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CURRENT ANIMAL HEALTH SITUATION WORLDWIDE IN REGARD TO SELECTED GLOBAL STRATEGIES AND INFECTION WITH LUMPY SKIN DISEASE VIRUS: ANALYSIS OF EVENTS AND TRENDS

Prepared by Lina Awada, Katherine Gregory, Jenny Hutchison, Paolo Tizzani, Laure Weber-Vintzel

Acknowledging support from Melanie Allan, Anna-Maria Baka, Charmaine Chng, Alexandre Fediaevsky, Néo Mapitse, Mohamed M. Sirdar, Rachel Tidman, Gregorio Torres

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Introduction

The objectives of this report are to present a summary of the situation regarding major diseases of interest, to stimulate discussion with and among World Organisation for Animal Health (WOAH) Members on the challenges and opportunities in global control and eradication efforts, and to work towards improvements in these areas. In this regard, the report covers A) Indicators on the progress made by Members with implementing selected global animal disease control and/or eradication strategies (comprising infection with African swine fever [ASF] virus, infection with foot and mouth disease [FMD] virus, infection with peste des petits ruminants [PPR] virus, dog-mediated human rabies, and the Aquatic Animal Health Strategy); and B) Infection with lumpy skin disease (LSD) virus, for which epizootic situations were observed in 2022. The situation regarding infection with avian influenza viruses of high pathogenicity is not covered in this report. It will be dealt with in the Technical Item as well as in the Animal Health Forum during the General Session of the World Assembly of WOAH Delegates. The report is mainly based on the information shared with WOAH by Members and partners. This report provides a summary of the situation as of 26 March 2023. While the data presented in this report may have some limitations, being on occasion incomplete and presenting variations in data granularity (depending on the reporting country), they mostly represent the reference official animal health information reported by Official Services, using a standard template and a standard data format.

Data sources considered in this report include (in alphabetical order): annual reports of Reference Laboratories to WOAH on their activities, list of WOAH Reference Laboratories, list of WOAH Laboratory Twinning projects, PPR Monitoring and Assessment Tool (PMAT), Progressive Control Pathway for FMD (PCP-FMD) stages, SARE (Stepwise Approach towards Rabies Elimination) assessment stages for dog-mediated human rabies, self-declarations of disease freedom, simulation exercises notified by WOAH Members, WOAH's official status recognition and programme endorsement, and the World Animal Health Information System (WAHIS) (data for the years 2019, 2020, 2021, 2022 are still partial, due to delays in reporting, and should be interpreted with caution). In order to have a clear understanding of the recent epidemiological situation of the relevant diseases, and to avoid misinterpretations, Members are encouraged to provide timely information by submitting their six-monthly reports.

As part of its digitalisation strategy, WOAH is investing in several of these systems (e.g., WAHIS) and other data sources (official status recognition and programme endorsement, simulation exercises, etc.), to provide our Members with more user-friendly information platforms that also allow for better integration of information, which in turn can better inform about the global animal health situation. More information is available in the Annual Report of the Director General on the Activities of WOAH in 2022 (doc. 90 SG1).

A. Indicators on the progress made by Members with implementing selected global animal disease control and/or eradication strategies

One of the key objectives of WOAH is to support the control of animal diseases. To help meet this objective, WOAH and its partners have developed global animal disease control and/or eradication strategies for specific diseases of global importance, including ASF, dog-mediated rabies, FMD, and PPR. In addition, WOAH has developed the Aquatic Animal Health Strategy, which aims to improve aquatic animal health and welfare worldwide. Some key information about these global strategies is provided in Table 1 below.

Table 1. WOAH global animal disease control and/or eradication strategies

Disease/ topic	Global strategy	WOAH Partners	Publication date	End date	Goal	Key components, objectives or intended outcomes
FMD	Global FMD Control Strategy[1]	FAO (through the GF-TADS initiative[2])	2012	2027	To reduce the global burden of FMD and the risk of reintroduction of the disease into free areas.	3 components: i) improving global FMD control, (ii) strengthening Veterinary Services, and (iii) improving the prevention and control of other major diseases of livestock.
PPR	Global Strategy for the Control and Eradication of PPR[3]	FAO (through the GF-TADS initiative[2])	2015	2030	PPR eradication by 2030	3 components: (i) PPR control and eradication, (ii) strengthening Veterinary Services, and (iii) improving the prevention and control of other major diseases of small ruminants.
Dog-mediated rabies	Zero by 30: The Global Strategic Plan to end human deaths from dog-mediated rabies by 2030[4]	WHO, FAO, Global Alliance for Rabies Control	2018	2030	To end human deaths from dog-mediated rabies by 2030	3 objectives: (i) to effectively use vaccines, medicines, tools, and technologies, (ii) to generate, innovate, and measure impact, and (iii) to sustain commitment and resources.

[1] WOAH/FAO, The Global Foot and Mouth Disease Control Strategy, https://www.fao.org/3/an390e/an390e.pdf. In 2022, an external review of the implementation of the strategy commenced, with the support of two external experts. The review aims to assess the progress achieved so far and the challenges in the implementation of the strategy since 2012. It is expected to provide outcomes and recommendations that will contribute to the revision of the strategy for its next cycle of implementation.
[2] WOAH/FAO, GF-TADs, https://www.gf-tads.org
[3] WOAH/FAO, Global Strategy for the Control and Eradication of PPR, https://www.fao.org/publications/card/en/c/6d14cbc5-b7c1-4213-bb1f-78690e805c95. In 2022, a 'Blueprint' document containing the plan of action for the second and third phases of the programme was released (Peste des Petits Ruminants Global Eradication Programme II & III: Overview of the plan of action, https://www.fao.org/documents/card/en/c/cc2759en)
[4] WOAH/FAO/WHO/Global Alliance for Rabies Control, Zero by 30: The Global Strategic Plan to end human deaths from dog-mediated rabies by 2030, https://www.woah.org/en/document/zero_by_30_final_130618/

Disease/ topic	Global strategy	WOAH Partners	Publication date	End date	Goal	Key components, objectives or intended outcomes
ASF	Global control of African swine fever, a GF-TADs initiative[5]	FAO (through the GF-TADS initiative[2]	2020	2025	Global control of ASF	3 intended outcomes: (i) capability of countries to control ASF is improved, (ii) regional and global coordination and cooperation to control ASF is improved, and (iii) national, regional and international trade of pigs and their products, based on international standards and guidelines, is facilitated.
Aquatic animal health	Aquatic Animal Health Strategy[6]	N/A	2021	2025	To improve aquatic animal health and welfare worldwide, and support the sustainable growth of aquatic animal production in the future	The strategy is designed to guide actions to strengthen four areas of the aquatic animal health system: standards, capacity building, resilience, and leadership.

The purpose of this chapter is to describe global trends for each of these diseases or topics, to determine whether the situation appears to be improving or deteriorating based on available data

[5] WOAH, Global control of African swine fever: A GF-TADs initiative. 2020-2025, https://www.woah.org/en/document/global-control-of-african-swine-fever-a-gf-tads-initiative-2020-2025/

[6] WOAH, OIE Aquatic Animal Health Strategy 2021–2025, https://www.woah.org/en/document/oie-aquatic-animal-health-strategy-2021-2025/

(acknowledging their limitations due to delays in receiving and validating the information in relevant reports), and to present information on some of the key measures implemented by countries that contribute to global control and eradication efforts. The findings will serve to inform reflection on the implications and stimulate discussion, with a view to working towards improving disease control and eradication.

This chapter of the report contains the following five sections:

- Trends in the global disease situation for ASF, FMD, PPR, and rabies
- Collaboration and data sharing between Members
- Surveillance in relevant populations
- Selected key control tools – vaccination, biosecurity/movement control
- Stepwise approach and Members' knowledge of their progress with implementing the strategies

1. Trends in the global disease situation for ASF, FMD, PPR, and rabies

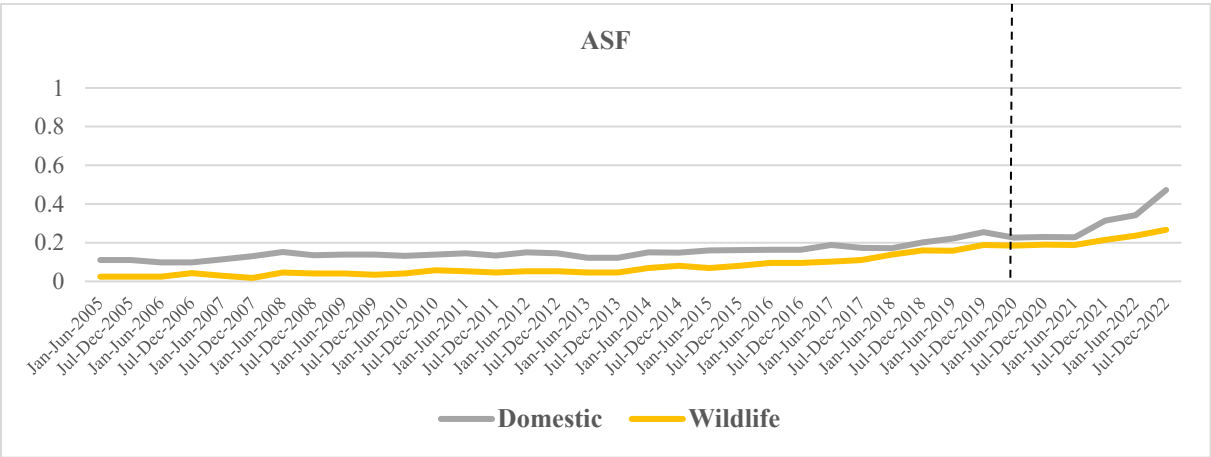
1.1 Trends in the percentage of Members reporting the diseases present

This subsection analyses the trends in the global situation of ASF, FMD, PPR, and rabies during the period 2005 – 2022. The trends consider the percentage of reporting Members having declared the diseases present in their six-monthly reports. This indicator does not take into account sub-national changes in disease spatial dynamics (extension of the affected areas at country level) and impact (number of cases, deaths, losses). However, despite this limitation, it can still provide useful information on global macro trends. The trends are first described, and then statistically tested for deterioration or improvement, using the Sen's estimator. Data for the years 2019, 2020, 2021, and 2022 are still partial, due to a limited number of reports being available because of delays in reporting and validation through WAHIS, and thus should be interpreted with caution.

Infection with African swine fever virus

On average during the period 2005–2022, ASF was declared present by 17% of reporting Members in domestic animals and by 9% in wildlife. The situation was stable until 2013; thereafter, the progressive spread of the disease in Europe, Asia, Oceania, and the Americas is reflected in an increasing percentage of Members reporting the presence of the disease (Figure 1). The results of the statistical tests indicate a slight deterioration of the situation in both domestic animals and wildlife.

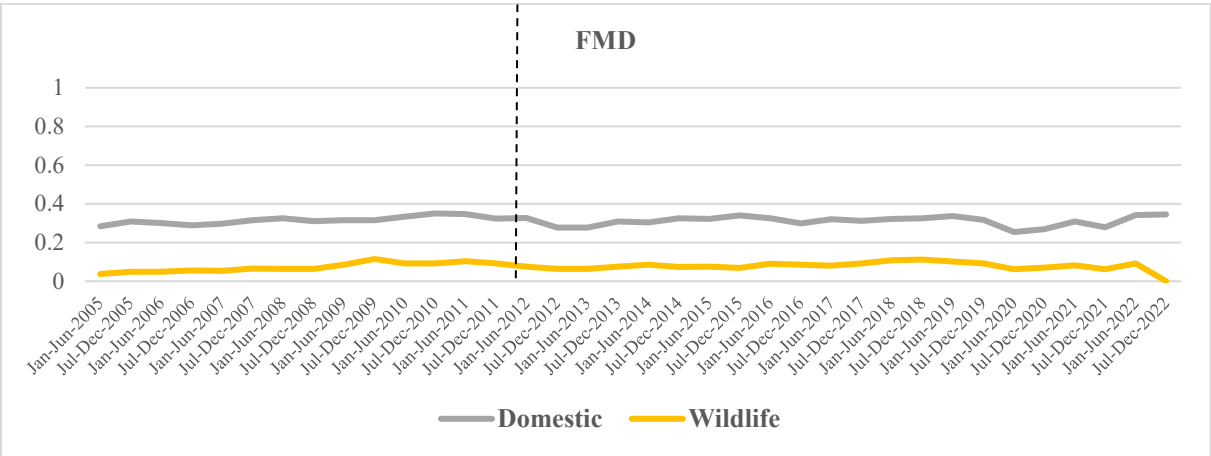
Figure 1. Proportion of reporting Members declaring ASF present in domestic animals and wildlife (2005–2022) *(the vertical dashed line indicates the year of publication of Global control of African swine fever, a GF-TADs initiative)*



Infection with foot and mouth disease virus

On average during the period 2005–2022, FMD was declared present by 31% of reporting Members in domestic animals and by 7% in wildlife. The trends since 2005 show little change, in either domestic animals or wildlife (Figure 2) as indicated by the statistical test.

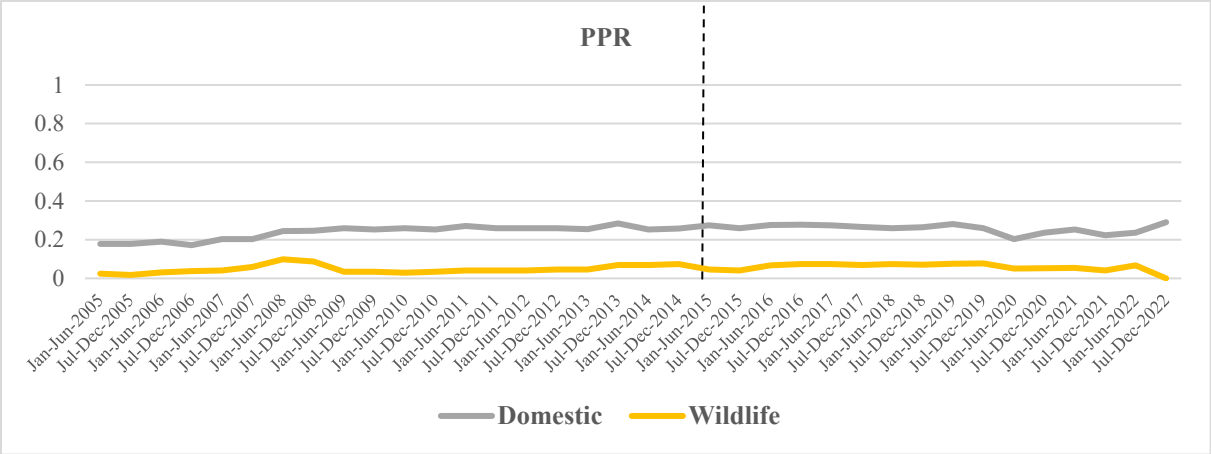
Figure 2. Proportion of reporting Members declaring FMD present in domestic animals and wildlife (2005-2022) *(the vertical dashed line indicates the year of publication of the Global FMD Disease Control Strategy)*



Infection with peste des petits ruminants virus

On average during the period 2005–2022, PPR was declared present by 25% of reporting Members in domestic animals and by 5% in wildlife. As in the case of FMD, although the trends since 2005 show little change (Figure 3), a slight deterioration of the situation in both domestic animals and wildlife was measured by the statistical test.

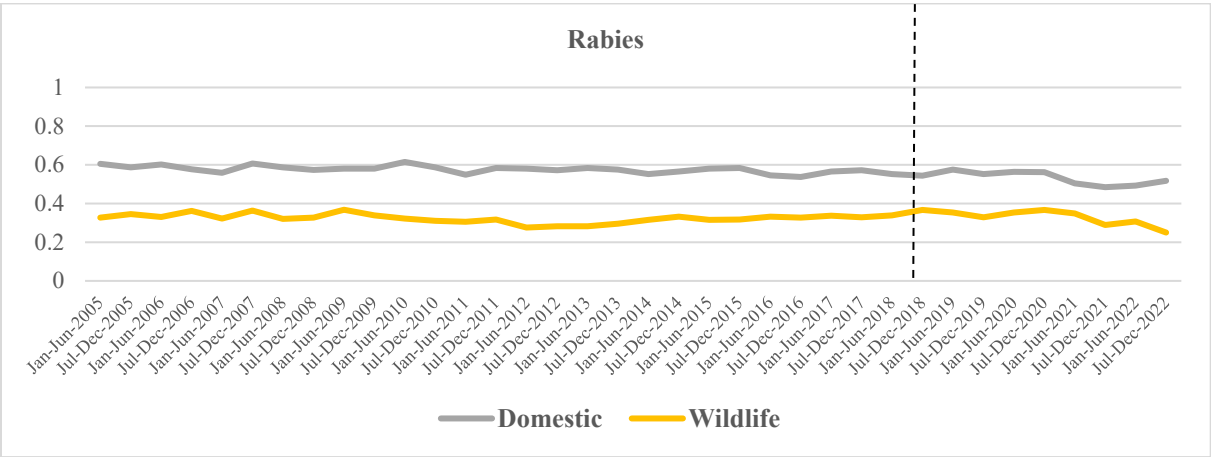
Figure 3. Proportion of reporting Members declaring PPR present in domestic animals and wildlife (2005–2022) *(the vertical dashed line shows the year of publication of the Global strategy for the Control and Eradication of PPR)*



Infection with rabies virus

On average during the period 2005–2022, rabies was declared present by 56% of reporting Members in domestic animals and by 32% in wildlife. A slight reduction in the percentage of reporting Members declaring the disease present in domestic animals has been observed in recent years (from 60% in 2008 to 48% in 2020, Figure 4). This improvement is reflected in the results of the statistical test and can be considered as an effect of the global efforts to reduce canine rabies, mainly through vaccination. Some WOAH Regions have made specific efforts to control and eradicate rabies and this is also reflected, for instance, in the self-declarations of disease freedom recently submitted by several Members in the Europe Region.

