

# ZERO BY 30

THE GLOBAL STRATEGIC PLAN



**TO END**

**HUMAN DEATHS  
FROM DOG-MEDIATED  
RABIES BY 2030**



Food and Agriculture  
Organization of the  
United Nations



WORLD ORGANISATION  
FOR ANIMAL HEALTH



World Health  
Organization



Global Alliance  
for Rabies  
Control



# **ZERO BY 30**

## **The Global Strategic Plan to end human deaths from dog-mediated rabies by 2030**

World Health Organization

Food and Agriculture Organization of the United Nations

World Organisation for Animal Health

Global Alliance for Rabies Control

Geneva, 2018

Zero by 30: the global strategic plan to end human deaths from dog-mediated rabies by 2030

ISBN 978-92-4-151383-8 (WHO)

ISBN 978-92-5-130461-7 (FAO)

ISBN 978-92-95108-76-9 (OIE)

© World Health Organization (WHO), Food and Agriculture Organization of the United Nations (FAO) and World Organisation for Animal Health (OIE), 2018

All rights reserved. WHO, FAO and OIE encourage the reproduction and dissemination of material in this information product. Any proposed reproduction or dissemination for non-commercial purposes will be authorized free of charge upon request, provided the source is fully acknowledged. Any proposed reproduction or dissemination for resale or other commercial purposes, including educational purposes, is prohibited without the prior written permission of the copyright holders, and may incur fees.

Requests for permission to reproduce or translate WHO publications – whether for sale or for non-commercial distribution – should be addressed to WHO Press through the WHO web site ([http://www.who.int/about/licensing/copyright\\_form/en/index.html](http://www.who.int/about/licensing/copyright_form/en/index.html)).

“The designations employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of the World Health Organization (WHO), the Food and Agriculture Organization of the United Nations (FAO) or of the World Organisation for Animal Health (OIE) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement. The mention of specific companies or products of manufacturers, whether or not these have been patented, does not imply that these are or have been endorsed or recommended by WHO, FAO and OIE in preference to others of a similar nature that are not mentioned. The published material is being distributed without warranty of any kind either expressed or implied. The responsibility for the interpretation and use of the material lies with the reader. In no event shall WHO, FAO and OIE be liable for damages arising from its use. The views expressed herein are those of the authors and do not necessarily represent those of WHO, FAO, OIE .”

# CONTENTS

Acknowledgements.....	iv
Abbreviations.....	v
Executive summary .....	vi
<b>Rationale.....</b>	<b>1</b>
Why eliminate rabies? .....	1
Why eliminate rabies now? .....	4
<b>The United Against Rabies collaboration.....</b>	<b>7</b>
United to end the neglect.....	7
Vision to reach Zero by 30.....	8
The value proposition .....	8
The theory of change.....	10
<b>Objective 1: to effectively use vaccines, medicines, tools and technologies .....</b>	<b>13</b>
Outcome 1.1: rabies is prevented through increased awareness and improved education.....	13
Outcome 1.2: rabies is prevented through increased and effective dog vaccination.....	14
Outcome 1.3: human deaths from rabies exposures are prevented by ensuring equitable, affordable and timely access to health care, medicines and vaccines .....	15
<b>Objective 2: to generate, innovate and measure impact.....</b>	<b>17</b>
Objective 2.1: to provide effective policies, guidance and governance.....	17
Outcome 2.1: policies, guidelines, and governance to prevent human rabies deaths are created and adopted at regional and national levels .....	17
Objective 2.2: to ensure reliable data to enable effective decision-making.....	19
Outcome 2.2: appropriate technology and information are made available .....	19
Outcome 2.3: progress towards the goal is constantly and consistently monitored and reported .....	20
<b>Objective 3: to sustain commitment and resources .....</b>	<b>21</b>
Outcome 3.1: key stakeholders are consistently and comprehensively engaged.....	21
Outcome 3.2: finances and other resources are effectively and efficiently used .....	22
Outcome 3.3: results and impact of the United Against Rabies collaboration are regularly monitored and reported .....	23
<b>Budget and governance.....</b>	<b>25</b>
A phased approach to funding Zero by 30 .....	25
Budget requirements: phase 1 .....	26
Budget requirements: beyond 2020.....	26
Governance.....	28
<b>Monitoring our progress and managing risks .....</b>	<b>29</b>
Workplan delivery monitoring and evaluation .....	29
Risk mitigation .....	29
<b>Conclusion.....</b>	<b>31</b>
<b>References.....</b>	<b>33</b>
Annex 1. What is rabies?.....	34
Annex 2. Successful regional elimination in Latin America and the Caribbean, and proof-of-concept programmes in Africa and Asia.....	36
Annex 3. The theory of change .....	39
Annex 4. The logic framework for the United Against Rabies collaboration.....	40
Annex 5. Human and animal rabies biological banks .....	43
Annex 6. Integrated bite case management .....	46
Annex 7. The stepwise approach towards rabies elimination.....	47

