific accounted for 63% and 28% of the total antimicrobial quantities reported by the 85 participants in this analysis. These regions also covered 41% and 29% of the total animal biomass, respectively.

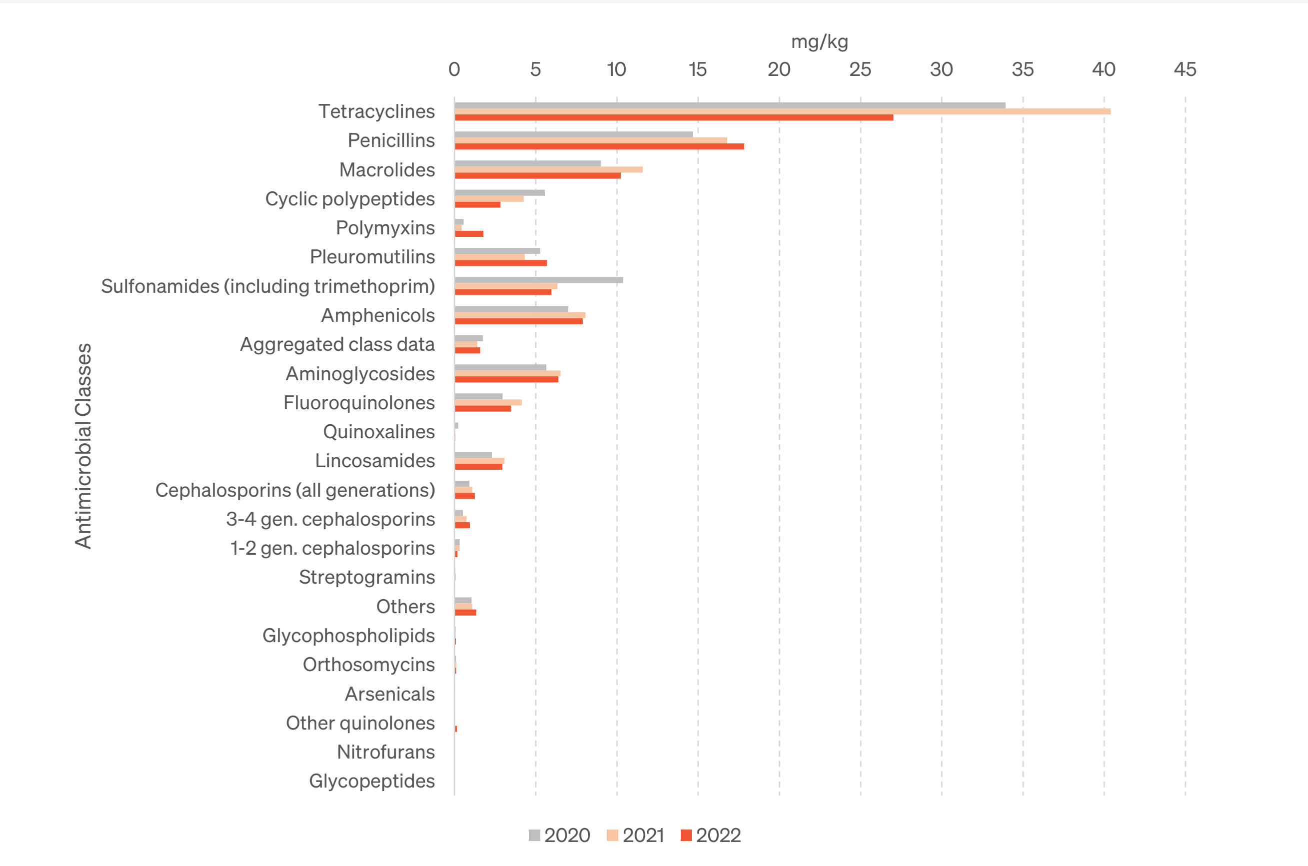


Figure 28. Trends over time for the antimicrobial classes reported by 85 Members from 2020 to 2022, adjusted by animal biomass (mg/kg)* [16]
* For each antimicrobial class, the summed antimicrobial quantities reported (in mg) in all WOAH regions are divided by the total animal biomass (in kg) based on 2018 animal population data.

[16] Please see notes from Figure 11.

5. Discussion

5.1. Progress made by Members

A large number of Members remained engaged in data reporting in the ninth round of data collection, reflecting their continued commitment to the Global Action Plan on AMR.