Figure 4. Proportion of reporting Members declaring rabies present in domestic animals and wildlife (2005–2022) *(the vertical dashed line indicates the year of publication of Zero by 30: the Global Strategic Plan to end human deaths from dog-mediated rabies by 2030)*



1.2 Trends in the distribution of GCES stages for PPR, PCP stages for FMD, and SARE stages for rabies

Three global animal disease control and/or eradication strategies covered in this analysis have a progressive, staged approach. For the Global FMD Control Strategy, published in 2012, the Progressive Control Pathway for FMD (PCP-FMD)[7] was developed to assist and facilitate FMD-endemic countries in progressively reducing the impact and burden of FMD. Since 2017, the PPR Monitoring and Assessment Tool (PMAT)[8] has been available to monitor and assess the implementation of the Global Strategy for the Control and Eradication of PPR. Since 2016, for dog-mediated human rabies, the Stepwise Approach towards Rabies Elimination (SARE)[9] – a One Health, practical planning, monitoring, and evaluation tool – has enabled countries to check their progress against five global milestones by assessing seven key areas of their rabies control programmes. The SARE process ensures that countries align their rabies control programmes with the internationally agreed Global Strategic Plan to end human deaths from dog-mediated rabies by 2030.

The assessment and resulting allocation of stages is done on an individual country basis. For specific stages, Members can apply for WOAH's procedures for approval of official control programmes, formal recognition of freedom status[10], or publication of self-declaration of disease freedom[11]. Details are provided in Table 2.

[7] The Progressive Control Pathway for Foot and Mouth Disease control (PCP-FMD) Principles, Stage Descriptions and Standards, https://www.fao.org/3/CA1331EN/ca1331en.pdf

[8] PPR Monitoring and Assessment Tool (PMAT), https://www.woah.org/fileadmin/Home/eng/Animal_Health_in_the_World/docs/pdf/PPR/EN_PMAT.pdf

[9] Stepwise Approach towards Rabies Elimination (SARE), https://rabiesalliance.org/tools/planning-tools/sare

[10] WOAH, Official Disease Status, https://www.woah.org/en/what-we-do/animal-health-and-welfare/official-disease-status/

[11] WOAH, Self-declared Disease Status, https://www.woah.org/en/what-we-offer/self-declared-disease-status/

Table 2. Details of assessment tools for stages of the Global FMD Control Strategy, the Global Strategy for the Control and Eradication of PPR, and the Global Strategic Plan to end human deaths from dog-mediated rabies by 2030

	FMD	PPR	Dog-mediated rabies
Name of the tool for assessing a country's current stage – and year tool was launched	Progressive Control Pathway for FMD (PCP-FMD) – 2012	PPR Monitoring and Assessment Tool (PMAT) – 2017	Stepwise Approach towards Rabies Elimination (SARE) – 2016
Range of stages	0 to 4	Below Stage 1 to beyond Stage 4	0 to 5
The stage corresponding to endorsement of the Official Control Programme by WOAH	4	3	3
The stage to which "freedom" corresponds (either official recognition or self-declaration)	Beyond Stage 4	Beyond Stage 4	5
Number of WOAH Members engaged in this process with a stage assessed, an Official Control Programme or a recognised free status, as of 26 March 2023	166 (since 2012)	150 (since 2017)	72 (since 2016)
Number of WOAH Members with an Official Control Programme or a recognised free status, as of 26 March 2023	86	60	16

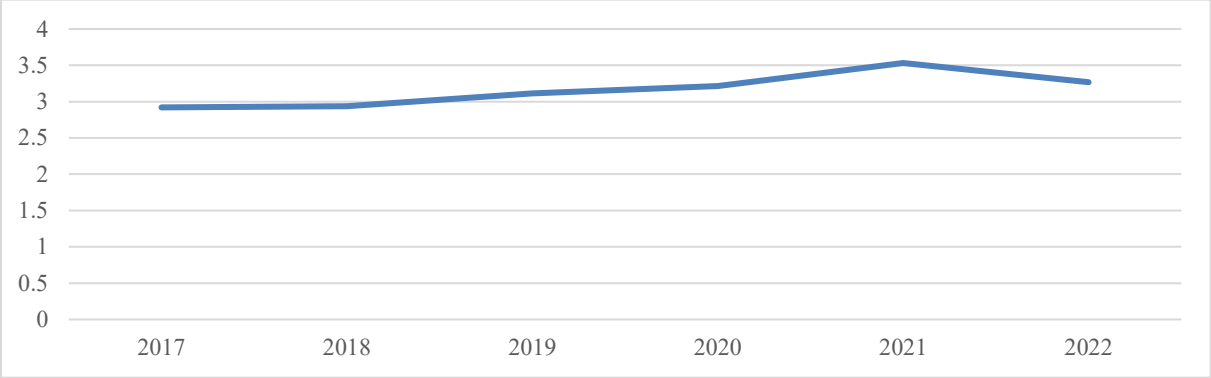
While the information presented in subsection 1.1. focuses on a binary indicator (presence vs. absence) without taking into consideration the efforts implemented in countries for surveillance and control, this subsection aims to present the evolution of the situation based on data derived from the classification of countries in different stages towards disease control and eradication. These data take into consideration the surveillance and control efforts implemented by Members. For this purpose, we used official data on the evolution of countries through the FMD, PPR, and rabies stages (scored 0 to 4). For FMD and PPR we also included countries that had achieved official recognition of their disease status (with or without vaccination, in a country or in a zone) adding a score equal to 5.

The analysis focuses only on Members that had continuous assessment throughout the years and the evolution of the global situation is represented as the yearly average global score. This evaluation was possible for FMD (N = 122 Members) and PPR (N = 125 Members), but not for rabies, as the data were

not sufficiently complete to derive a meaningful trend. The trends for both PPR and FMD show a positive evolution, with an increasing trend in the global average, indicating a good progression towards the objectives of the strategies in the targeted Members (Figures 5 and 6).

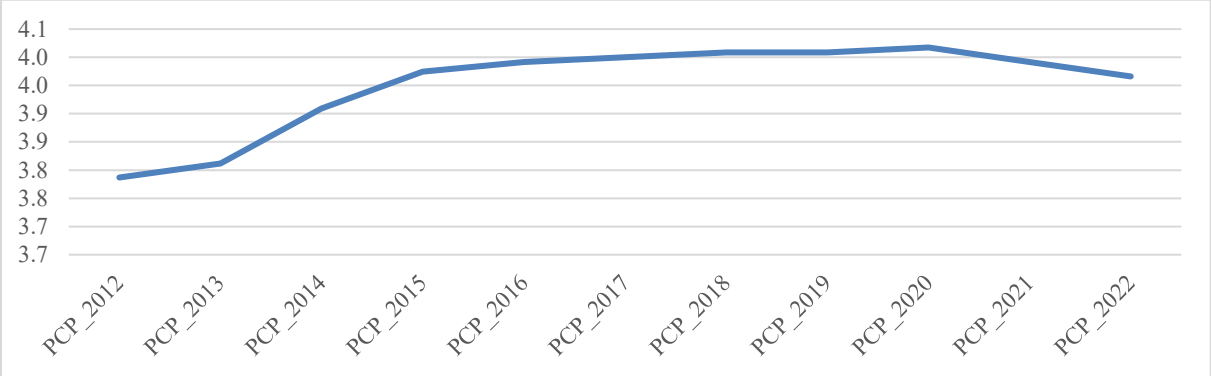
Infection with peste des petits ruminants virus

Figure 5. Evolution of the yearly average global score based on PPR GCES stages and data from official status confirmation during the period 2017 – 2022 (score only includes the 125 Members for which a score was available from the beginning of the strategy)



Infection with foot and mouth disease virus

Figure 6. Average scoring based on FMD PCP stages and data from official status confirmation during the period 2012 – 2022 (score only includes the 122 Members for which a score was available from the beginning of the strategy)

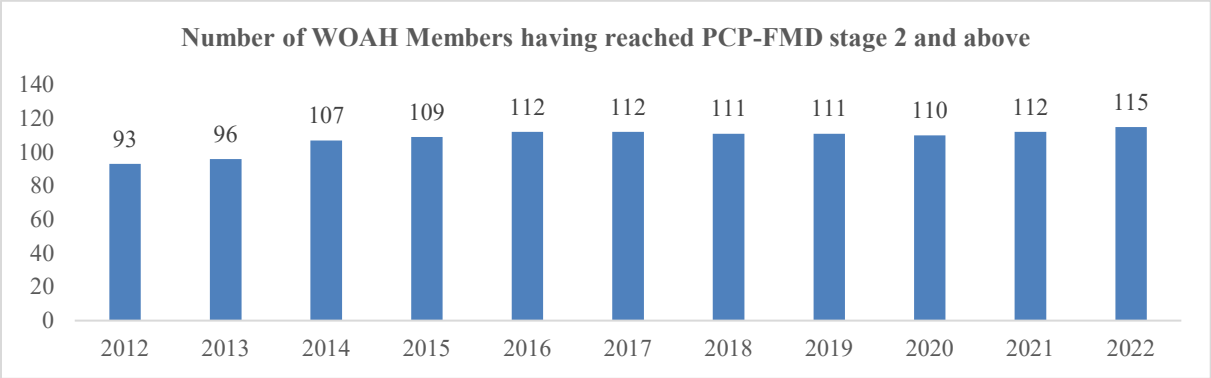


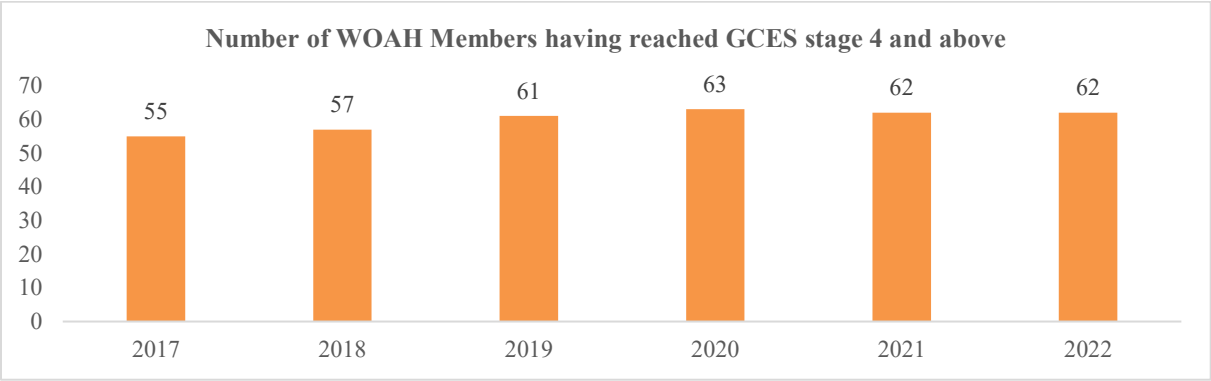
1.3 Number of WOAH Members meeting the target of the global strategies for FMD and PPR

The goal of the Global FMD Control Strategy is to achieve FMD control in all countries (corresponding to PCP-FMD Stage 2 and above), whereas the goal of the Global strategy for the Control and Eradication of PPR is eradication (corresponding to GCES Stage 4 and above). The upper panel of Figure 7 shows the trend in the number of WOAH Members that reached PCP-FMD Stage 2 and above between 2012 and 2022. The bottom panel shows the trend in the number of WOAH Members that reached GCES Stage 4 and above between 2017 and 2022. Both trends increased over the period: from 93 Members in 2012 to 115 Members in 2022 for FMD and from 55 Members in 2017 to 62 Members in 2022 for PPR.

This is a clear sign of progress with implementing both these strategies. By 2022, 63% of WOAH Members had achieved the goal of the Global FMD Control Strategy and 34% of WOAH Members had achieved the goal of the Global Strategy for the Control and Eradication of PPR.

Figure 7. Trend in the number of WOAH Members meeting the target of the global strategies for FMD and PPR





1.4 Overall disease trends

This subsection shows that for ASF and PPR, the number of Members reporting the presence of these diseases has increased over time, both in domestic animals and in wildlife. For ASF, no assessment tools have been developed for the steps of the global strategy. However, for FMD and PPR, the assessment tools show that there has been an overall increase in the implementation of control programmes in those Members that have been regularly assessed, and a slight increase in the number of Members achieving the objectives of the strategies (i.e., control for FMD and eradication for PPR). However, there is still room for improvement (by 2022, 63% of Members had achieved the goal of the Global FMD Control Strategy and only 34% of Members had achieved the goal of the Global strategy for the Control and Eradication of PPR). With regard to rabies, fewer Members are reporting the presence of the disease in domestic animals (i.e., an improvement) and the situation is stable in wildlife. However, the evolution in the number of human deaths due to rabies cannot be measured, due to significant gaps in surveillance and

reporting. Indeed, in the World Health Organization (WHO) Global Health Observatory dataset for human rabies deaths, 54% of records are marked as "no data available"[12]. These gaps in human surveillance are mainly due to poor enforcement of existing legislation, poor implementation of international guidelines, and the fact that canine rabies is an incurable disease that affects very poor sectors of society. It is currently estimated that over 90% of human rabies deaths go undetected[13]. This estimate raises doubts about the possibility of using official data as a proxy indicator of progress with implementing the rabies control strategy.

The following sections of the chapter aim to describe some key activities and measures implemented in countries that contribute to global disease control and eradication efforts.

2. Surveillance in relevant animal populations

2.1 Trends in Members' reporting of surveillance activities

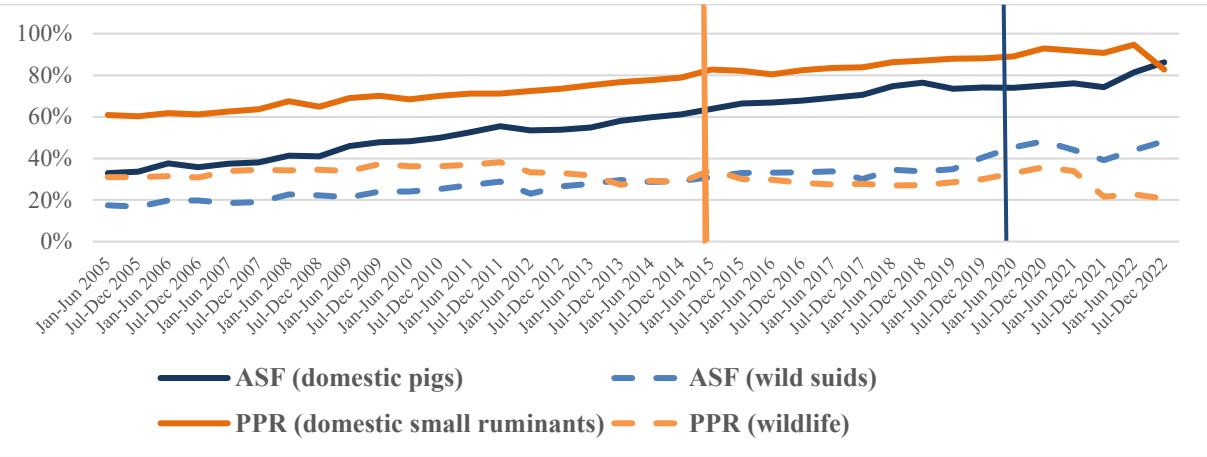
A good understanding of disease dynamics in relevant populations is essential to achieve proper control and eradication. The trends in Members' reporting of surveillance activities (including general surveillance, targeted surveillance, monitoring, or screening) through WAHIS were therefore analysed.