# ACKNOWLEDGEMENTS

The four partners (FAO, WHO, OIE and GARC) of the United Against Rabies collaboration gratefully acknowledge the contributions to developing this business plan of the following individuals and organizations, specifically:

**Steering Committee Members:** Bernadette Abela-Ridder, Katinka de Balogh, Kim Doyle, April Johnson, Isabelle Dieuzy-Labaye, Louis Nel, Henk Jan Ormel, Sean Shadomy, Matthew Stone, Gregorio Torres

**Writing team:** Annette Ives, Jocelyn Kessels, Anne-Marie Labouche, Jennifer Macleod, Louise Taylor

**Consultants:** PwC: Gill Sivyler, Saleh Khan, Gerard Coenen, Sakshi Uberoi, Krupa Varghese, WHO: Lea Knopf

**Modelling work:** Jesse Blanton, Katie Hampson, Caroline Trotter, Ryan Wallace

**WHO interns:** Mercedes Carballo, Dayna Schultz, Victoria Suslovitch

Monique Eloit (OIE), Dirk Engels (WHO), Ren Minghui (WHO), Ren Wang (FAO), Lord Alexander Trees (House of Lords and University of Liverpool) and Joris Vandeputte (International Alliance for Biological Standardization) provided valuable insights that helped to focus the business plan.

We thank the WHO staff Rabindra Abeyasinghe, Lamine Diawara, Elkhan Gasimov, Gyenendra Gongal, Aya Yajima and Marco Vigilato, Stephen Martin, Martin Friede, Erin Sparrow, Naoko Obara, Tejinder Chowdhary, Alejandro Javier Costa and WHO collaborating centres on rabies.

From FAO, we thank Angélique Angot, Juan Lubroth, Mia Rowan and Berhe G. Tekola. From OIE, we thank Catherine Bertrand-Ferrandis, Yael Farhi and Stéphane Renaudin. From GARC, we thank Deepashree Balaram.

We acknowledge also the contributions of our in-country stakeholders; the Gavi learning agenda; the Partners for Rabies Prevention; the Bill & Melinda Gates Foundation for studies that provided data; UBS Optimus Foundation; and the assistance of Rabies Unit and the Global Immunization Division of the United States Centers for Disease Control and Prevention.

# ABBREVIATIONS

FAO	Food and Agriculture Organization of the United Nations
GARC	Global Alliance for Rabies Control
GSG	Global Steering Group
IBCM	integrated bite case management
OCV	oral cholera vaccine
OHZDP	One Health Zoonotic Disease Prioritization
OIE	World Organisation for Animal Health
PAHO	Pan American Health Organization
PEP	post-exposure prophylaxis
PrEP	pre-exposure prophylaxis
REDIPRA	Regional Meeting of Rabies Program Directors
RIG	rabies immunoglobulin
SARE	Stepwise Approach towards Rabies Elimination
SIRVERA	Regional Information System for Epidemiological Surveillance of Rabies
WAHIS	World Animal Health Information System
WHO	World Health Organization

# EXECUTIVE SUMMARY

## WHY ELIMINATE RABIES?

An estimated 59 000 people die from rabies each year. That's one person every nine minutes of every day, 40% of whom are children living in Asia and Africa. As dog bites cause almost all human cases, we can prevent rabies deaths by increasing awareness, vaccinating dogs to prevent the disease at its source and administering life-saving treatment after people have been bitten. We have the vaccines, medicines, tools and technologies to prevent people from dying from dog-mediated rabies. For a relatively low cost it is possible to break the disease cycle and save lives.

A country's health system benefits from the capacity-building required for rabies surveillance. This core activity strengthens the health system by improving the mechanisms for surveillance of other disease and expanding access to health care. Minimizing duplication and improving efficiencies by pooling resources and developing strong health service networks saves money and makes the most of resources. Countries can maximize the impact of each dollar invested.

Investing in rabies elimination saves lives and strengthens both human and veterinary health systems. A collaborative response, through rabies programmes, contributes to disease prevention and preparedness. This means integrated rabies elimination is a model for One Health collaboration.