Of the 154 Members who submitted reports in the ninth round, 136 had also participated in the eighth round. Among these 136 Members, the following progress was noted:

- Six Members graduated from reporting only baseline information in the eighth round to providing quantitative data on antimicrobial agents used in animals for the first time (n = 20; 30%). Two Members used Reporting Option 1, which allows data to be reported by antimicrobial class and type of use (veterinary medical use or growth promotion). Four Members used Reporting Option 3, which allows for categorisation of quantitative data by type of use, animal group and route of administration; three of these Members used the Calculation Module.
- Nine Members who had previously reported quantitative data through Reporting Option 1 (n = 21; 42%) progressed to more detailed reporting in this round. One Member switched to Reporting Option 2, and eight switched to Reporting Option 3 (six of them using the Calculation Module).
- One Member who used Reporting Option 2 in the eighth round provided data through Option 3 (n = 8; 13%).

It is important to highlight that, for this ninth round, 18 Members aligned their submissions with WOAH's target year (2022) supporting the goal of achieving a single harmonised global dataset. As a result, all those Members who initially intended to provide 2023 during the data call in September 2023, participated only with qualitative data. Therefore, the apparent decrease in the number of participants submitting antimicrobial quantities should not be interpreted as a lack of national interest in providing data. Instead, it reflects Members' commitment to adhering to guidelines aimed at improving the consistency and quality of global data analysis.

During the ninth round, 41% of the 136 Members who provided quantitative data used the Calculation Module, representing an increase of 19 Members compared to the previous round using this support for the calculations. This tool assisted Members in collecting product information, calculating amounts of active ingredients and providing different visuals for national analysis. Much of the progress demonstrated by Members can be attributed to the use of these supports.

5.2. Limitations in the analysis of antimicrobial quantities

All Members who reported quantities of antimicrobial agents intended for use in animals used the WOAH template. This document collects essential information to analyse the amounts of antimicrobials ('Baseline Information', Part C).

Data sources

In some cases, there is a risk of data duplication or overestimation when the following situations are reported in a participant's data sources:

- Import data on active ingredients or manufacturing data are reported without accounting for the potential of re-exports;
- Import data of veterinary products are reported in addition to sales data of veterinary products (domestic and imported);
- Import, sales or purchase data of veterinary products are reported in addition to usage data at the farm level. As outlined in the *Guide for completing the WOAH template* (available at the ANIMUSE public portal), Members are instructed on how to calculate antimicrobial quantities per kg of active ingredient.
- Data are collected from wholesalers or marketing authorisation holders in addition to data from retailers, prescriptions, pharmacies and/or farm records.

To mitigate these risks, ANIMUSE automatically flags potential problems and prompts participants to highlight and clarify possible areas of data duplication or overestimation before submission to WOAH. WOAH staff then analyse the information provided and, if necessary, further engage with the Members. WOAH continues to work closely with these participants to understand their systems and approaches, supporting them to address limitations in their data.

Calculation of quantitative data

Wherever possible, the data reported by participants were cross-checked by WOAH against existing reference sources, either using the previous year's reported data or national reports available online. The indicator for this comparison was a calculated 'percentage of change'.

During the ninth round, participants' data that showed a change by more than 25% from one year to the next were considered unlikely to reflect the true situation.

For participants with high percentages of unexplained change (>25%), WOAH inquired how the calculations to obtain kg of antimicrobial agents were carried out. In doing so, calculation errors were discovered. These errors often stemmed from participants either not following or misinterpreting the calculation procedure outlined in the annex provided for calculating kilograms of active ingredients. Such errors occurred across all WOAH regions during the ninth round.

In parallel to the verification process of the percentages of change, WOAH developed a tool (the Calculation Module) to assist participants in performing calculations to obtain amounts of active ingredients. The Calculation Module takes into account the different calculation and conversion rules for notification to WOAH. It includes different units of measurement (mg, g, mL, IU, etc.); provides conversion factors; identifies product data (e.g. molecule names, purpose of use, target animals and routes of administration as declared on the product label); and allocates them to the different antimicrobial classes of the Reporting Options 1, 2 and 3. Of the 111 participants reporting antimicrobial quantities in the ninth round, 48% used the Calculation Module for calculating amounts of active ingredients. However, WOAH observed instances where participants declared the wrong concentration for veterinary products due to errors while entering information into the tool (e.g. enrofloxacin 250 g/g instead of enrofloxacin 250 mg/g). None of the participants noticed these errors, even when visuals were provided. In response, WOAH has integrated a component for data visualisation and interpretation into its regional workshops.