For ASF and PPR, domestic and wild animal populations are both relevant in the global strategies. For ASF, the role of wild suids varies from region to region, and GF-TADs[14] has highlighted important knowledge gaps, justifying the use of specific surveillance in different regions of the world to understand disease dynamics. For PPR, surveillance in wildlife is encouraged in the global strategy. In 2021, guidelines for the control and prevention of PPR in wildlife populations[15] were jointly published by WOAH and FAO[16], to help countries in the development and implementation of PPR eradication programmes, including objectives, policies, and strategies that can be adapted to the full range of national needs and facilitate the integration of the wildlife sector into the national strategic plan. Among their additional purposes, these guidelines are expected to assist with the systematic accumulation of evidence to evaluate the epidemiological role of wildlife in national and regional contexts. Figure 8 shows the percentage of Members declaring surveillance activities among those having submitted reports, for each semester. For ASF in domestic pigs, the percentage steadily increased from 33% in the first half of 2005 to over 80% in 2022. The results for PPR in small domestic ruminants followed a similar upward trend. However, the starting point was much higher in 2005, with a percentage of 60% in the first half of 2005. It exceeded 90% in 2020 and remained at that level through the first half of 2022. The decrease in the second half of 2022 is likely biased due to the low number of reports that WOAH had received from its Members for this semester, as of 26 March 2023. For ASF in wild suids, the percentage also increased steadily from 17% in the first half of 2005 to over 40% in 2020, 2021 and 2022. For PPR in

[12] https://www.who.int/data/gho/data/indicators/indicator-details/GHO/reported-number-of-human-rabies-deaths
[13] Taylor, L.H., Hampson, K., Fahrion, A., Abela-Ridder, B. and Nel, L.H., 2017. Difficulties in estimating the human burden of canine rabies. *Acta tropica*, 165, pp.133-140.
[14] GF-TADs: Global Framework for the Progressive Control of Transboundary Animal Diseases
[15] https://www.woah.org/en/document/guidelines-ppr-wildlife/
[16] FAO: Food and Agriculture Organization of the United Nations

wildlife, the starting point was higher in 2005, but no significant change (neither an increase nor a decrease) was observed between 2005 and 2022, with percentages fluctuating around 30% of reporting Members. These results show global progress in the number of Members implementing surveillance activities for ASF and PPR. While domestic animal surveillance is now widely implemented by the vast majority of Members, less than half reported implementing wildlife surveillance activities in 2022. In 2020, WOAH expanded its work on wildlife health and invested considerable efforts in promoting the growth of surveillance systems for wildlife health at national, regional, and international level, and encouraging Members to re-evaluate the importance and visibility given to wildlife health in their countries. WOAH's strategic vision in this respect is outlined in the Wildlife Health Framework[17].

Figure 8. Percentage of reporting Members declaring surveillance activities for ASF and PPR (2005-2022) *(vertical lines indicate the year of publication of each global strategy)*

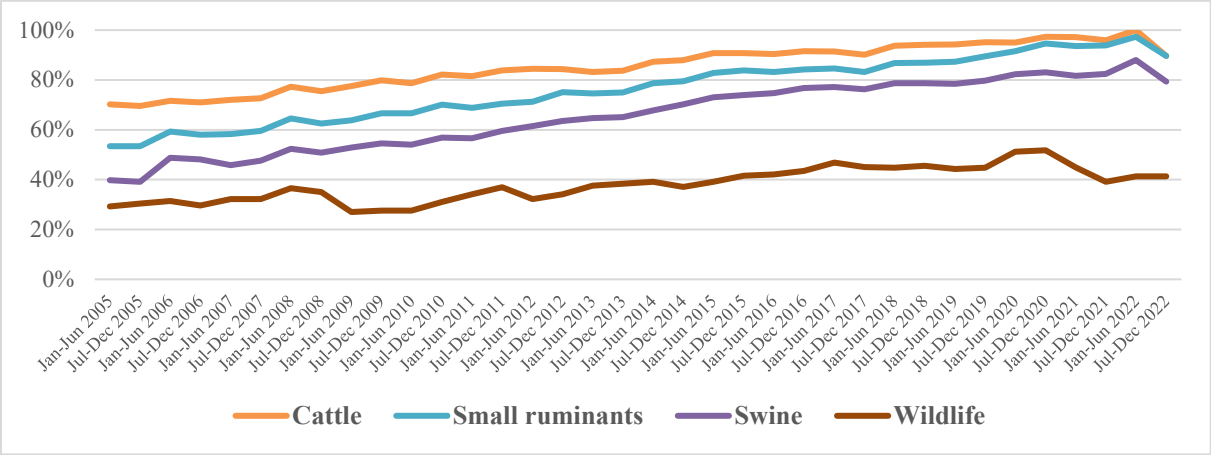


For FMD, the global strategy focuses on susceptible livestock, while recognising the epidemiological role of wildlife in some areas, such as southern Africa. In all countries, the case of wildlife has to be addressed in PCP-FMD Stages 4 and 5. The percentage of Members reporting surveillance activities among those that submitted reports for each semester is shown in Figure 9. For the three livestock animal groups considered in the analysis (cattle, small ruminants, and swine), the percentage increased very steadily between 2005 and 2022, approaching 100% for cattle and small ruminants and around 80% for pigs by the first semester of 2022. For cattle (the animal group with the highest percentages observed during the analysis period), the percentage increased from 70% in the first half of 2005 to 94% in 2018 and remained above 95% in subsequent years. For small ruminants, the percentage increased from 53% in the first half of 2005 to 87% in 2018 and remained above 90% in subsequent years. Finally, for swine, the percentage increased from 40% in the first half of 2005 to 79% in 2018 and remained above 80% in subsequent years. The decreases for the three groups in the second half of 2022 are likely

[17] WOAH Wildlife Health Framework, https://www.woah.org/fileadmin/Home/eng/Internationa_Standard_Setting/docs/pdf/WGWildlife/A_Wildlifehealth_conceptnote.pdf

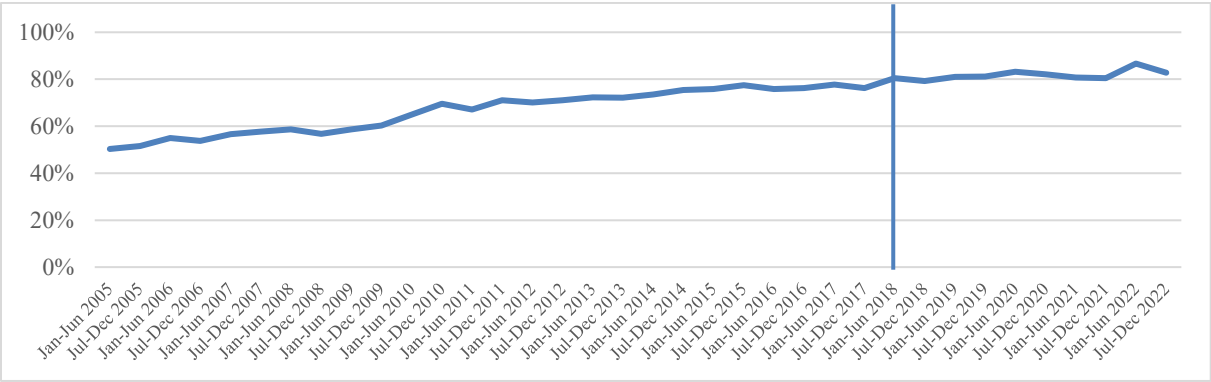
biased due to the low number of reports that WOAH had received from its Members for this semester, as of 26 March 2023. For wildlife, the percentage also increased, but more slowly, from 29% in the first half of 2005 to over 40% in 2018 and subsequent years.

Figure 9. Percentage of reporting Members declaring surveillance activities for FMD, by animal group (2005-2022) *(the vertical line indicates the year of publication of the FMD global strategy)*



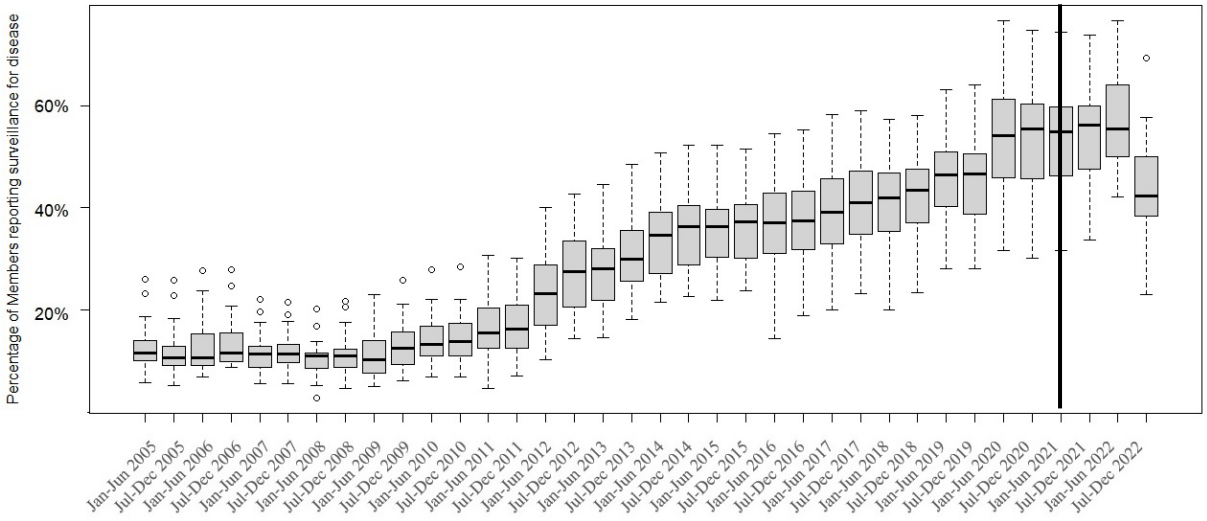
The Global Strategic Plan to end human deaths from dog-mediated rabies ('Zero by 30') emphasises the importance of surveillance for rabies in animals, primarily dogs. The percentage of reporting Members declaring surveillance activities in domestic dogs for each semester is shown in Figure 10. This percentage has steadily increased from 50% in the first half of 2005 to 80% in 2018 and remained stable in subsequent years. While this trend and the results of the past few years seem encouraging, the reality is that, globally, rabies is still massively underreported for both human and canine cases. While WOAH is able to measure the existence of surveillance implementation in dogs through WAHIS, there are no details regarding interaction between the field and the central level, intersectoral collaboration between public health and animal health for surveillance, and the coverage and effectiveness of surveillance in dogs. WOAH encourages reporting and emphasises the need to consider and improve these aspects in the implementation of surveillance programmes in general.

Figure 10. Percentage of reporting Members declaring surveillance activities for rabies in domestic dogs (2005–2022) *(the vertical line indicates the year of publication of the dog-mediated rabies global strategy)*



Finally, with respect to WOAH's Aquatic Animal Health Strategy, the distribution of the percentages of Members reporting farmed aquatic animal surveillance activities by disease and by semester is presented in Figure 11. An upward trend was observed for the listed aquatic animal diseases. The median increased from 12% in the first half of 2005 to over 55% in the second half of 2021 and the first half of 2022. The decrease in the second half of 2022 is likely biased due to the low number of reports that WOAH had received from its Members for this semester, as of 26 March 2023.WOAH is working on updating the standards in the *Aquatic Animal Health Code* (*Aquatic Code*) and the *Manual of Diagnostic Tests for Aquatic Animals* (*Aquatic Manual*) with the objective of improving surveillance of aquatic animal diseases: In May 2022, 13 revised chapters and eight new chapters were adopted; five new chapters will be proposed for adoption in 2023.

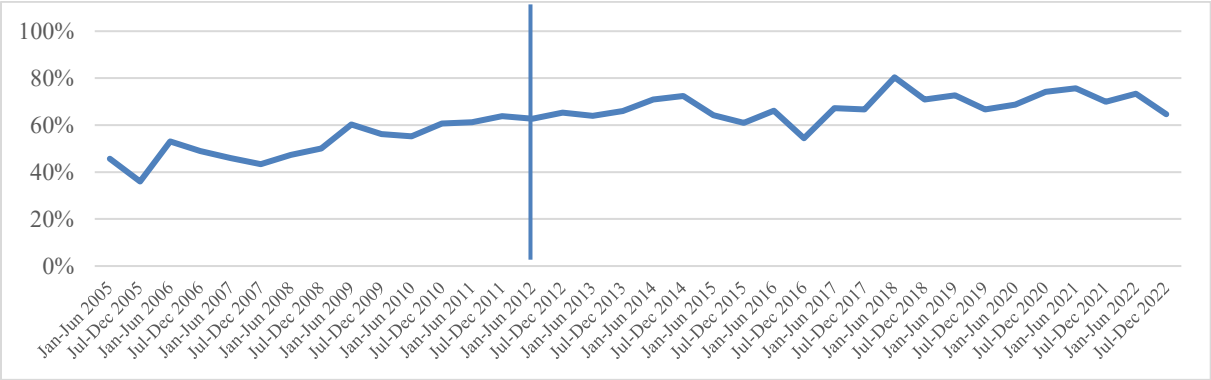
Figure 11. Percentage of reporting Members declaring surveillance activities for listed diseases in farmed aquatic animals (2005–2022) *(the graph shows the distribution of results for all listed aquatic animal diseases, as boxplots. Each boxplot is based on as many values as the number of aquatic animal diseases listed for the semester. For each disease, the percentage of Members reporting surveillance activities was calculated. Each boxplot shows the distribution of these values, and the median value. The vertical line indicates the year of publication of the Aquatic Animal Health Strategy.)*



2.2 Pathogen typing

To achieve appropriate disease control, pathogen typing is important for some strategies. For FMD, typing of circulating viruses is critically important for tailoring control strategies, and the identification of circulating virus types is addressed in Stage 1 of the PCP. The trend in the percentage of Members reporting FMD serotype information among those reporting the disease as present through WAHIS is shown in Figure 12. The percentage increased from about 40% in 2005 to over 70% in 2018. The percentage then fluctuated between 65% and 76% between 2019 and 2022. During the past five years, Members that did not provide serotype information were mainly located in Africa (N = 23), Asia (N = 7) and Middle East (N=4). The importance of monitoring FMD serotypes is further highlighted by the statistics on the number of Immediate notifications (INs) received by WOAH on the occurrence of new FMD strains in different countries, with a peak of reports received in 2009 (and 48 INs received since 2005). In 2023 (as of 26 March), Iraq, Jordan and Türkiye reported the first occurrence of SAT2, in early January 2023, late January 2023 and March 2023 respectively.

Figure 12. Percentage of Members reporting FMD serotype information among those reporting FMD present (2005–2022) *(the vertical line indicates the year of publication of the FMD global strategy)*



Similarly, virus typing is considered important in the 'episystem' approach to PPR control and eradication. A viral episystem is a set of interconnected host populations capable of maintaining virus circulation and transmission indefinitely[18]. Analysis of the strains detected in an episystem is the best epidemiological tool for delineating systems. Information on PPR genotypes and lineages is not yet available in WAHIS but WOAH is exploring the reporting requirements for pathogen typing in WAHIS. In addition, WOAH encourages the sharing of sequencing data in publicly available databases.

2.3 Access to laboratory diagnostics

Surveillance capacity relies in part on sufficient diagnostic capacity. The percentage of Members reporting diagnostic capacity for the diseases covered in this chapter in their national reference laboratories, through the most recent annual report (year 2019) submitted through WAHIS, is shown in Figure 13. The situation may have changed since then, especially in the case of ASF. FMD was the disease with the highest percentage of Members reporting diagnostic capacity (65%), followed by rabies (60%), ASF (40%), PPR (37%) and listed aquatic animal diseases (30%). Regional disparities were observed. For FMD, the WOAH Regions with the highest capacity were the Middle East and Europe, followed by Asia, the Far East and Oceania, Africa, and the Americas. For rabies, the region with the highest capacity was Europe, followed by the Middle East, Africa, the Americas, and finally Asia, the Far East and Oceania. For ASF, the region with the highest capacity was also Europe, followed by Africa, the Americas, and Asia, the Far East and Oceania, far ahead of the Middle East. For PPR, the region with the highest capacity was the Middle East, followed by Africa, Europe, and Asia, the Far East and Oceania, far ahead of the Americas. For listed aquatic animal diseases, the regions with the highest capacity were the Americas and Europe, followed by Asia, the Far East and Oceania, far ahead of the Middle East and Africa.

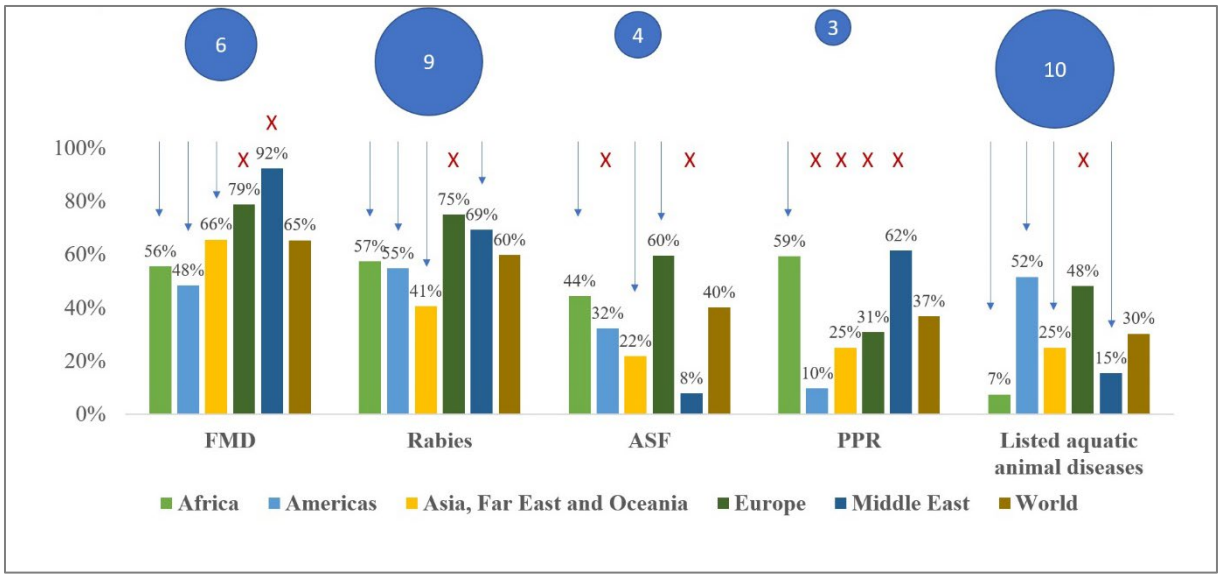
The WOAH Laboratory Twinning Programme has been in place since 2006 and directly supports

[18] Peste des Petits Ruminants Global Eradication Programme II & III: Overview of the plan of action (fao.org)

WOAH's strategy to improve global capacity for disease prevention, detection, and control, through capacity building and networking. The Laboratory Twinning Programme enables WOAH to use its network of Reference Laboratories and Collaborating Centres (referred as Parent institutes) to assist "Candidate" institutes wishing to improve their capacity and scientific expertise. Details of the number of twinning projects on diseases considered in this chapter by each region, as of 26 March 2023, are also presented in Figure 13.