In the past, the global response has been fragmented and uncoordinated. We need to break the status quo and come together with a combined will, an achievable goal and a common plan. That combined will was evident in 2015, and the resulting global call to action made it clear that now is the time to act.

## A CALL FOR ACTION

In 2015, the world called for action by setting a goal of zero human dog-mediated rabies deaths by 2030, worldwide. Now, for the first time, four organizations – the World Health Organization (WHO), the World Organisation for Animal Health (OIE), the Food and Agriculture Organization of the United Nations (FAO) and the Global Alliance for Rabies Control (GARC) – have joined forces, as the United Against Rabies collaboration, and are determined to reach this goal.

The United Against Rabies collaboration leverages existing tools and expertise in a coordinated way to empower, engage and enable countries to save human lives from this preventable disease. The global strategic plan puts countries at the centre with renewed international support to act.

This country-centric engagement will be flexible and consider different contexts and capacities. Countries will lead efforts, driving the changes needed to reach Zero by 30, empowered by the United Against Rabies collaboration, as they build sustainable institutional capacity and end human deaths from dog-mediated rabies.



## HOW WE WILL REACH ZERO BY 30

Our global strategic plan prioritizes the societal changes needed to reach Zero by 30 into three objectives:

**OBJECTIVE 1**  
to effectively use  
vaccines, medicines,  
tools and  
technologies

**Reduce human rabies risk**

- improved awareness and education
- increased access to healthcare, medicines and vaccines
- dog vaccinations

**OBJECTIVE 2**  
to generate,  
innovate and  
measure impact

**Provide guidance and data**

- effective policies, guidance and governance
- ensuring reliable data to enable effective decision-making

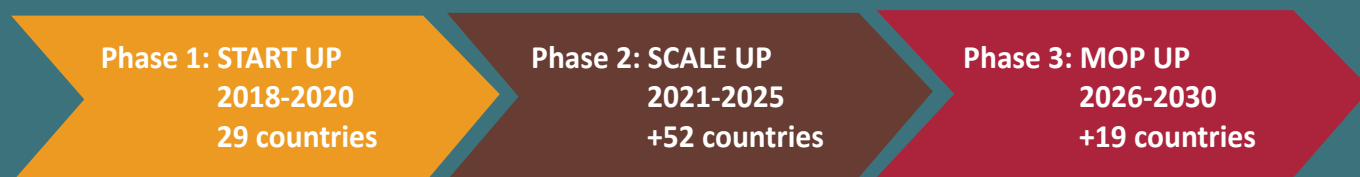
**OBJECTIVE 3**  
to sustain  
commitment  
and resources

**Harness multi-stakeholder engagement**

- demonstrate the impact of activities completed under the **United Against Rabies** collaboration

## A PHASED APPROACH TO ELIMINATION

We propose a pragmatic, three-phase approach to achieve the shared goal of Zero by 30:



### Phase 1: START UP

We will build a strong foundation for rabies elimination by preparing and improving normative tools and structures to catalyse action. Core activities include supporting countries to prepare robust, budgeted, effective and sustainable national rabies elimination plans following a One Health approach; and facilitating the coalescence of these plans into a coordinated regional effort.

### Phase 2: SCALE UP

We will engage with and involve 52 more countries in rabies elimination, to give a total of 81 out of 100 endemic countries. Using the strong foundation established in Phase 1, refined and improved with learning and experience, we will expand our efforts and truly go global.

### Phase 3: MOP UP

We will engage the remaining endemic countries in the fight to eliminate rabies, and continue to support country efforts as communities, nations and regions advance to reach Zero by 30. Phase 3 is the last mile.

## BUDGET AND MONITORING

Our global strategic plan details the funding requirements for the core activities of Phase 1 only (START UP: 2017–2020, estimated at US\$ 16.5 million). This will allow us to stay agile and to flexibly adapt our strategy to accommodate changing environments, lessons learned along the way and new technologies.

Financing and implementing national rabies elimination plans at the country level is not included in our budget. Countries will need to mobilize domestic and international resources to sustainably finance and implement control activities.

We will develop a detailed workplan to guide implementation, including a monitoring framework with defined, aligned milestones to measure progress. Each country will lead the drive towards Zero by 30.

## NEXT STEPS

Reaching Zero by 30 will save the lives of children and the livelihoods of adults. It will keep families together. Investing in rabies elimination strengthens health systems, improves equity and access to care, and contributes to sustainable development. For the first time in history, we are united to coordinate capacity-building and leverage existing knowledge, tools and technology.