Development of antimicrobial monitoring systems

Considering that many participants worldwide are still improving their capability to accurately report quantitative data on antimicrobials intended for use in animals, and that errors in data sources have been noted that may result in instances of data duplication, caution is necessary when interpreting these results. However, identifying such errors is considered a positive step, as provides opportunity to correct the system and to foster continuous improvement. As stated in the 2022 annual report of the European Surveillance of Veterinary Antimicrobial Consumption (ESVAC) project: **'It is generally agreed that it usually takes at least three to four years to establish a valid baseline for the data on sales of veterinary antimicrobial agents. Consequently, the data from countries that have collected such data for the first or even second time should be interpreted with due caution'** [19]**.**

5.3. Limitations in estimating animal biomass

The animal biomass methodology was developed with the goal of best representing animal biomass in all WOAH regions, accounting for varying animal populations and data collection systems. Biomass estimates obtained from this methodology reflect a margin of error, which is expected to decrease over time as data collection is further refined (see Section 6, 'Future developments for the Antimicrobial Use Survey'). Further information can be found in the article 'OIE Annual Report on Antimicrobial Agents Intended for Use in Animals: methods used' [3].

Data availability

For the years 2020, 2021 and 2022, animal biomass estimates were calculated using animal population figures from 2018, due to temporary limitations in availability of up-to-date population figures. As of June 2024, an updated version of the Annual Report within WAHIS now enables Members to report detailed animal population data for the year 2023 and onwards. For earlier years, the use of animal population figures from 2018 serves as an interim solution to bridge the data gap for 2020–2022, since 2018 remains the most recent year for which reliable and up-to-date data are available.

Given the general global increase in animal biomass observed in the past, it is estimated that using data from 2018 may result in an underestimation of the global animal biomass for 2020, 2021 and 2022. Despite this limitation, the animal biomass denominator is maintained to provide a continuous mg/kg analysis of antimicrobial quantities.

Calculation methodology of average animal weights

Different antimicrobial use surveillance programmes have adopted varying methodologies for calculating average animal weights for use when calculating total biomass. The ESVAC report [19] uses estimated average weights at time of treatment. The Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS) [20] uses the same standard weights at time of treatment, as well as Canadian standard weights at time of treatment and live average weights at time of slaughter. Surveillance programmes in Japan [21] and the United States of America [22] take a different approach, using estimates of average animal weights by production category, rather than focusing the estimates on the time of treatment.

For the purposes of this report, WOAH adopted the latter approach, using estimates of live average weight without focus on time of treatment. This was deemed most appropriate given the global variability in antimicrobial compounds used and their labelling, including target species and production class. Data on these differences are not available. Given these variations, it is not feasible to estimate weights at time of treatment for all participants reporting data to WOAH. Instead, average weights were calculated using globally available slaughter data as reported by FAO Statistical Database (FAOSTAT), for all species and regions where these data were available.

The average weights calculated for this report are therefore larger than the estimated weights at the time of treatment, resulting in a larger denominator and a decreased relative mg/kg estimate of antimicrobial agents intended for use in animals. Therefore, the results reported in WOAH analyses of antimicrobial quantities adjusted by animal biomass are not directly comparable to those of ESVAC, which are based on weight at the time of treatment.

Specificity of data

As described in the methodology, the globally available data sources on animal population, FAOSTAT and WAHIS, were not systematically reported by production class for 2019 and beyond. However, it is necessary to stratify species population by production class to better assign average weights (e.g. to separate veal calves from adult cattle). To address this, the methodology for calculation of biomass uses some necessary standard animal reproduction rates to extract the best estimate of the population breakdown by production class. These rates will vary between species, countries and production systems and so are not fully representative of the animal populations of any individual country or region.

Imported and exported animals

As in ESVAC and CIPARS, animal biomass calculations typically subtract exported animals and add imported animals to ensure that only animals raised in the country during the relevant antibiotic treatment period are considered. To minimise the effect of imported and exported animals, WOAH used the FAOSTAT 'Trade of live animals' data set for bovine species.