As of 26 March 2023, of all the diseases/group of diseases considered in this chapter, the group of aquatic animal diseases had the highest number of twinning projects (10 projects). While most of the aquatic animal disease projects focused on a single disease, some covered groups of diseases (such as "crustacean diseases") or all aquatic diseases. This is good news, as it is also the disease group with the largest gaps according to the information presented above (only 30% of Members worldwide reported diagnostic capabilities). Overall, the Twinning Programme has been effective in building capacity for all the diseases considered in this chapter over the past decade. However, it is regrettable that there are no candidate laboratories for twinning for certain diseases in the regions where they are most needed (e.g., no candidate laboratories for PPR in Asia, the Far East and Oceania, which is one of the regions with the largest gaps).

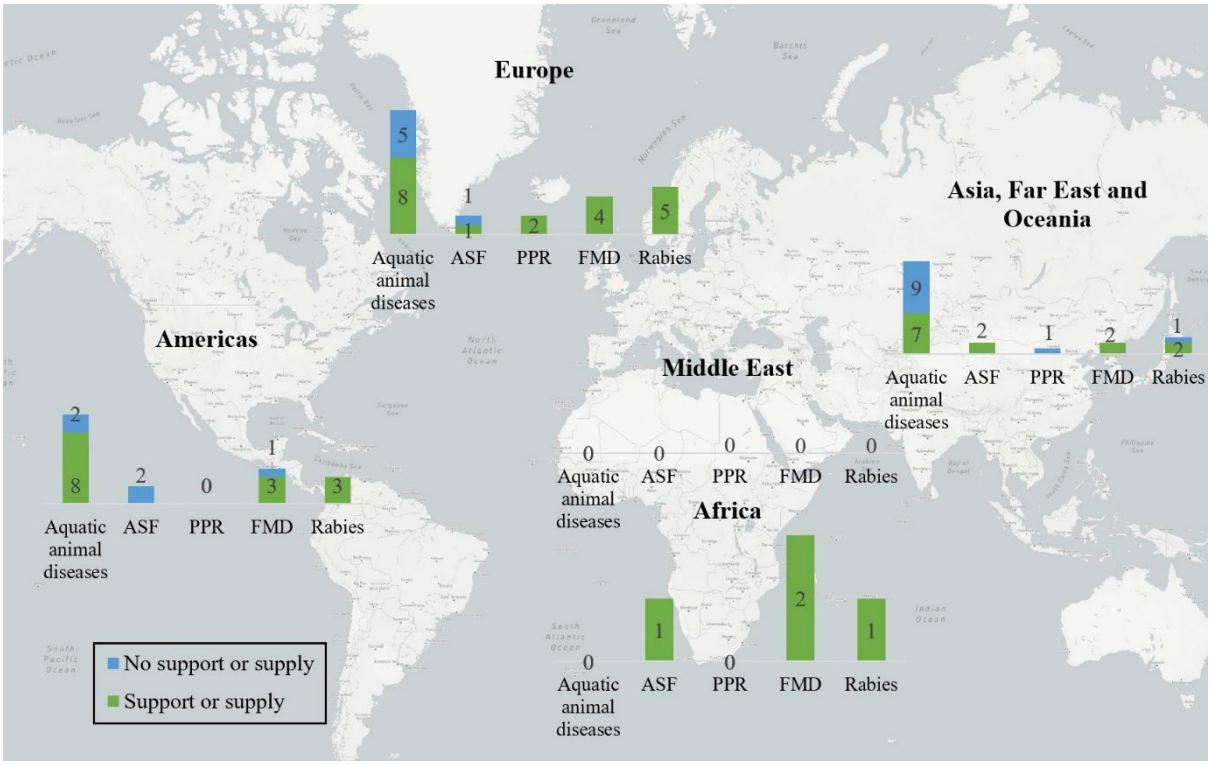
Figure 13. Percentage of Members reporting diagnostic capacity for the diseases covered in this chapter in their national reference laboratories and details of twinning projects implemented on these diseases, as of 26 March 2023 *(Information on national diagnostic capacity was retrieved from the most recent annual reports submitted through WAHIS. The bubbles show the number of twinning projects that have been implemented since 2006 for the diseases of interest, and the arrows indicate the regions where the candidate laboratories were located for these projects. A cross indicates that no candidate laboratories were involved in the region.)*



WOAH Reference Laboratories are designated to pursue all scientific and technical issues related to a given disease. Reference Laboratories also provide scientific and technical training to the personnel of Members and coordinate scientific and technical studies in collaboration with other laboratories or organisations, including through the laboratory twinning programme. The number of WOAH Reference Laboratories, by geographical region and by subject covered in this chapter, is presented in Figure 14. Reference Laboratories are required to send annual reports on their activities to WOAH. Based on the reports received in 2022, the figure differentiates between Reference Laboratories that have supported

Members in diagnosing diseases or provided international standard reference reagents internationally, and those that have not. For ASF, FMD, and rabies, Reference Laboratories are present in four of the five WOAH Regions. The Middle East is the only region without a Reference Laboratory for any of the diseases covered in this chapter. For aquatic animal diseases, Africa is also a region with no Reference Laboratory. For PPR, Reference Laboratories are only present in two regions, Asia, the Far East and Oceania and Europe. As shown in the figure, in 2021 only 70% of the Reference Laboratories considered in the analysis supported Members in diagnosing diseases and/or provided international standard reference reagents internationally.

Figure 14. Number of WOAH Reference Laboratories, by WOAH Region and by selected disease (as of 26 March 2023) - *the figure differentiates between Reference Laboratories that supported Members in diagnosing diseases or provided international standard reference reagents internationally in 2021, and those that did not.*



Reference Laboratory networks exist for most of the strategies considered in this chapter. In their most recent annual reports to WOAH, all Reference Laboratories for ASF, PPR, and rabies indicated that they exchange information with other Reference Laboratories for the same disease. For FMD, 11 out of 12 laboratories did so. As part of the aquatic strategy, WOAH plans to establish a laboratory network dedicated to aquatic diseases.

3. Information sharing between Members

The prevention and control of transboundary animal diseases is complex and requires the collaboration of many stakeholders and disciplines. Actions of Members are key in these collaborative global efforts, notably in terms of information sharing. This section therefore describes how Members have been sharing disease occurrence information over the years, in terms of timeliness and exhaustiveness, through the tools provided by WOAH.

In accordance with Chapter 1.1. of the *Terrestrial Animal Health Code* (*Terrestrial Code*) and *Aquatic Animal Health Code*, WOAH Members are required to submit an immediate notification for any of the exceptional events of listed diseases described in the aforementioned *Codes*, within 24 hours of confirmation of the event. Considering the current dynamics of the diseases presented in the previous section, the timely submission of immediate notifications after disease confirmation is very important to avoid uncontrolled disease spread at national, regional, and international level. Figures 15 and 16 present the time taken by Members to submit a notification after disease confirmation (submission time – ST) since 2005. Each ST trend was statistically tested using the Sen's estimator.

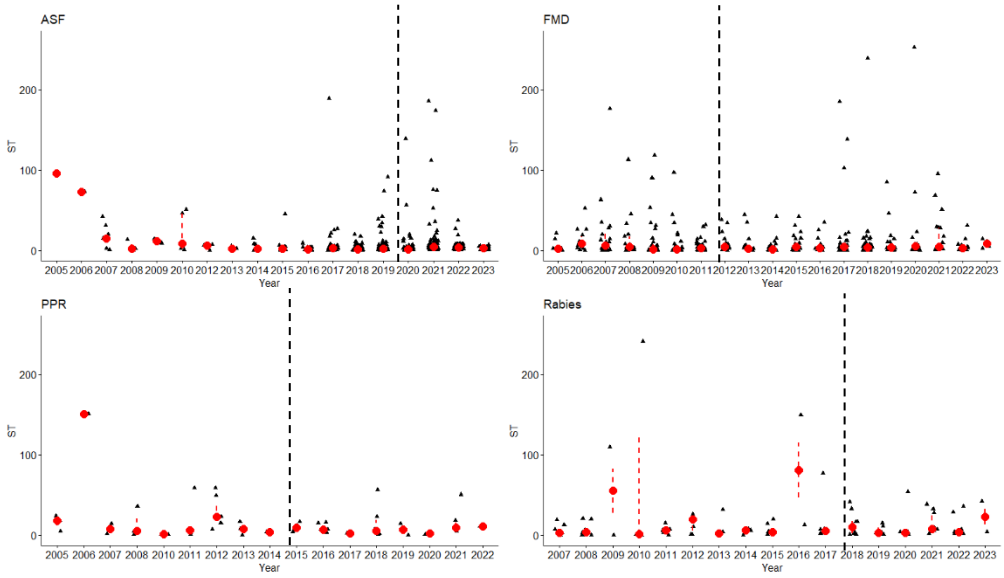
The median ST to report an ASF event to WOAH after confirmation was 2.6 days (first quartile = 1; third quartile = 5). Figure 15 shows a progressive increase of the ST since 2007. This increase was statistically significant. Considerable variability in ST can be observed in recent years (i.e., since 2017), with countries taking from 0 to more than 150 days to report an event after confirmation.

The median STs for other targeted terrestrial diseases were as follows:

- FMD: 3 days (first quartile = 1; third quartile = 10)
- PPR: 7 days (first quartile = 3; third quartile = 17)
- Rabies: 4.1 days (first quartile = 1.5; third quartile = 17).

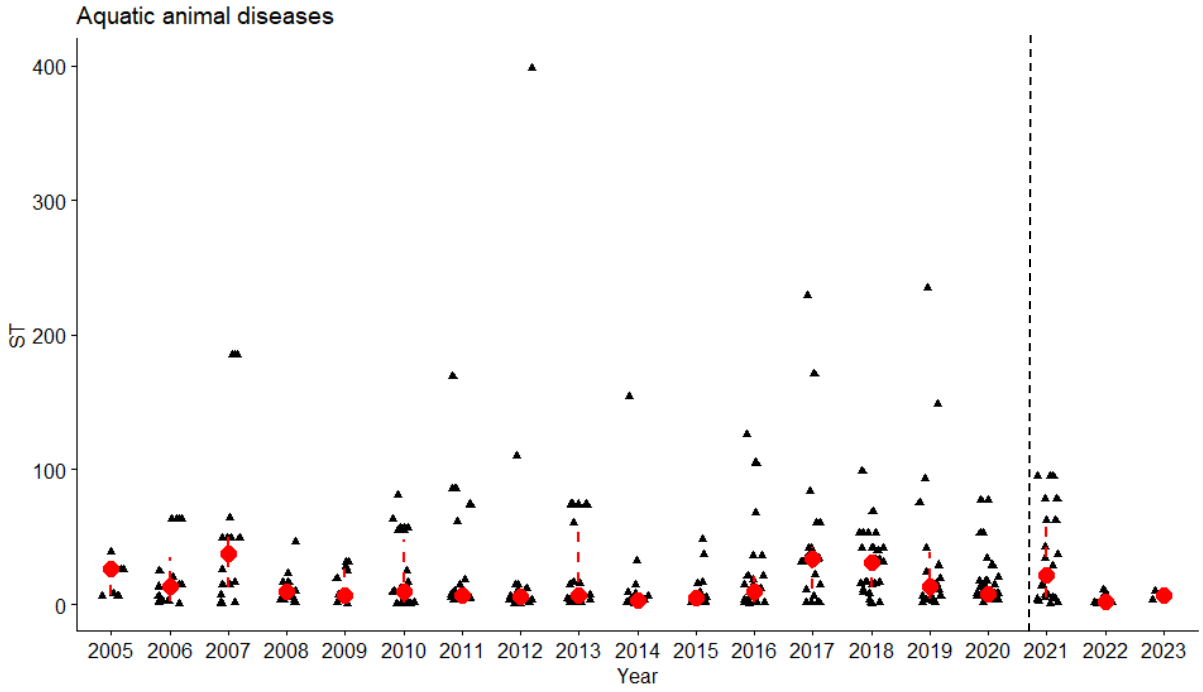
Figure 15 shows quite a stable situation for these three diseases in terms of ST values during the whole period (confirmed with the statistical test), with large variability (Members taking up to a maximum of 250 days to report an FMD event after confirmation, up to a maximum of 150 days for a PPR event, and a maximum of almost 250 days for a rabies event).

Figure 15. Distribution of ST values (days) for ASF, FMD, PPR and rabies during the period 2005 – 2023 (as of 26 March) *(Red dots represent the median ST, while the dashed red lines represent interquartile range Q1 – Q3. Single values are represented by the black triangles. The vertical dashed black lines show the year of publication of each global strategy.)*



The median ST to report an aquatic animal disease event to WOAH after confirmation was 10 days (first quartile = 3; third quartile = 33.0). Figure 16 shows quite a stable situation in the distribution of STs throughout the period (confirmed by the statistical test) and very large variability (maximum delay in submitting a report after confirmation of 398 days).

Figure 16. Distribution of ST values (days) for aquatic animal diseases during the period 2005–2023 (as of 26 March) *(Red dots represent the median ST, while the dashed red lines represent interquartile range Q1 – Q3. Single values are represented by the black triangles. The vertical dashed line indicates the year of publication of the global strategy.)*



Gaps in compliance with the requirement for timely submission of immediate notifications may occur for various reasons, including lack of proper communication at country level among diagnostic laboratories, local and central Veterinary Services/Aquatic Animal health Services, technical delays in filing the information in WAHIS, lack of capacity, or a lack of country transparency.

To address some of the reporting gaps, in 2002 WOAH established active search activities[19] to track non-official information, rumours, and signals relating to animal health and public health events around the world. A total of 170 000 signals of relevance for WOAH and Members were captured by this activity in 2022 and were verified in an automated manner. All this information was used to follow-up with the countries concerned in the event of any discrepancies being observed with the official information reported to WOAH. The impact of this activity is seen primarily in an improved capacity of WOAH and its Members to be aware of any unofficial information related to WOAH-listed diseases but also of other potential animal and public health threats. Both these factors (improved awareness for WOAH and for its Members) could lead to improvements in reporting transparency, by giving WOAH greater capacity to follow-up on unreported events and Members better reactivity in complying with their reporting

[19] WOAH active search for unofficial animal health information - https://www.woah.org/en/what-we-do/animal-health-and-welfare/disease-data-collection/active-search/

obligations. Six percent of all the immediate notifications submitted in 2021 and three percent of those submitted in 2022 were submitted after communications between WOAH and Members as a result of this active tracking activity. In previous years, between 2017 and 2020, this percentage ranged between 6% and 18%. In terms of communication with Members, ASF (N=16), FMD (N=4), PPR (N=1), and rabies (N= 1) accounted for 31% (22/71) of the news items that resulted in a contact with Members for the purpose of clarifications and potential official notifications. Only one aquatic animal disease (koi herpesvirus) signal was followed up with Members.

For rabies, another challenge is intersectoral collaboration on disease detection and reporting. Human rabies data are collected by human health authorities, whereas animal rabies data are often collected by veterinary authorities. This results in constraints to data sharing, and the development of overlapping guidance documents and data definitions, resulting in confusion over which data to collect and report. To address these challenges, the United Against Rabies Forum has developed a 'Minimal Data Elements' document[20], which provides details of the essential data elements needed to track progress towards the goal of 'Zero by 30'. The document also provides consistent case definitions and data elements that align with international standards published by WOAH and WHO. National authorities are encouraged to use this guide to adopt globally standardised data definitions, improve in-country rabies data collection, and submit data to the WHO Global Health Observatory and WAHIS.

4. Selected key control tools – vaccination, biosecurity/movement control

This section describes the current situation and provides a summary of the historical trends (2005–2022) regarding the relevant preventive and control tools for disease control and eradication reported in WAHIS six-monthly reports: in particular, the section focuses on the reporting of official vaccination and the application of biosecurity measures (movement control inside the country, precautions at borders, zoning).