We will not stop there. We will pursue breaking transmission in dogs, thereby maintaining freedom from disease. The United Against Rabies collaboration is already working with countries to coordinate and catalyse global change. Investing in rabies will accelerate progress, as the world works to make elimination a reality.

Our One Health collaboration engages experts and stakeholders from the public and private sectors to play an active role in empowering, supporting and engaging countries to prevent rabies and make zero human deaths from rabies by 2030 a reality.

# RATIONALE

## WHY ELIMINATE RABIES?

### Because rabies kills

Every year, an estimated 59 000 people die of one of the oldest and most terrifying diseases known to man: rabies (1) (*Annex 1*). Rabies is caused by infection with a lyssavirus. The disease is named after Lyssa, the Greek spirit of madness, frenzy and rage, vividly evoking the horror of a rabid death (2).

Rabies is spread via bites and scratches from infected animals. Dogs are responsible for 99% of human cases (3). Clinically, rabies is characterized by fitful consciousness, hyperactivity, hallucinations and hydrophobia (furious rabies), or paralysis and coma (paralytic rabies), progressing rapidly and inevitably towards death (3).

### Because rabies is preventable

Although fatal once clinical signs appear, rabies is preventable through three proven, effective interventions.

- 1. Awareness** of rabies disease engages communities and empowers people to save themselves by seeking the care they need (4). This includes an understanding of how to prevent rabies in animals, when to suspect rabies, and what to do in case of a bite.
- 2. Post-exposure prophylaxis (PEP)** consists of a series of rabies vaccines and, in some cases, rabies immunoglobulin (RIG), administered after a suspected exposure to rabies. Appropriate wound management and prompt access to quality-assured PEP is almost 100% effective in preventing human rabies deaths (5).<sup>1</sup>

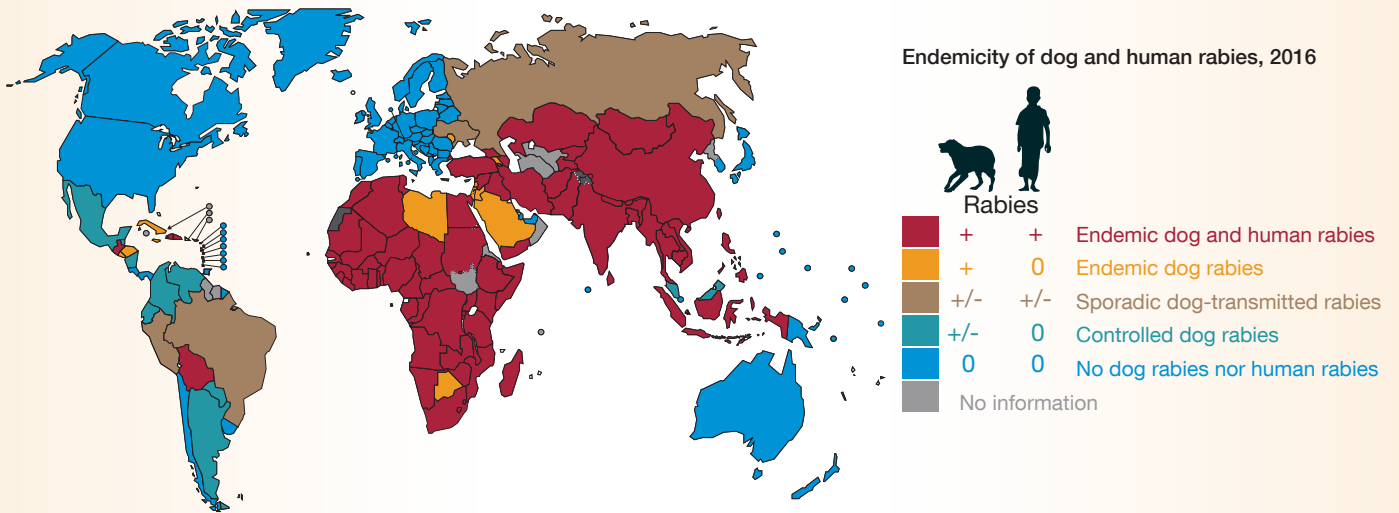
- 3. Mass dog vaccination** is a proven, cost-effective way to save human lives by stopping transmission of rabies at its source. While a variety of animal species can host rabies, dogs are responsible for 99% of human cases (3). Disease models and real-world experience show that sustained vaccination coverage of 70% of dog populations is sufficient to stop transmission of the disease between dogs, and from dogs to humans (3, 6). Eliminating rabies in dogs is therefore key to sustainably preventing human disease.