Extrapolations within the methodology

Carcass conversion factors

To calculate average animal weight from slaughter data, a conversion factor from carcass weight to live weight at time of slaughter is needed (see methodology on the ANIMUSE portal). Currently, these conversion factors are only available for Europe. It is unknown how well these European conversion factors apply to other countries, which may have different breeds, husbandry and slaughter practices; it is likely that the conversion factors would differ. The significance of this difference and its impact on the accuracy of the biomass calculation for all countries cannot be estimated.

Reproduction rates and weights

Data on reproduction rates and slaughter for cervids, camelids or equids were not collected in some regions at the time of reporting. In such cases, estimates were obtained from the literature or extrapolated from regions where data were available. The extent to which these published and extrapolated weights and reproduction rates represent the true situation in any country is expected to vary.

Animal species not retained in the denominator

In developing the current denominator methodology, it was decided not to include companion animals when calculating animal biomass. Although population data for cats and dogs are available in WAHIS, they are not included in FAOSTAT, and reporting by participants is often inconsistent or incomplete. Another factor is the uncertainty around whether reported cat and dog populations represent owned or stray animals, which would affect the likelihood of their treatment with antimicrobials.

For participants that did report cat and dog population data, these species were found to represent less than 0.5% of the overall biomass.

However, since some participants do include antimicrobials used in companion animals in their reported quantitative data, excluding these species from the denominator could lead to a small effect on the results. Since excluding them decreases the denominator, the effect, if any, would be a minor increase in antimicrobial quantities adjusted for animal biomass.

Looking ahead, one goal of the AMU data collection system is to enable separate analysis for antimicrobial agents used in companion animals, as more participants become capable of reporting population data and differentiating antimicrobial quantities by animal group.

5.4. Barriers to collecting antimicrobial quantities

Among participants unable to report antimicrobial quantities, the most frequently cited barrier was a lack of staff and funding to collect and analyse data on antimicrobial quantities intended for use in animals.

Another persistent challenge reported during the ninth round of data collection was a lack of coordination and collaboration with the participant's Ministry of Health, which is often responsible for the authorisation of veterinary products at the national level.

6. Future developments for the Antimicrobial Use Survey

Institutionalisation of AMU data

In 2024, marking nine years of WOAH's AMU data collection and two years since the launch of its interactive online database ANIMUSE for all its Members, WOAH initiated a first series of workshops aimed at institutionalising AMU data collection. During these workshops, selected countries worked alongside WOAH and external experts to discuss and analyse their AMU data with the aim to produce their first AMU national report for the animal sector.

This initiative emphasises fostering communication with diverse stakeholders and promoting transparency in data reporting. It aligns closely with Members' National Action Plans on AMR, raising awareness of AMR while facilitating any initiative for integrated analyses at national levels. Publishing AMU reports will enable WOAH Members to make evidence-based decisions and empower different sectors to collectively address the challenges posed by antimicrobial resistance. By May 2025, it is expected that eight African Members will have published AMU reports. Furthermore, two additional workshops are planned for 2025.

Reported years

At this report's time of publication, the ongoing tenth round of data collection will have marked a significant change in WOAH›s reporting framework. For the first time, Members are asked to submit quantitative data exclusively for the year 2023, discontinuing the previous practice of allowing optional data from prior years. This change addresses challenges with incomplete datasets and the lack of analyses at the national level, particularly for countries that have traditionally submitted data corresponding to the year of the data call.

To streamline the reporting process, WOAH ensures that all Members provide data from the same target year for subsequent reports. By synchronising data collection efforts, WOAH aims to enhance the consistency and reliability of global monitoring of antimicrobial agents intended for use in animals. This strategic alignment reflects the evolving standards of data collection systems among Members, facilitating more routine and systematic reporting.

Data by animal species

In 2024, WOAH initiated discussion on the collection of data at species level, along with supporting guidelines and communication materials.

To advise, guide, mentor and monitor these evolutions, WOAH established an Electronic Technical Group (ETG) composed of experts on AMU monitoring. The ETG provides insightful guidance and support in all aspects that require consideration when designing these documents and improving ANIMUSE.

During its initial meetings in 2024 and early 2025, the ETG will offer insightful guidance and support on the methodology required when stratifying data at species level. It is expected that this guidance will help WOAH take the best approach at a global level and to implement such best practices in ANIMUSE.