4.1 Vaccination

Veterinary vaccines, when associated with other measures, have proven to be powerful tools to prevent, control, and eradicate animal diseases. Vaccines differ from other veterinary products in many ways and must be given special consideration during their purchase. For example, most vaccines are temperature-sensitive, which means that the reliability and adequacy of cold chain capacity is critical throughout the supply chain to ensure that the vaccines are effective in the field. Vaccine 'quality', as demonstrated by meeting WOAH standards as defined in the *Manual of Diagnostic Tests and Vaccines for Terrestrial Animals* (*Terrestrial Manual*), should always be the first criterion to be considered. It is worth highlighting that most of the current WOAH control and eradication strategies for terrestrial animal diseases rely heavily on the use of vaccination campaigns.

To limit the impact of FMD, in particular in endemic countries, adequate supplies of vaccines are required. The vaccines used should meet WOAH standards of potency and safety. In these countries, FMD vaccination is usually limited to dairy cattle and buffaloes and/or ring vaccination during outbreaks. The FMD Global Strategy requires an increased production of vaccine as well as effective delivery systems. Typically, the cost of vaccines and vaccination represents over 90% of the total cost of FMD control, so it is essential to plan and evaluate vaccine and vaccination effectiveness to convince decision-makers, including the most important – farmers – to maintain rigorous vaccination efforts. To

[20] United Against Rabies Forum, Minimum Data Elements, https://www.unitedagainstrabies.org/uar-best-practice/minimum-data-elements/

this end, FAO and WOAH have developed and published the Foot and mouth disease vaccination and post-vaccination monitoring Guidelines[21]. In accordance with the *Terrestrial Manual*, inactivated virus vaccines of varying composition are available commercially. Many FMD vaccines are multivalent to provide protection against the different serotypes, or to accommodate antigenic diversity likely to be encountered in a given field situation.

PPR vaccination is also identified as a key tool for successful disease eradication. Lessons learned from the Global Rinderpest Eradication Programme demonstrate that the use of a highly efficacious rinderpest vaccine capable of immunising animals against all rinderpest virus strains was a vital contributor to the campaign's success. Similarly, efficient PPR vaccines are available and can induce life-long protective immunity in vaccinated animals. The availability of thermostable vaccine for PPR is another key element in favour of a successful application of the vaccination strategy for disease eradication. Vaccination is thus one of the key tools for controlling PPR and has been identified as the main option in Stage 2 'Control' and Stage 3 'Eradication', of the Global Strategy for the Control and Eradication of PPR. According to the *Terrestrial Manual*, effective live attenuated PPR virus vaccines are widely available. Since the global eradication of rinderpest, the use of rinderpest vaccines to protect against PPR is prohibited[22].

Finally, vaccination is one of the key components of a successful national control programme for dog-mediated rabies. The main tool to achieve zero cases of dog-mediated rabies in humans is mass dog vaccination campaigns, with vaccination of at least 70% of dogs in at-risk areas. According to the *Terrestrial Manual*, for rabies vaccination in animals, inactivated virus (for companion animals and livestock), live attenuated virus (for wildlife and free-roaming dogs), or recombinant vaccines (for wildlife, cats, and dogs) are used[23].

4.1.1 Trends in Members' implementation of official vaccination for selected diseases

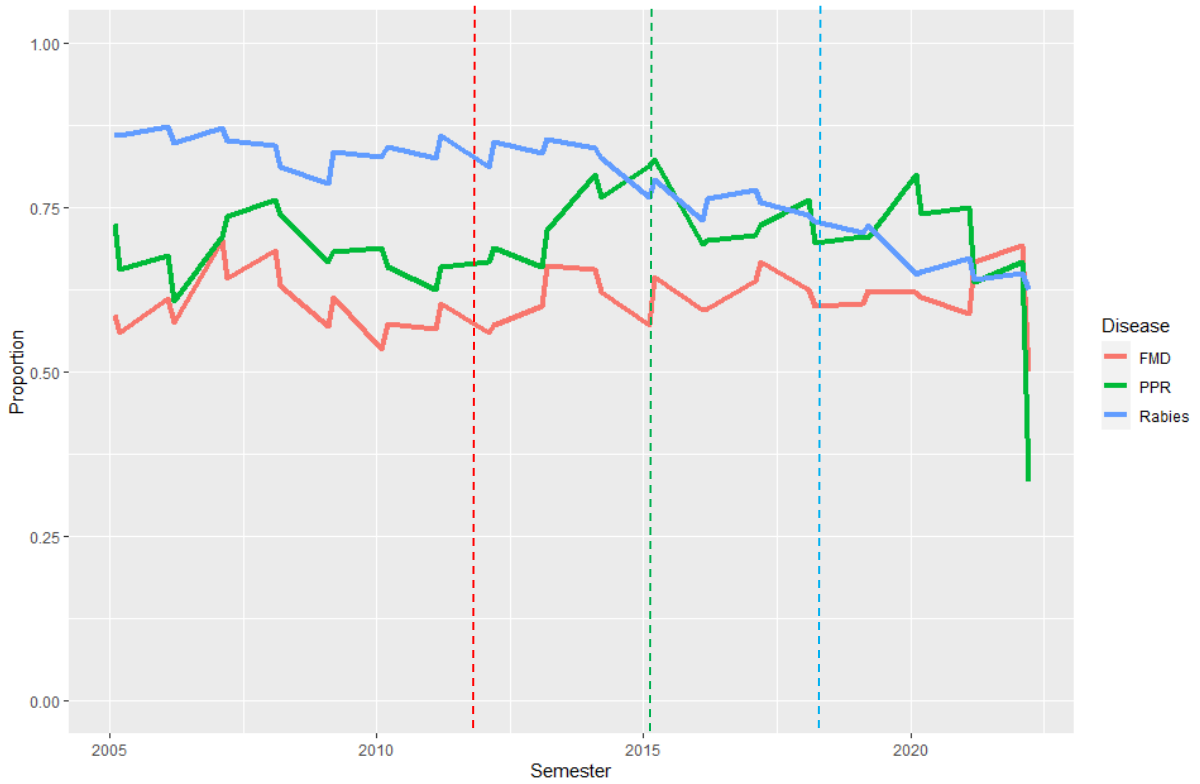
For the purposes of this section, trends in the percentage of affected Members having reported the implementation of official vaccination for the selected diseases were analysed. Data on the implementation of official vaccination was derived from the information reported through six-monthly reports by Members during the period 2005–2022. The trends were statistically tested using the Sen's estimator. A summary of the vaccination situation for the selected diseases is reported in Table 3 and Figure 17.

[21] https://www.fao.org/3/i5975e/I5975E.pdf
[22] https://www.woah.org/fileadmin/Home/eng/Health_standards/tahm/3.08.09_PPR.pdf
[23] https://www.woah.org/fileadmin/Home/eng/Health_standards/tahm/3.01.18_RABIES.pdf

Table 3. Summary statistics on official vaccination activity for the selected diseases, average percentage of affected Members reporting official vaccination; comments; and significance of the trend

Disease	Average percentage of affected Members reporting official vaccination	Comments	Significance
FMD	61%	Trend stable, an increase up to around 70% in recent years	Not statistically significant
PPR	70%	Stable trend with a peak in 2015 (82%)	Not statistically significant
Rabies	78%	Progressive reduction (85% to 62%)	Downward trend, statistically significant

Figure 17. Proportion of affected Members reporting official vaccination for FMD, PPR, and rabies (2005–2022) *(the vertical dashed lines indicate the year of publication of each global strategy)*



4.1.2 WOAH vaccine banks to support the vaccination activities of Members in need

In 2006, WOAH set up its first regional vaccine bank of avian influenza vaccines in Africa and in 2007 enlarged the vaccine bank to include Asian countries. In the following years, WOAH's vaccine banks expanded to include other diseases, adding FMD and rabies (vaccination of dogs). The WOAH vaccine bank for FMD was created in 2011 and the rabies vaccine bank in 2012. In 2013, a PPR vaccine bank was established to provide vaccines to eligible African countries.

Vaccine banks ensure the procurement of high-quality vaccines manufactured in line with WOAH international standards and delivered in a timely manner. The use of the vaccine bank mechanism

encourages beneficiary countries to act and also creates leverage effects when these countries decide to fund animal disease control programmes and implement them efficiently. Vaccine banks enable economies of scale, synergies, and leveraging of results, while contributing to harmonisation and coordination of global and regional control programmes. In addition, they allow for multi-party vaccination campaigns, public–private partnerships and the possible involvement of non-governmental organisations. As of 26 March 2023, two WOAH vaccine banks are active, for rabies and PPR. A summary of key vaccine bank figures is provided in Table 4 (situation as of December 2022).

Table 4. Key figures on the WOAH vaccine banks for FMD, PPR, and rabies

Vaccine bank	Year started	Number of doses delivered	Targeted regions
FMD*	2011	8.1 million	Africa
PPR	2012	91.6 million	Africa
Rabies	2013	27.1 million	Africa and Asia

*Vaccine bank no longer active

4.1.3 Improper use of vaccination and use of low-quality vaccines

Access to and use of high-quality vaccines is crucial to ensuring the efficacy and effectiveness of vaccination programmes. Governments are expected to provide appropriate regulations on the authorisation, manufacturing, distribution, and use of veterinary products (including vaccines) through their veterinary legislation. These regulations ensure effective and sustainable animal disease control while minimising risks to both humans and animals. In this context, WOAH develops international standards, guidelines, and recommendations for veterinary products. A reference for terrestrial animal disease vaccines can be found in the *Terrestrial Manual.* The *Aquatic Manual* contains information on the limited number of available and effective vaccines for aquatic animal diseases.

WOAH also provides permanent support to Veterinary Services and laboratories to enable Members to implement its international standards, guidelines, and recommendations. The importance of developing and implementing high-quality vaccines is highlighted by the example of ASF vaccines. While the development of ASF vaccines is ongoing, with promising candidates being trialled, Members are reminded that at the time of writing, there is no ASF vaccine with proven effectiveness and safety that has been authorised for production and commercial sale. The use of unauthorised vaccines without rigorous efficacy and safety testing poses significant risks to pig herds and may lead to the circulation of novel, low virulence strains of ASF virus (ASFV) and long-term persistence in the pig population. To address the gap in international consensus on key vaccine performance and quality parameters and guide national authorities in the registration process for ASF vaccines, WOAH is working with partners to facilitate the creation of internationally acceptable guidelines for the manufacture and development of safe and efficacious vaccines. These guidelines will be presented to the Biological Standards Commission and serve as a precursor for future development of standards in the *Terrestrial Manual*.

Members are encouraged to refer to the to-be-soon-published guidelines for the national procurement of veterinary vaccines, for further details on vaccine procurement.

4.1.4 Case study: PPR, accessible thermotolerant vaccines and application in PRAPS countries.

A good example of PPR vaccination implementation is the eradication project in PRAPS (Regional Sahel Pastoralism Support Project[24]) countries[25]. This eradication project covers six Sahel countries (Senegal, Mauritania, Mali, Burkina Faso, Niger, and Chad) and includes five components. Component 1 "Improving animal health" aims to support key national and regional efforts to build more sustainable and effective national Veterinary Services with a specific focus on the provision of local animal health services in remote pastoral areas and focusing on the control of two priority diseases, PPR and contagious bovine pleuropneumonia (CBPP).

The PPR vaccination has increased in most PRAPS countries, with 188 million vaccine doses distributed between 2016 and 2022 and 32.2 million vaccine doses in 2022, the WOAH PPR vaccine bank has been instrumental to support the supply of large quantities of quality vaccines.

However, despite significant progress has been made since the start of the PRAPS project, significant challenges to control PPR include traceability/identification of small ruminants, the effectiveness of vaccinations, vaccine quality control, and lack of human resources (inadequate level of training and understaffing). Lessons learnt are taken into account in the second phase of the project, the use of PPR thermotolerant vaccines, also included in the renewed WOAH PPR vaccine bank, now enables the efficient vaccination of animals in remote areas and all PRAPS countries have increased awareness of the importance of good vaccination practices (certification of vaccines and control of their quality, sero-monitoring, supervision, etc.).

4.2 Biosecurity/movement control

This second part of the section on key selected control tools focuses on the importance of biosecurity and movement control, whose importance is sometimes underestimated. According to the *Terrestrial Code*, biosecurity "means a set of management and physical measures designed to reduce the risk of introduction, establishment and spread of animal diseases, infections or infestations to, from and within an animal population". In the context of diseases with global control/eradication plans, the application of proper biosecurity measures allows Members to effectively reduce the risk of disease spread and increase the probability of disease control and eradication. One of the important measures included under this definition is movement control (of animals and animal products). In 2021 a new *Aquatic Code* chapter (4.1) on Biosecurity for Aquaculture Establishments was adopted. The purpose of the chapter is to "provide recommendations on the development and implementation of biosecurity measures

[24] https://rr-africa.woah.org/en/projects/praps_en/
[25] Project funded by the World Bank

primarily to mitigate the risk of the introduction of specific pathogenic agents into aquaculture establishments, and if pathogenic agents are introduced, to mitigate the risk of further spread within, or release from, the aquaculture establishment".

In this section, trends related to reporting of three selected measures in affected Members are described and statistically tested using the Sen's estimator. A summary of the statistical tests is presented in the section.

4.2.1 Statistics on application of movement control

This subsection presents statistics on movement control for the selected terrestrial (ASF, FMD, PPR and rabies) and aquatic diseases (koi herpesvirus selected as a representative of an aquatic disease with global presence). In particular, the subsection analyses data reported on "movement control inside the country" and "precaution at borders". "Movement control inside the country" is defined in the WOAH notification guidelines as "Measures aimed at avoiding the spread of the disease, infection or infestation within a country/zone/compartment due to the movement of animals or their products". The trend and summary statistics for the percentage of Members reporting the selected diseases as present that declared movement control inside the country for domestic animals during the period 2005–2022 are presented in Table 5 and Figures 18 and 19.

Table 5. Summary statistics on application of movement control for the selected diseases, average percentage of affected Members that reported the control measure; comments; and significance of the trend

Disease	Average percentage of affected Members reporting movement control	Comments	Significance
ASF	74%	Increasing trend since 2005	Significant increase
FMD	72%	Application of this control measure was quite stable until recent years	Significant increase
PPR	44%	Progressive increase observed throughout the years up to around 60% of the Members	Significant increase
Rabies	39%	Slightly increasing trend in the application of this control measure	Significant increase
Koi herpesvirus	52%	Increasing trend, with a peak (68%) reached in 2018	Significant increase

Figure 18. Proportion of affected Members that declared movement control inside the country for ASF, FMD, PPR, and rabies (2005–2022) *(the vertical dashed lines indicate the year of publication of each global strategy)*

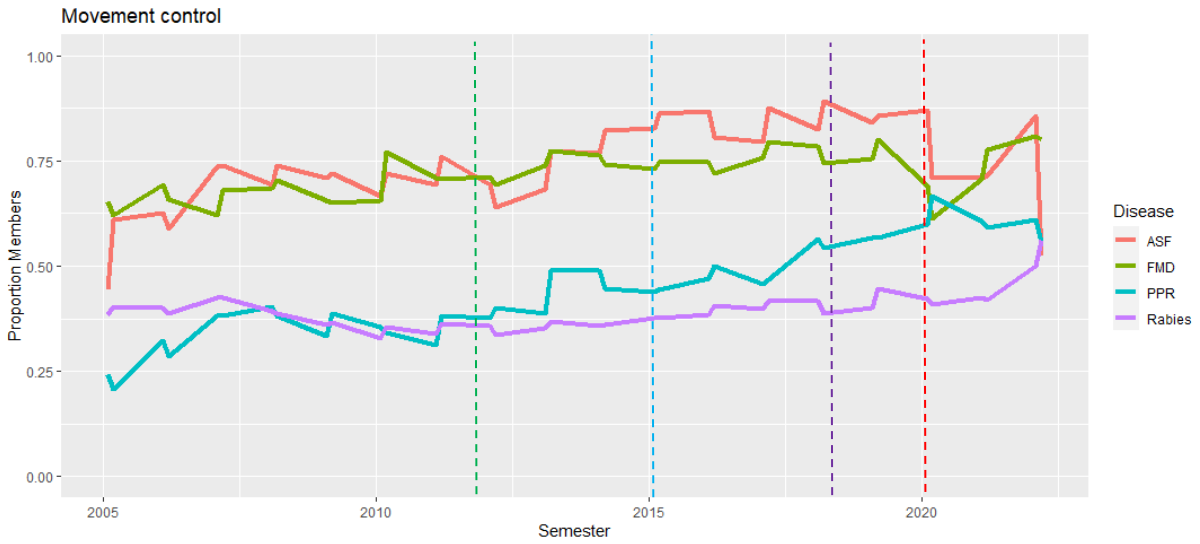
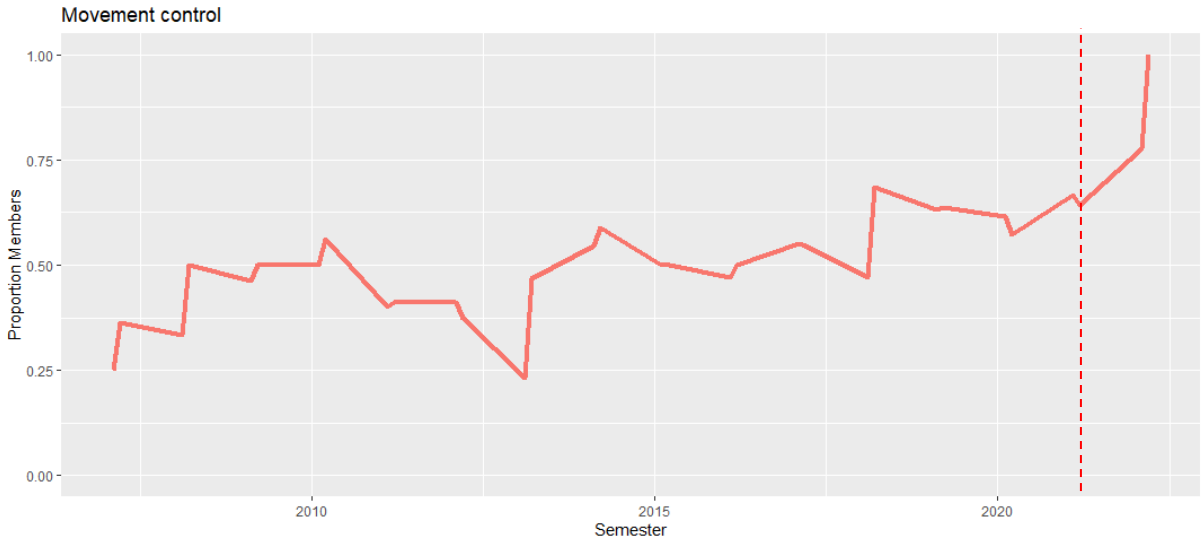


Figure 19. Proportion of affected Members declaring movement control inside the country for koi herpesvirus (2005–2022) *(the vertical dashed line indicates the year of publication of the Aquatic Animal Health Strategy)*



4.2.2 Statistics on Members' application of precautions at borders

"Precautions at borders" is defined in the WOAH notification guidelines as "Measures applied at airports, ports, railway stations, or road checkpoints open to international movement of animals, animal products and other related commodities, where import inspections are performed to prevent introduction of the disease, infection or infestation into a country/territory or zone."

The trend and summary statistics of the percentage of Members free from the disease in question reporting precautions at borders for domestic animals during the period 2005–2022 is presented in Table 6 and Figures 20 and 21.

Table 6. Summary statistics on application of precautions at borders for the selected diseases, average percentage of Members free from the disease in question that reported the control measure; comments; and significance of the trend

Disease	Average percentage of Members free from the disease reporting precautions at borders	Comments	Significance
ASF	66%	Trend stable until 2013, then a progressive increase	Significant increase
FMD	89%	Progressive and steady increase since 2005	Significant increase
PPR	81%	Progressive and steady increase since 2005 and up to 90% in recent years	Significant increase
Rabies	77%	Progressive and steady increase since 2005 and up to 80% in recent years	Significant increase
Koi herpesvirus	48%	Increasing trend up to 66% in recent years	Significant increase

Figure 20. Proportion of Members free from the disease that declared precautions at borders in domestic animals for ASF, FMD, PPR, and rabies (2005–2022) *(the vertical dashed lines indicate the year of publication of each global strategy)*

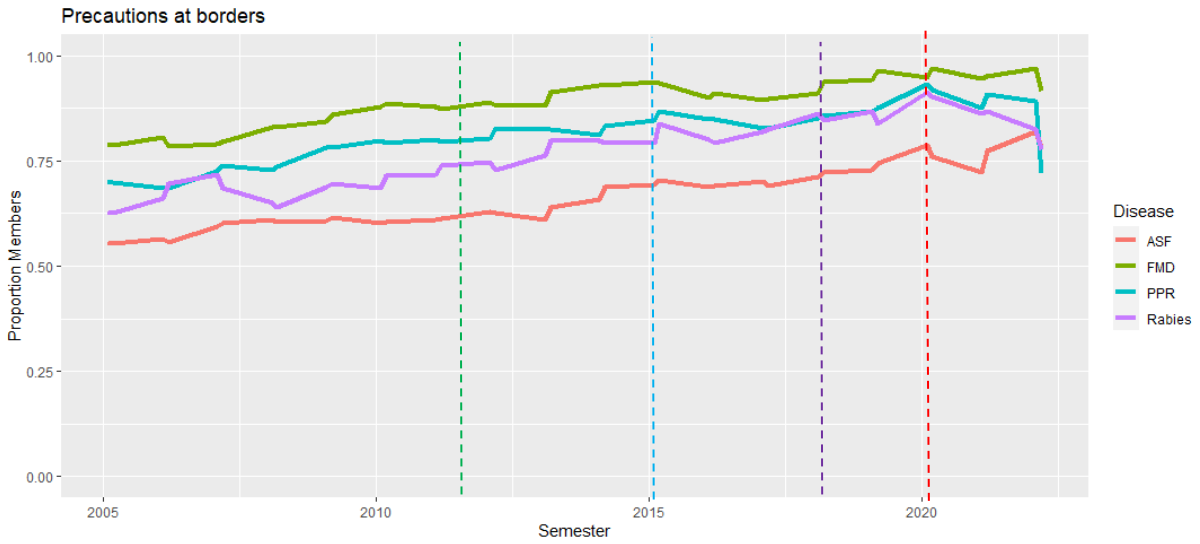
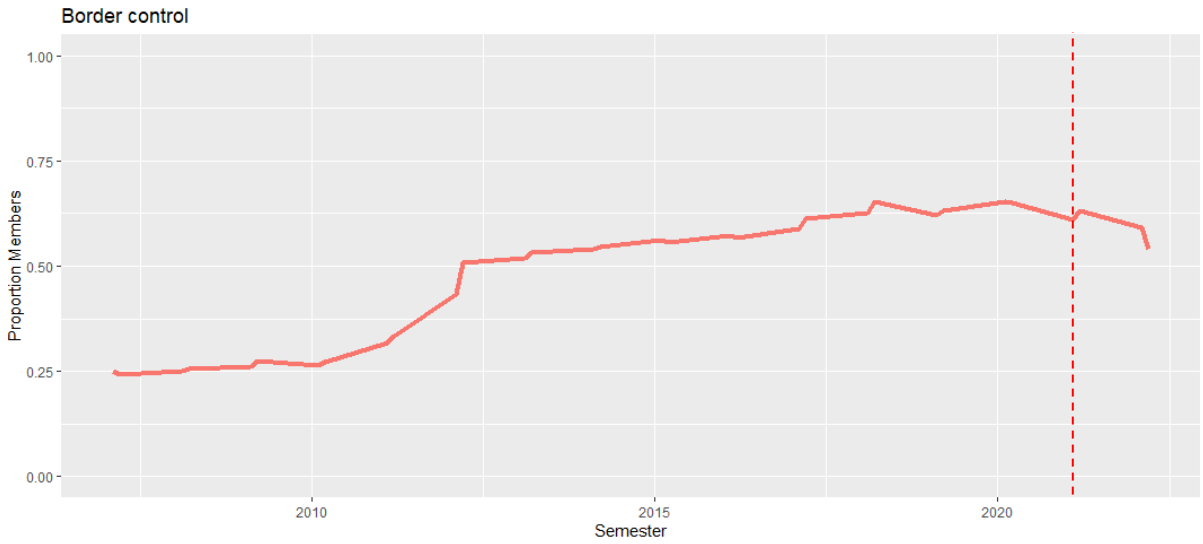


Figure 21. Proportion of Members free from the disease that declared precautions at borders in domestic animals for koi herpesvirus (2005–2022) *(the vertical dashed line indicates the year of publication of the Aquatic Animal Health Strategy)*



4.2.3 Statistics on implementation of zoning

Zoning is a measure to prevent disease incursion and enable animal disease control. This measure can limit the disruption of international/regional trade in the event of introduction of a disease in a given territory. Zones may be recognised through bilateral agreements between trading partners for the purpose of international trade.

For the purpose of six-monthly reports, zoning for terrestrial animal diseases is defined as "Delineation defined by the Veterinary Authority, of part of a country/territory containing an animal population or subpopulation with a specific animal health status with respect to a disease, infection or infestation for which required surveillance, control and biosecurity measures have been applied for the purposes of international trade or disease prevention and control, under the provisions of Chapter 4.4. of the *Terrestrial Code*".

The purpose of this subsection of the report is to provide information on the current status of implementation (and the trends over time) of zoning in Members affected by ASF, FMD, PPR, and rabies.

Detailed information on zoning implementation is provided in Table 7 and Figures 22 and 23 below. The trends are described and tested using the Sen's estimator.

Table 7. Summary statistics on implementation of zoning for the selected diseases, average percentage of affected Members that reported implementation of zoning; comments; and significance of the trend

Disease	Average percentage of affected Members reporting zoning	Comments	Significance
ASF	17%	Progressive increasing trend with a peak of around 30% in recent years	Significant increase
FMD	35%	Progressive increase since 2005	Significant increase
PPR	16%	Very low percentage of Members applying this control measure, barely reaching 18%	Significant increase
Rabies	12%	Very low percentage of Members applying this control measure. Slight increase since 2009	Significant increase
Koi herpesvirus	10%	Slight increase over the period but in general, very few Members declaring the application of this control measure.	Significant increase

Figure 22. Percentage of affected Members that declared zoning for ASF, FMD, PPR, and rabies (2005–2022) *(the vertical lines indicate the year of publication of each global strategy)*

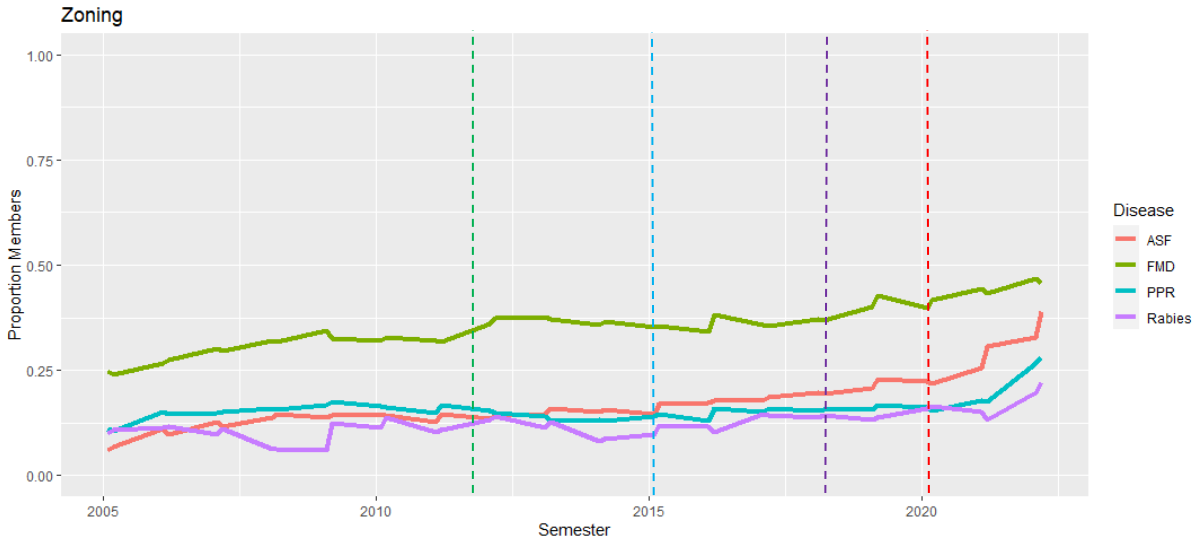
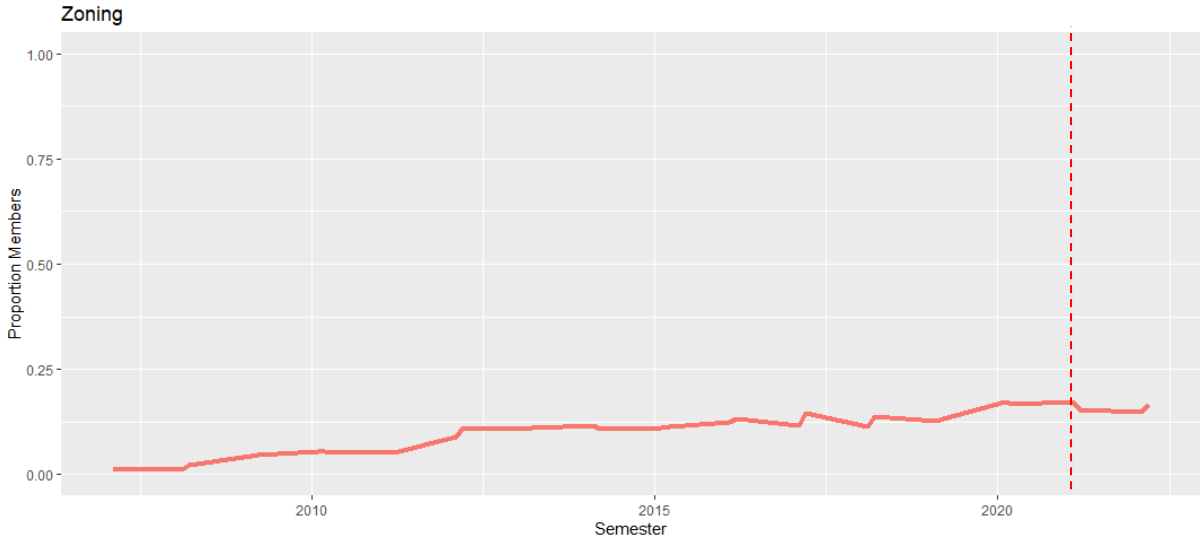


Figure 23. Percentage of affected Members that declared implementation of zoning for koi herpesvirus (2005–2022) *(The vertical line indicates the year of publication of the Aquatic Animal Health Strategy)*

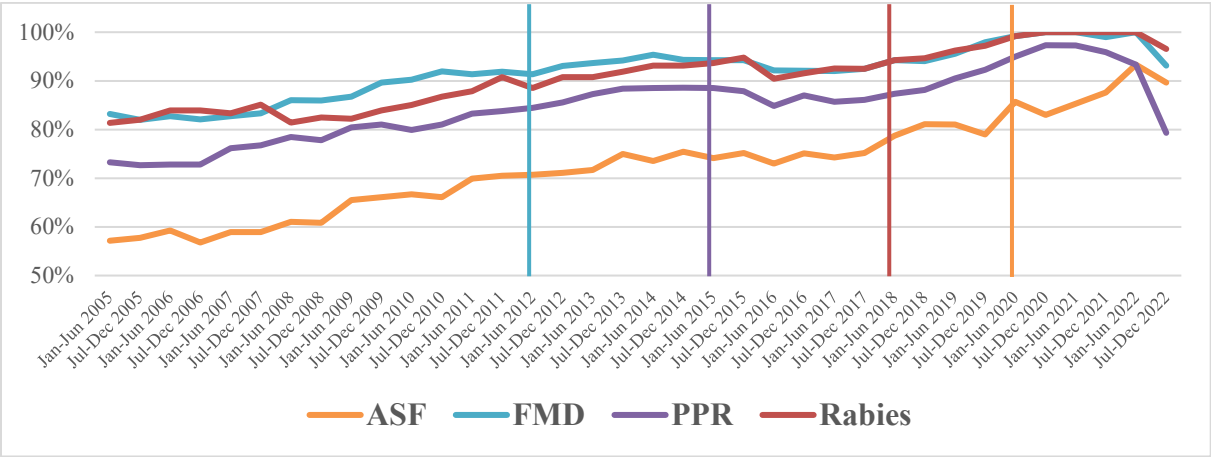


5. Stepwise approach and Members' knowledge of their progress with implementing the strategies

5.1 Legal obligation of national reporting

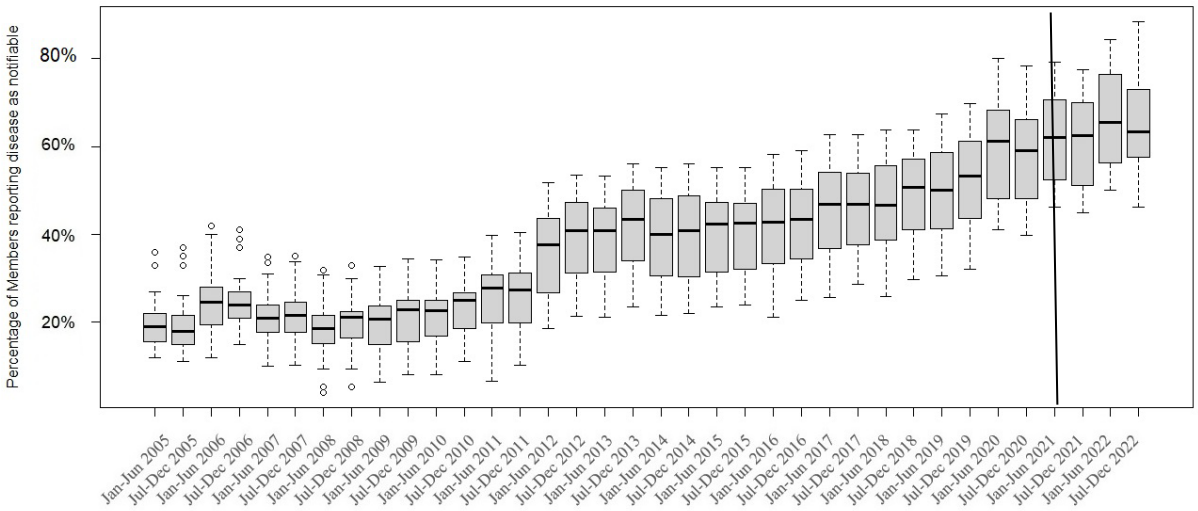
Members are asked to inform WOAH each semester through WAHIS whether each of the listed diseases is notifiable in their country. Analysis of the resulting data provides a first indicator of Members' legal obligations at national level. Having a disease notifiable at national level is the first step towards understanding the national situation with respect to that disease. For each of the four terrestrial animal diseases considered in this chapter, the percentage of Members reporting the disease as notifiable increased between 2005 and 2022 (Figure 24). Specifically, for ASF, the percentage increased from 57% in the first half of 2005 to above 90% in the first half of 2022. For the other three terrestrial animal diseases, the starting point was higher. For FMD, the percentage increased from 83% in the first half of 2005 to 99% in 2020 and subsequent years. For PPR, the percentage increased from 73% in the first half of 2005 to 97% in 2021. For rabies, the percentage increased from 81% in the first half of 2005 to 100% in 2020, 2021 and first semester 2022. The apparent decreases in 2022 (and especially the second half) should be viewed with caution, as they are based on the limited number of reports submitted as of 26 March 2023.