The input of experts from the ETG contributes to the design of Reporting Option 4, which allows for data to be stratified by animal species. This option will be piloted throughout 2025 by different experts and Members around the world in WOAH's three official languages (English, French and Spanish). Following this pilot phase, ANIMUSE will be updated to accommodate these data and provide suitable visuals for analysis.

7. Conclusions

Since 2015, the commitment of WOAH Members to report on antimicrobial use has been a notable achievement. The overall participation rate in the current ninth data collection round has remained steady over time, despite the competing priorities and resilience challenges that WOAH Members face. Remarkably, nearly 80% of the submitted reports contained quantitative data – a stunning result that reflects the constant efforts by WOAH Members to improve their valuable AMU surveillance systems. This marks a three-fold increase in capacity from the baseline established in 2012, when scarcely 40 Members had systems in place to collect and analyse quantitative sets of data. With consistent Member engagement, and the full deployment of the ANIMUSE system across the globe, WOAH is able to provide an invaluable set of validated and analysed data, including trends over time, to all its Members for their own use in AMU and AMR monitoring and surveillance programmes. ANIMUSE provides the most comprehensive and reliable representation of the global situation on antimicrobial agents intended for use in animals, representing almost 85% of global geography and 71% of the total global livestock animal biomass.

Data presented in this report estimate that, in 2022, the total amount of antimicrobial agents intended for use in animals ranged between 70,648 and 74,035 tonnes (based on reports from 107 participants in this ninth annual report). Overall, tetracyclines remained the most-used antimicrobial agent in animal health globally (28.3% of the total amount), followed by penicillins (17.8%) and macrolides (10.6%). The number of participants providing data by antimicrobial class and animal group has steadily increased over time, reaching a record high of 84 participants for the year 2022. Among 71 participants reporting on terrestrial food-producing animals, tetracyclines and penicillins remained dominant (25.7% and 17.9% of the total amount, respectively). For aquatic species, 18 participants reported data, with amphenicols (27.4%), tetracyclines (26.2%) and fluoroquinolones (15.8%) being the leading classes. Notably, fluoroquinolones – classified as highest priority critically important antimicrobial for human health according to the *WHO List of Medically Important Antimicrobials* – featured as a third class in aquaculture, highlighting the need for ongoing and careful monitoring in aquaculture. Sixty-one participants reported the use of antimicrobial agents in non-food-producing animals (mainly canines and felines, followed by equines and ornamental fish). Penicillins were the most-reported antimicrobial class (34.8% of the total amount), followed by sulfonamides (18.8%, including trimethoprim) and all generations of cephalosporines (12.2%). Penicillins and sulfonamides are classified as veterinary critically important antimicrobial agents. The implementation of the ANIMUSE Calculation Module has contributed positively to the higher number of detailed returns, and WOAH encourages participants to continue providing such accurate reporting.

To contextualise the data, these absolute antimicrobial quantities were also analysed in relation to the animal population, by normalisation with the use of the WOAH animal biomass denominator. An independent review deemed this denominator the best indicator for global monitoring of antimicrobial sales in food-producing animals as it allows data comparison across sectors and regions, as well as over time [23]. In this ninth report, WOAH covers 71% of the total animal biomass for the year 2022, representing 107 participants around the world. This figure encompasses terrestrial and aquatic food-producing animals, (excluding companion animals). Bovine species accounted for 42% of the total coverage, followed by swine (20%) and poultry (18%). Aquatic animals accounted for 8% of the total coverage, and almost two-thirds of these were fish. Based on these figures, WOAH estimates that, in 2022, a total of 89 to 93 mg of antimicrobial agents were used per kg of animal biomass (mg/kg), depending on how coverage estimations were adjusted among the 107 participants. Analysis of these data over time shows that, among the 85 participants who have consistently provided data from 2020 to 2022, the indicator used to track trends showed a decrease of 5% (from 102 mg/kg to 97 mg/kg).

The Middle East, included in a regional analysis for the first time, presented a 43% rise in antimicrobial use during that same period, with decreases evident in Europe (23%), Africa (20%), the Americas (4%) and Asia and the Pacific (2%). Although the increase in the data from the Middle East may seem significant, their AMU rate in mg/kg is the lowest across all regions, representing only 0.3% of the global biomass and 0.04% of the global quantities reported. Currently, the included participants cover only 17% of the region's animal biomass, making expanded participation an urgent priority to enhance the accuracy and reliability of regional estimates.