Figure 24. Percentage of reporting Members declaring ASF, FMD, PPR, and rabies as notifiable (2005–2022) *(the vertical lines indicate the year of publication of each global strategy)*



A similar upward trend was observed for listed aquatic animal diseases (Figure 25). The median increased from 19% in the first half of 2005 to 66% in the first half of 2022, with a sudden increase in 2012 most likely due to changes in the reporting process through WAHIS implemented that year[26].

Figure 25. Percentage of reporting Members that declared aquatic animal diseases as notifiable (2005–2022) *(Distribution of results for all listed aquatic animal diseases, as boxplots. Each boxplot is based on as many values as the number of aquatic animal diseases listed for the semester. For each disease, the percentage of Members reporting it as notifiable was calculated. The boxplot shows the distribution of these values, and the median value. The vertical black line indicates the year of publication of the Aquatic Animal Health Strategy.)*



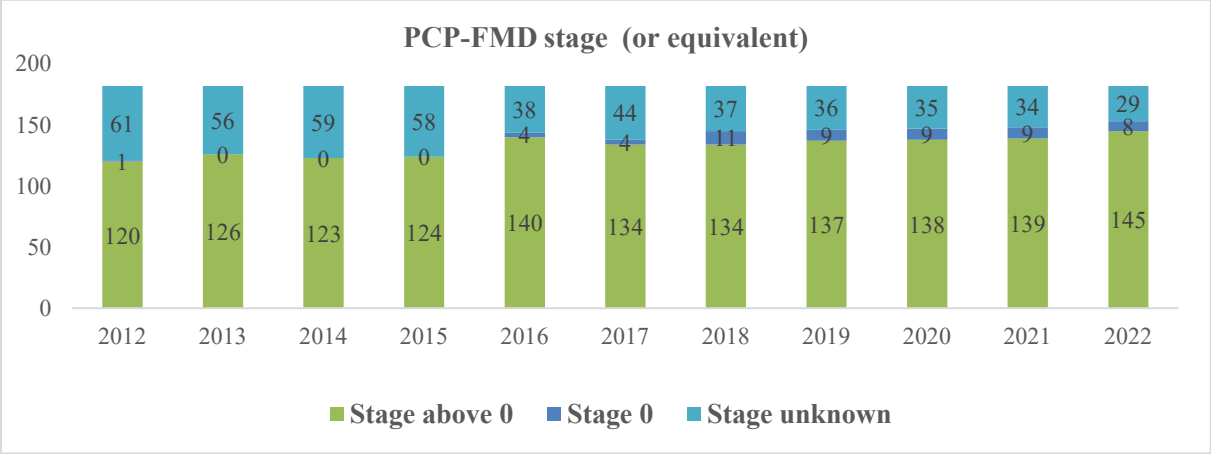
[26] Between 2005 and 2011, terrestrial and aquatic animal disease data were provided through the same six-monthly report. Beginning in 2012, countries and territories were able to provide the information through two separate reports, one for each animal category.

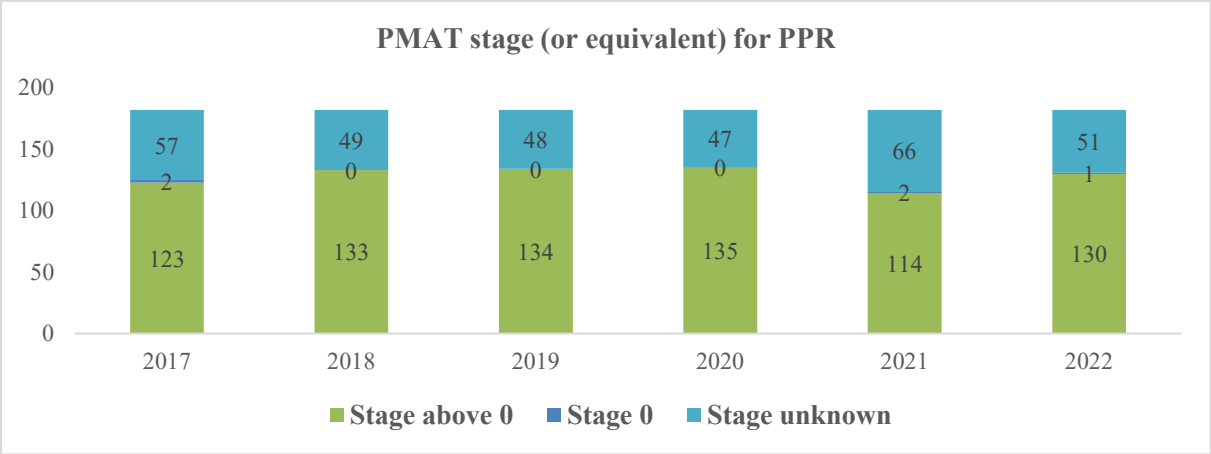
These results suggest that the number of Members having the diseases covered in this chapter as notifiable at national level has increased over time. It is important to note that in the absence of susceptible populations, countries most often consider diseases as non-notifiable (especially in the case of aquatic animal diseases). The results for 2019, 2020, 2021, and 2022 are still partial due to delays in reporting and should therefore be interpreted with caution.

5.2 Stepwise approach proposed by three strategies

This subsection is based on data from three strategies: PCP-FMD, PMAT, and SARE. To assess Members' knowledge of their progression through the strategies, the trend in the number of Members in Stage 0 or equivalent (i.e., disease not controlled, reliable information not available) versus stages above 0 (or equivalent) was analysed. For FMD, stage information has become increasingly available over time. The number of Members staged above 0 increased from 120 in 2012 to 145 in 2022 (Figure 26, top graph). This confirms the conclusions drawn from the results presented above, namely that the number of Members aware of their national FMD situation has increased over time. For PPR, stage information has remained available for most countries since 2017; the number of Members with a stage greater than 0 ranged between 114 (in 2021) and 135 (in 2020) during the period analysed (Figure 26, bottom graph), with no significant increase or decrease over this period. For dog-mediated human rabies, during the period 2016 to 2022 the number of Members for which stage information was available ranged between 22 (in 2016) and 43 (in 2018, when several SARE assessments were conducted), which is still relatively low; there were 28 Members with a stage assessment above 0 in 2022.

Figure 26. Number of Members with stage higher than 0, stage equal to 0, or stage unknown, for FMD (2012-2022) and PPR (2017-2022)





6. Summary and conclusions

Trends in the global disease situation for ASF, FMD, PPR, and rabies: The first section of the chapter focused on trends in the global situation for the selected diseases based on disease occurrence and Members' progression in terms of stages in the application of the respective global strategies. In terms of the percentage of affected Members, the ASF situation has shown a marked deterioration, FMD a stable situation, and PPR has shown a slight deterioration over time. In contrast, the rabies situation has slightly improved over the years (also reflected in the efforts dedicated to controlling and eradicating rabies made by some regions). These trends could be partially masked by the quality of data collected at international level and do not necessarily indicate that international efforts are not producing any effects, as actions may sometimes only show relevant results in a long-term perspective. In addition, this indicator does not take into account the spread of different viral strains for the same disease, which may however be of concern, as for example for FMD. The progression of Members along the PCP-FMD and PMAT stages indicates some degree of improvement in Members' application of the eradication strategy for both FMD and PPR. By 2022, 63% of WOAH Members had achieved the goal of the Global FMD Control Strategy while only 34% of WOAH Members had achieved the goal of the Global strategy for the Control and Eradication of PPR, which shows that there is still room for improvement. For rabies, this section highlighted the poor quality of the data collected on human rabies cases, clearly showing an underestimation and the impossibility of using these data for monitoring purposes.

Surveillance in relevant animal populations: The results show that implementation of surveillance by Members in domestic animals has steadily increased since 2005 for all diseases covered in this chapter, reaching percentages close to 100% of Members in recent years for some diseases, such as FMD and PPR, 80% for ASF and rabies, and 60% for aquatic animal diseases. This can be considered a success. However, the situation regarding Members conducting surveillance in wildlife for ASF, FMD, and PPR is less satisfactory, with percentages around 50% in recent years after years of slow or no progress. It should also be borne in mind that while WOAH is able to measure the existence of surveillance implementation through WAHIS, there are no details regarding interaction between the field and the central level, intersectoral collaboration (if relevant), and surveillance coverage and effectiveness. For example, while almost all Members reported surveillance capacity for FMD, only 70% of Members affected by the disease in recent years were able to report serotype information to WOAH, even though this information is essential for adapting control strategies. The results also showed gaps in the diagnostic capacity of national reference laboratories. Surveillance capacity relies in part on sufficient diagnostic capacity, but the percentage of Members with diagnostic capacity in their national reference laboratories ranged from only 30% to 65%, depending on the disease. The section highlighted two mechanisms that could be useful for countries to improve diagnostic capacity: direct support from Reference Laboratories and capacity building through the WOAH twinning programme. While these mechanisms have had some success (70% of the Reference Laboratories considered in the analysis have assisted Members with diagnosing diseases or provided international standard reference reagents, and the twinning programme has been effective in building capacity over the past decade for all of the diseases considered in this chapter), these mechanisms could be used more extensively to fill the remaining gaps (such as capacity development for PPR in the Asia, the Far East and Oceania Region).

Information sharing between Members: Regarding the reactivity of countries in sending alerts to WOAH after confirmation of exceptional disease events, large differences can be observed among diseases: ASF is the disease with the most timely reporting (median of 2.6 days after confirmation), whereas PPR is the disease with the poorest performance (median of 7 days after confirmation). In addition, this indicator shows a large variability among countries and territories in reporting behaviour, with submission times ranging from zero to more than 250 days after confirmation. Our indicators show a deteriorating trend for ASF with an increase in the time taken to report significant disease events at international level, and this is a concern. The trends were stable for the other diseases covered in this chapter. These data provide useful indicators on where efforts should be focused to understand gaps and barriers to proper reporting. The active search activity conducted by WOAH has been shown to be a useful tool to improve the sensitivity of reporting by raising awareness among WOAH and its Members of inconsistencies between the official information reported to WAHIS and rumours and other information circulating in the media.

Selected key control tools – vaccination, biosecurity/movement control: Vaccination is an important component of several global control and eradication strategies, in particular for those targeting PPR, FMD, and rabies. To be applied successfully, a vaccination strategy needs access to

good quality and effective vaccines and a good coverage of the population at risk. Findings from this section of the chapter highlighted WOAH's efforts through the years in assisting its Members through the creation of vaccine banks for FMD, PPR, and rabies, with millions of doses delivered, as well as through the recently produced guidelines on vaccine procurement.Data provided by Members on official vaccination coverage are concerning, as our main findings are that only around two third of affected Members are declaring official vaccination against FMD and PPR, and that for rabies the percentage has significantly decreased in recent years. On the positive side, the percentages of Members reporting official vaccination against PPR and FMD are slightly increasing, which is an indirect index of increased awareness and engagement of Members in the PPR eradication strategy and the FMD control programme. The data obtained on the application of the other selected control measures (precautions at borders, movement control, and zoning) indicate a progressive improvement, with higher percentages of Members declaring their application. In terms of the proportion of Members, movement control is widely applied by Members for ASF and FMD but is applied by fewer of the affected countries for PPR and rabies. On the other hand, precautions at borders are widely applied by all Members for all the diseases. Finally, zoning has been applied by a minority of countries, and this is in line with similar findings reported in the 2022 WOAH annual report of the Observatory.

Stepwise approach and Members' knowledge of their progress with implementing the strategies: The results presented in this section show that Members' baseline knowledge of their national situation regarding the selected diseases has increased over time. This is demonstrated by the increase in diseases reported as notifiable through WAHIS since 2005, and by the increase in the number of Members with PCP-FMD stages above 0 since 2012. For PPR and dog-mediated rabies, analysis of the stages assessed in the strategies did not yield the same results. For PPR, analysis of PMAT stages showed a relatively stable situation in the number of Members engaged in disease surveillance and control since 2017. For dog-mediated rabies, not enough data were available to perform such an analysis.

In general, there was no association between the trends presented in this chapter and the years the strategies were launched. This finding suggests that, while the strategies support countries in their control and eradication efforts, they build upon transversal capacities such as surveillance, movement control, laboratory capacities, etc.

It is widely recognised that socio-economic factors (such as compensation to farmers, involvement of the private sector, and political engagement) are indispensable for the successful and sustainable implementation of major transboundary disease prevention and control activities worldwide. It is also recognised that good quality Veterinary Services are indispensable in that respect. Strengthening the Veterinary Services is a key factor for the success of the strategies, and a key mission of WOAH. To assess the performance of Veterinary Services to support the technical activities of control and eradication for the diseases covered by global strategies, the WOAH PVS Evaluation tool can be used. Members can choose to include a specific content supplement (report annex) related to global priority diseases and issues in the PVS Evaluation and Evaluation Follow Up missions. As of 26 March 2023, 29 Members had used this tool or were planning to use this tool for at least one of the diseases covered in this chapter, and other Members are encouraged to do so as appropriate.

This chapter shows, first of all, the progress made in some areas of surveillance and control for the selected diseases, and in particular the increase in Members' basic knowledge of their national situation regarding these diseases, the overall increase in domestic animal surveillance, as well as in

the application of official vaccination (PPR and FMD) and, more generally, of the main biosecurity control measures. Secondly, it highlights important gaps that remain and that will need to be addressed in the coming years, such as the inadequacy of wildlife surveillance for ASF and PPR, the overall inadequacy of pathogen characterisation capabilities and access to laboratory diagnostics, a generally low proportion of Members declaring the application of biosecurity control measures, as well as long delays in submitting information on disease occurrence after confirmation of the event. These gaps are highlighted by the trend in the proportion of Members reporting the presence of the selected diseases in domestic animals and wildlife. For most of the diseases, with the exception of rabies, the trends highlight a deterioration or stability of the global situation. In view of this, WOAH Members are encouraged to make every effort to maintain their commitment to WOAH strategies and to use the support tools developed by the Organisation. Members are also reminded of the importance of sharing timely information with WOAH. This will allow for continuous monitoring of indicators in the coming years, to inform WOAH, its Members, and its partners of progress against the overall strategies, and to support decision-making.

B. Update on infection with lumpy skin disease virus, for which epizootic situations were observed in 2022

1. Background and importance of the disease

Lumpy skin disease (LSD) is highly host specific and causes disease only in cattle and water buffalo. Although infection with LSD virus has been reported in several species of wild ruminants, their susceptibility and their possible role in the epidemiology is not well characterised. The primary mode of transmission is thought to be by arthropod vector. LSD does not cause chronic disease. Its signs range from inapparent to severe disease and include skin nodules, pox lesions, and reproductive signs (such as abortions and infertility). The morbidity rate varies between 10% and 20%, although in some places it has been reported to be as high as 45%. Mortality rates of 1-5% are considered typical[27].

LSD is endemic in most African countries. Since 2012, it has spread rapidly to the Middle East, South East Europe, and Western and Central Asia (15 countries reported their first occurrence of the disease to WOAH between 2012 and 2018 in these regions[28]). Since 2019, several outbreaks of LSD have been reported by Members in Asia, and recently, in Southeast Asia (between 2019 and the end of 2022, 20 countries and territories notified their first occurrence of LSD to WOAH[29]). This worrisome situation is described in this chapter.

LSD tends to be more common in hot, humid areas, but it is not limited to these areas. In endemic areas, the number of cases generally increases during wet and warm periods, when more insect vectors are

[27] WOAH Lumpy Skin Disease Technical Disease Card, https://www.woah.org/en/document/lumpy-skin-disease-technical-disease-card/

[28] Based on notifications submitted to WAHIS, LSD spread in 2013 for the first time to Iraq, Jordan, and Türkiye, in 2014 to Azerbaijan and Iran, in 2015 to Armenia, Greece, Russia, and Saudi Arabia, in 2016, to Albania, Bulgaria, Georgia, Montenegro, North Macedonia, and Serbia.

[29] Based on notifications submitted to WAHIS, LSD spread in 2019 for the first time to Bangladesh, China (People's Rep. of), India, and Syria, in 2020 to Bhutan, Chinese Taipei, Hong Kong (SAR-PRC), Myanmar, Nepal, Sri Lanka, and Vietnam, in 2021 to Cambodia, Laos, Malaysia, Mongolia, Pakistan, and Thailand, and in 2022 to Afghanistan, Indonesia, and Singapore.

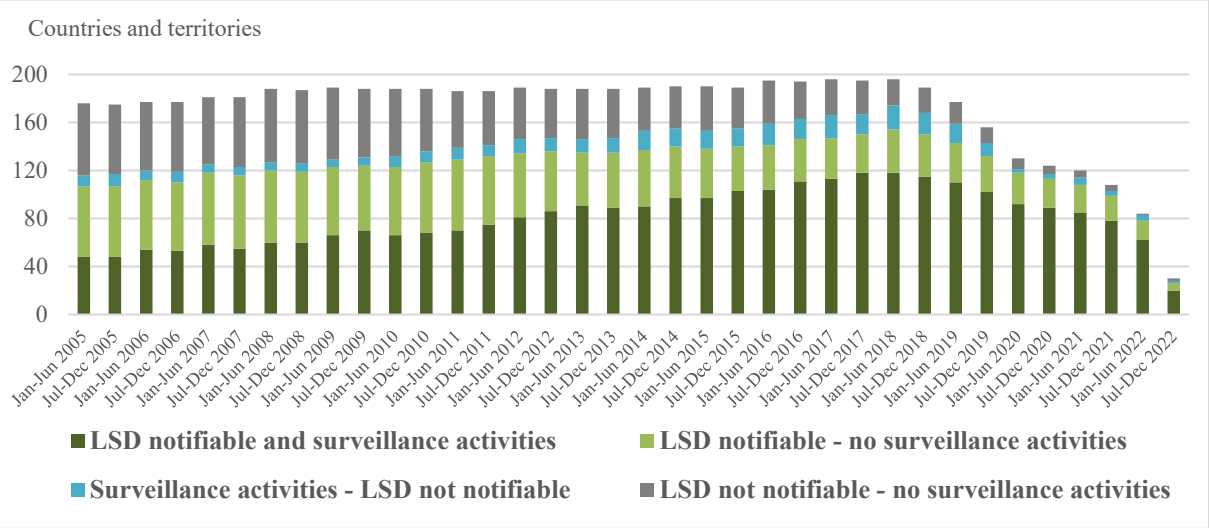
present, and decreases during the dry season. It is not possible to determine the global seasonality of LSD from WAHIS data, due to the six-monthly reporting format used by most of the affected countries.

2. Trends in Members' implementation of surveillance activities

To interpret the notifications in the context of surveillance capacity, we analysed the change in the number of countries and territories declaring in their WAHIS six-monthly reports: (i) LSD as a notifiable disease; and (ii) the implementation of LSD surveillance activities (including general surveillance, targeted surveillance, monitoring, and screening), over the period 2005–2022 (Figure 27). Data for 2019, 2020, 2021, and 2022 are still only partial and the corresponding results should be treated with caution.

The trend in the number of countries and territories declaring LSD as notifiable and reporting the implementation of disease surveillance activities increased steadily and sharply from 48 in 2005 to 118 in 2018. This large increase is exceptional and likely correlates with the growing concerns associated with the disease in the global community related to its progressive spread as described above. In 2018 (the most recent year with complete information), 22 countries and territories did not report LSD as notifiable or the implementation of LSD surveillance activities. Thirty-six countries and territories reported LSD as notifiable but no surveillance activities, and 20 countries and territories reported the implementation of surveillance activities but LSD as non--notifiable.

Figure 27. Number of countries and territories declaring that LSD is a notifiable disease and the number declaring implementation of surveillance activities for LSD, by semester (2005–2022)



3. Summary of the situation reported between 2005 and 26 March 2023

Figure 28 presents a summary of the LSD situation worldwide, as reported through WAHIS in each semester between 2005 and 2022 (six-monthly reports received as of 26 March 2023). Most countries

reported only through six -monthly reports during the analysis period, in accordance with WOAH standards for stable situations. Due to delays in the submission of six-monthly reports, data for 2019, 2020, 2021, and 2022 are still only partial and should be treated with caution. To present the trend of affected countries and territories, the percentage of those that reported LSD among those that submitted a report was calculated. As of 26 March 2023, no country or territory had reported the presence of LSD in 2023 by immediate notification or follow-up report.

For the period prior to 2019, reporting can be considered complete. During this period, the percentage of reporting countries and territories declaring LSD presence steadily increased from 13% in 2005 to 23% in 2018 (the most recent year for which complete information is available) and has remained around 23% in subsequent years. The peak in the second half of 2022 should be viewed with caution, as it is based on the very limited number of reports submitted by 26 March 2023.

The number of LSD outbreaks also increased between 2005 and 2018 (the most recent year for which complete information is available) and peaked in the first half of 2019 (1821 outbreaks in that half-year due to the very high number of outbreaks reported by Iran and Oman) and, to a lesser extent, in the first half of 2016 (679 outbreaks, mainly reported by North Macedonia, Russia, and Serbia). As explained above, data for 2019, 2020, 2021 and 2022 are still only partial.

Figure 28. Percentage of reporting countries and territories that notified LSD presence, and the number of outbreaks reported, between 2005 and 2023 (reports received by WOAH as of 26 March 2023)

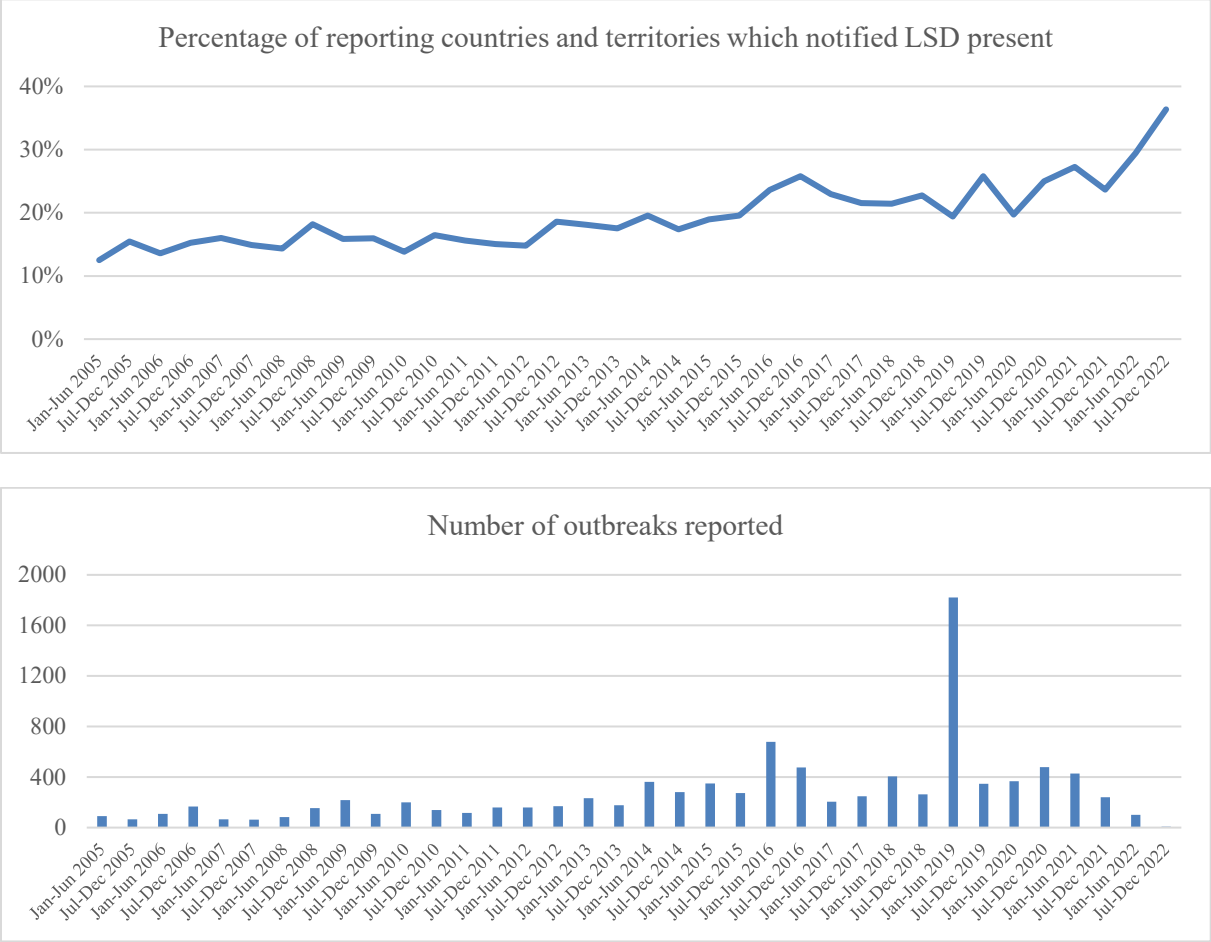
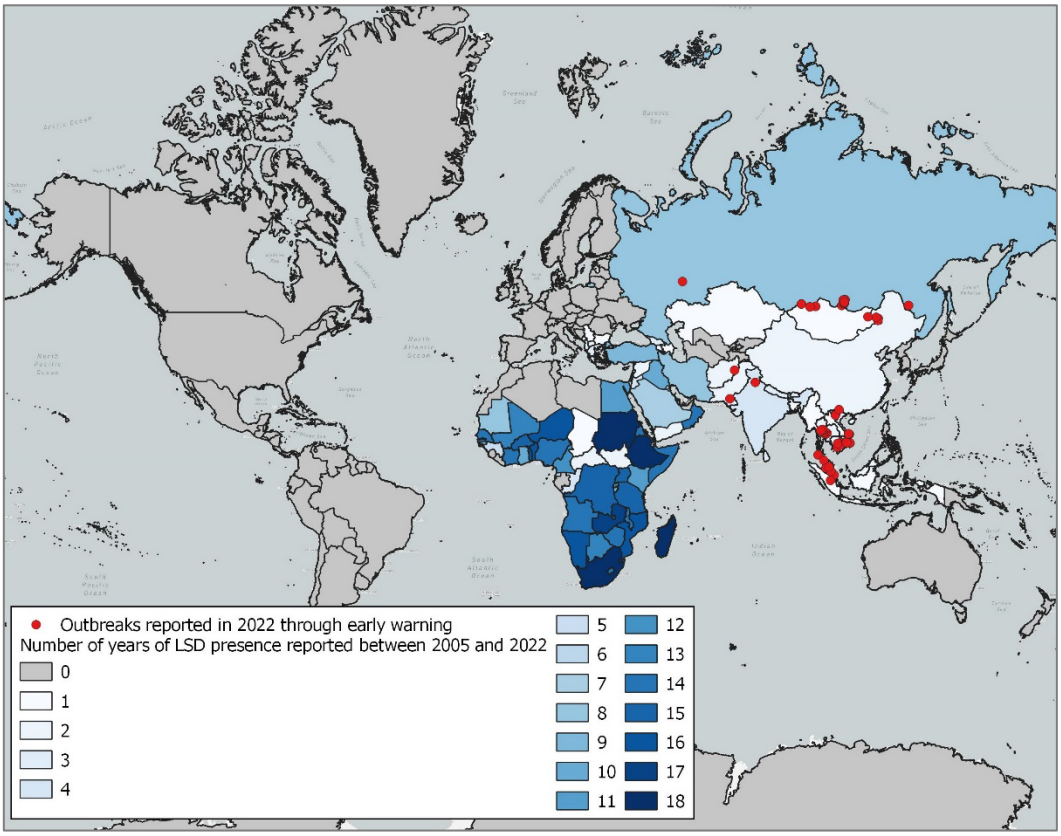


Figure 29 shows, in blue, the 89 countries and territories that have reported LSD at least once between 2005 and 2023 (as of 26 March). The distribution of LSD outbreaks reported through the early warning system in 2022 is also shown. In 2022, eight events were reported to WOAH through the early warning system. That year, LSD spread for the first time to three countries: Indonesia in February, Singapore in March, and Afghanistan in May. The Delegates of India and Russia reported the spread of LSD to new areas of their countries, while Mongolia and Russia reported recurrences. As of 26 March, no events had been reported to WOAH in 2023. Figure 29 also shows outbreaks that were reported through WAHIS for events that began in 2020 or 2021 in Cambodia, Malaysia, Pakistan, Russia, Thailand, and Vietnam and were still ongoing in 2022.

Figure 29. Distribution of LSD presence reported to WOAH between 2005 and 2022 and distribution of LSD outbreaks reported through the early warning system in 2022



WOAH Members may make a self-declaration of freedom of a country, zone, or compartment from LSD in accordance with the provisions of the *Terrestrial Code*. Members may request that WOAH publish their self--declaration in accordance with the Standard Operating Procedure. As of 26 March 2023, no Member had an active self-declaration for LSD.

WOAH also has a procedure for disseminating, via its website, announcements received from Members about disease simulation exercises taking place in their country. In most cases, these simulation exercises are designed to test and practise the implementation of an existing national contingency plan. Between 1 January 2022 and 26 March 2023, no Members informed WOAH of simulation exercises conducted on LSD.

4. Activities and recommendations for disease surveillance and control

Evidence from the recent LSD epidemic in Europe and West Asia has revealed that successful control and eradication of LSD relies on early detection of the index case, followed by a rapid and widespread vaccination campaign[30]. As noted above, 118 countries and territories worldwide reported LSD as notifiable and implementation of LSD surveillance activities in 2018 (the most recent year with complete information in WAHIS). However, looking at the information that countries and territories submitted through their WAHIS annual reports, only 38 countries and territories reported having LSD diagnostic capacity in their national reference laboratories[31]. This low number indicates gaps in resources for appropriate diagnostic capacity, which may be a concern in the current context of the international spread of LSD.

In terms of control, it is unlikely that total stamping-out (killing all clinically affected cattle and unaffected herd-mates) and partial stamping-out (killing only clinically affected cattle) alone, in the absence of vaccination, can eradicate LSD[30]. In a practical example, LSD was controlled in some Balkan countries within one to three months with a vaccination coverage higher than 80%, when supported by other measures such as early detection, zoning, and movement controls, and total or partial stamping-out. In unaffected countries or zones, it is also important to prepare preventive vaccination or emergency vaccination plans. Chapter 3.4.12. of the WOAH *Terrestrial Manual* sets out the requirements for the vaccines to be used for LSD control. An appropriate vaccine to control LSD should provide good immunity for cattle against LSD, be safe to use for all cattle breeds, ages, and pregnant animals, and be correctly labelled. The risk associated with low quality vaccines has been a concern in recent years. For vaccine quality control, WOAH can facilitate contact with WOAH Reference Laboratories in South Africa and the United Kingdom and a Collaborating Centre in Belgium (Validation, Quality Assessment and Quality Control of Diagnostic Assays and Vaccine for Vesicular Diseases in Europe)[32].

GF-TADs regional Action Plans address the animal diseases and cross-cutting topics identified as 'priority' for the regional level. In this context, LSD is currently considered a priority in Europe. In this region, the Standing Group of Experts on LSD last met in January 2021, to develop a set of recommendations on vaccination, surveillance, and other activities that can support countries and territories of the region[33].

[30] WOAH FAQ on Lumpy Skin Disease, https://www.woah.org/en/document/faq-on-lumpy-skin-disease-lsd/
[31] Collection of this information was conducted through WAHIS between 2005 and 2020, and then suspended due to system modernisation. Therefore, the most recent information is from 2019.
[32] WOAH FAQ on Lumpy Skin Disease, https://www.woah.org/en/document/faq-on-lumpy-skin-disease-lsd/
[33] 10th meeting of the Standing Group of Experts on Lumpy Skin Disease, https://rr-europe.woah.org/en/Events/sge-lsd10-10th-meeting-of-the-standing-group-of-experts-on-lumpy-skin-disease/

5. Summary and conclusions

LSD is a vector-borne disease, endemic in most African countries, which has spread to 35 new countries and territories in the Middle East, Southeast Europe, Western, Central and Southeast Asia in the past 10 years. In 2022, eight events were reported to WOAH through the early warning system. That year, LSD spread for the first time to three countries: Indonesia in February, Singapore in March, and Afghanistan in May.

As concern grows, countries and territories have been developing their surveillance programmes and, according to the most recent year in WAHIS with complete information, 118 countries and territories reported LSD as notifiable and surveillance activities in place. However, WAHIS data also indicate gaps in resources for appropriate diagnostic capacity, which may be a concern in the current context of the international spread of LSD.

In terms of control, vaccination is a key element. Members are encouraged to refer to the *Terrestrial Manual*, which defines the requirements for the vaccines to be used for LSD control. WOAH Reference Laboratories and Collaborating Centres can also support WOAH Members with vaccine quality control.

Finally, in terms of regional coordination, a Standing Group of Experts on LSD has been set up in Europe under the umbrella of GF-TADs, and the Group has provided recommendations to Members in the region on vaccination, surveillance, and other relevant activities. In addition, many webinars/information events have been organised in Asia-Pacific due to the emergence of LSD in several countries.