While the Africa region saw a decrease for the 2020–2022 period, AMU surveillance remains fragile and requires urgent strengthening for better assessment and more compelling decision-making. This is particularly critical given that this region has the heaviest AMR burden on public health. The increase observed in 2021 was reviewed with the relevant participants to better understand the data collection context for that year. Updates to historical ANIMUSE data are made in each round to reflect increased data are made in each round to reflect increased data coverage, enhancements to information capture systems and, in some cases, corrections to previously reported antimicrobial quantities. Thus, it is essential to continue the improvement of surveillance systems in African countries, and to also continue improving the precision of estimates.

More detailed analysis could help determine whether a particular disease in an animal species might have contributed to the increase in antimicrobial quantities intended for use. When analysing trends over time, mg/kg is predominantly influenced by regions with the largest antimicrobial quantities. In the case of the Middle East, the region does not significantly impact mg/kg, as it represents only 0.3% of biomass and 0.04% of antimicrobial quantities for the 85 countries analysed. In contrast, the Americas account for approximately 30% of antimicrobial quantities, and Asia and the Pacific nearly 65%. In terms of animal biomass, these two regions represent 30–40% of the total. In other words, the Americas and Asia and the Pacific hold a greater contribution for these 85 countries, while their respective decreases were only 4% and 2%, respectively.

Despite significant progress having been made in reducing the use of antimicrobials for growth promotion, this practice is still reported by almost 25% of WOAH Members. It is also concerning that 12 Members continue to use colistin, enrofloxacin and fosfomycin as growth promoters. Given these factors, and the commitments made by WOAH Members in 2016, the Organisation reminds its Members of the statement made during the 2023 World AMR Awareness Week: Members should restrict the use of antimicrobials to solely veterinary medical use, and should actively engage in dialogue with concerned parties.

In September 2023, WOAH launched the public interface of its ANIMUSE system, achieving global deployment across all WOAH regions by November 2023. ANIMUSE provides a platform for easy data entry, calculation of antimicrobial quantities and animal biomass estimations, with secure and confidential access to a central database. By January 2025, 21% of WOAH Members had made their data on antimicrobial use publicly available through ANIMUSE regardless of whether a national report on AMU had been produced – doubling the figure within a year. WOAH reminds all Members of the importance of transparency, as noted in Chapter 6.9. of the *Terrestrial Animal Health Code* [1], enabling all interested parties to assess trends, perform risk assessments and for risk communication purposes.

Each year, WOAH not only presents quantitative data from participants currently able to provide data but also evaluates current global governance of veterinary antimicrobials, as well as identifying barriers to quantitative data collection. While WOAH remains strongly committed to supporting its Members to develop robust and transparent measurements and reporting mechanisms for antimicrobial use, the key to sustainable and strong surveillance and reporting systems ultimately rests with Members themselves. Governments must strengthen national capacities for sustainable, sector-specific, integrated and interoperable surveillance systems for antimicrobial resistance and antimicrobial use, in line with commitments made in the Political Declaration of the High-Level Meeting on Antimicrobial Resistance, during the 79th UN General Assembly in September 2024.

Additionally, WOAH and WHO are strengthening collaboration with national agencies beyond Veterinary Services to foster interdisciplinary cooperation, furthering the global fight against antimicrobial resistance.

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Annex

Distribution of Members by WOAH Region, in alphabetical order

AFRICA (54)

1. ALGERIA
2. ANGOLA
3. BENIN
4. BOTSWANA
5. BURKINA FASO
6. BURUNDI
7. CAMEROON
8. CABO VERDE
9. CENTRAL AFRICAN REP.
10. CHAD
11. COMOROS
12. CONGO (REP. OF THE)
13. CONGO (DEM. REP. OF THE)
14. CÔTE D'IVOIRE
15. DJIBOUTI
16. EGYPT
17. EQUATORIAL GUINEA
18. ERITREA
19. ESWATINI
20. ETHIOPIA
21. GABON
22. GAMBIA
23. GHANA
24. GUINEA
25. GUINEA-BISSAU
26. KENYA
27. LESOTHO
28. LIBERIA
29. LIBYA
30. MADAGASCAR
31. MALAWI
32. MALI
33. MAURITANIA
34. MAURITIUS
35. MOROCCO
36. MOZAMBIQUE
37. NAMIBIA
38. NIGER
39. NIGERIA
40. RWANDA
41. SAO TOME AND PRINCIPE
42. SENEGAL
43. SEYCHELLES
44. SIERRA LEONE
45. SOMALIA
46. SOUTH AFRICA
47. SOUTH SUDAN (REP. OF)
48. SUDAN
49. TANZANIA
50. TOGO
51. TUNISIA
52. UGANDA
53. ZAMBIA
54. ZIMBABWE

AMERICAS (31)

1. ARGENTINA
2. BAHAMAS
3. BARBADOS
4. BELIZE
5. BOLIVIA
6. BRAZIL
7. CANADA
8. CHILE
9. COLOMBIA
10. COSTA RICA
11. CUBA
12. CURACAO
13. DOMINICAN REP.
14. ECUADOR
15. EL SALVADOR
16. GUATEMALA
17. GUYANA
18. HAITI
19. HONDURAS
20. JAMAICA
21. MEXICO
22. NICARAGUA
23. PANAMA
24. PARAGUAY
25. PERU
26. SAINT LUCIA
27. SURINAME
28. TRINIDAD AND TOBAGO
29. UNITED STATES OF AMERICA
30. URUGUAY
31. VENEZUELA

ASIA AND THE PACIFIC (32)

1. AUSTRALIA
2. BANGLADESH
3. BHUTAN
4. BRUNEI
5. CAMBODIA
6. CHINA (PEOPLE'S REP. OF)
7. FIJI
8. INDIA
9. INDONESIA
10. IRAN
11. JAPAN
12. KOREA (REP. OF)
13. KOREA (DEM. PEOPLE'S REP. OF)
14. LAOS
15. MALAYSIA
16. MALDIVES
17. MICRONESIA (FED. STATES OF)
18. MONGOLIA
19. MYANMAR
20. NEPAL
21. NEW CALEDONIA
22. NEW ZEALAND
23. PAKISTAN
24. PAPUA NEW GUINEA
25. PHILIPPINES
26. SINGAPORE
27. SRI LANKA
28. TAIPEI (CHINESE)
29. THAILAND
30. TIMOR LESTE
31. VANUATU
32. VIETNAM

EUROPE (53)

1. ALBANIA
2. ANDORRA
3. ARMENIA
4. AUSTRIA
5. AZERBAIJAN
6. BELARUS
7. BELGIUM
8. BOSNIA AND HERZEGOVINA
9. BULGARIA
10. CROATIA
11. CYPRUS
12. CZECH REP.
13. DENMARK
14. ESTONIA
15. FINLAND
16. FRANCE
17. GEORGIA
18. GERMANY
19. GREECE
20. HUNGARY
21. ICELAND
22. IRELAND
23. ISRAEL
24. ITALY
25. KAZAKHSTAN
26. KYRGYZSTAN
27. LATVIA
28. LIECHTENSTEIN
29. LITHUANIA
30. LUXEMBOURG
31. MALTA
32. MOLDOVA
33. MONTENEGRO
34. NETHERLANDS (THE)
35. NORTH MACEDONIA
36. NORWAY
37. POLAND
38. PORTUGAL
39. ROMANIA
40. RUSSIA
41. SAN MARINO
42. SERBIA
43. SLOVAKIA
44. SLOVENIA
45. SPAIN
46. SWEDEN
47. SWITZERLAND
48. TAJIKISTAN
49. TÜRKIYE (REP. OF)
50. TURKMENISTAN
51. UKRAINE
52. UNITED KINGDOM
53. UZBEKISTAN

MIDDLE EAST (12)

1. AFGHANISTAN
2. BAHRAIN
3. IRAQ
4. JORDAN
5. KUWAIT
6. LEBANON
7 OMAN
8. QATAR
9. SAUDI ARABIA
10. SYRIA
11. UNITED ARAB EMIRATES
12. YEMEN

12, rue de Prony, 75017 Paris, France
Tel: (+33) 144 151 949
Fax: (+33) 142 670 987
woah@woah.org
woah.org

facebook.com/worldanimalhealth
instagram.com/worldanimalhealth
x.com/WOAH
youtube.com/c/WorldAnimalHealth
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