### Because rabies affects the world's most vulnerable populations

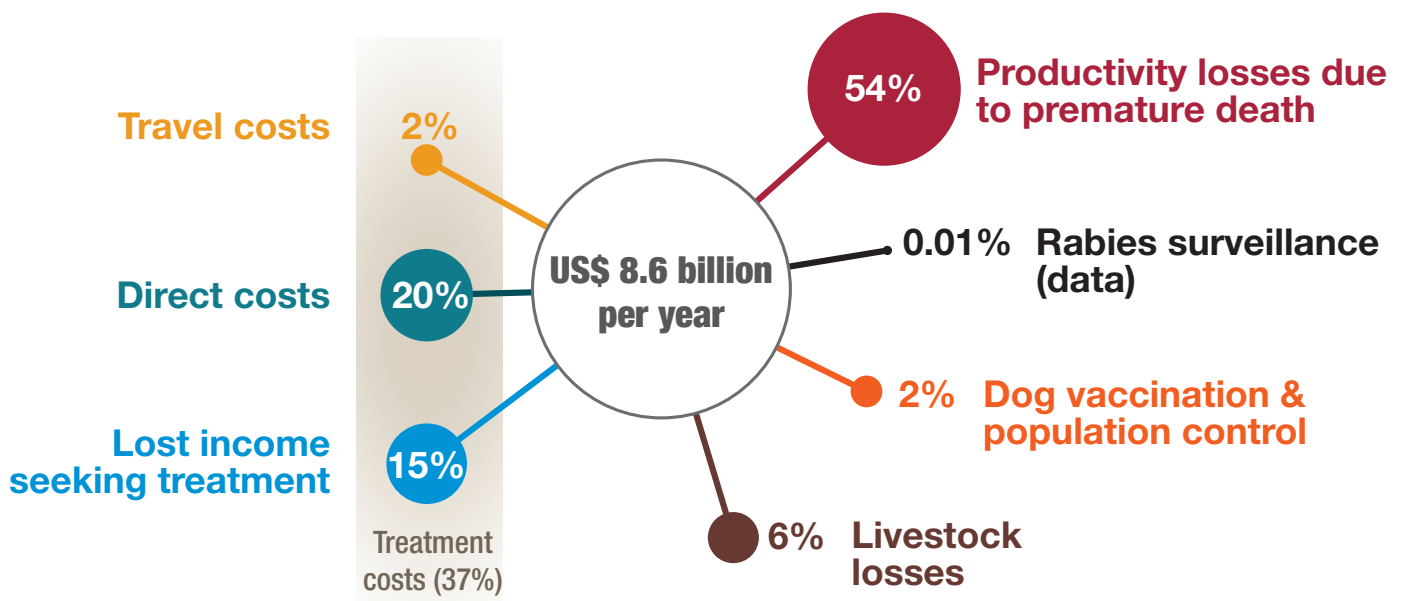
Rabies is a neglected tropical disease. Most rabies cases occur in Africa and Asia.

Approximately 80% of human cases occur in rural areas, and over 40% of rabies deaths occur in children aged under 15 years (3, 7) (*Figure 1*). Globally, the economic burden of rabies is estimated at US\$ 8.6 billion per annum (1) (*Figure 2*). This cost is disproportionately borne by the world's poorest and most disadvantaged communities. People continue to die of rabies because it is neglected, because their awareness of the disease is limited, because the disease remains uncontrolled in dogs, and because they lack access to basic medical care, such as PEP, following an exposure.

<sup>1</sup> Pre-exposure prophylaxis (PrEP) consists of a series of rabies vaccines administered prior to a potential exposure, followed by booster vaccinations in the case of a bite. PrEP is costly, and only recommended for people at constant risk of rabies exposure, such as veterinarians, and laboratory workers handling live virus.



**Figure 1.** Endemicity of dog and human rabies, 2016. Rabies affects poor and rural populations



**Figure 2.** Rabies imposes a heavy economic burden

## Because eliminating rabies strengthens health systems

Investing in rabies maximizes the impact of each dollar. Providing life-saving PEP to the people at highest risk of rabies relies on health systems capable of reaching the world's most underserved populations (8). The same basic infrastructure required to build rabies awareness and improve access to PEP in communities is required to provide essential medicines, vaccines and health care; strengthening human and veterinary health systems, improving health outcomes and maximizing the impact of each invested dollar. That means that every dollar invested in well integrated rabies elimination programmes not only quickly makes a significant impact on eradicating human rabies deaths but also improves access to health care for the world's most vulnerable people (Figure 3).

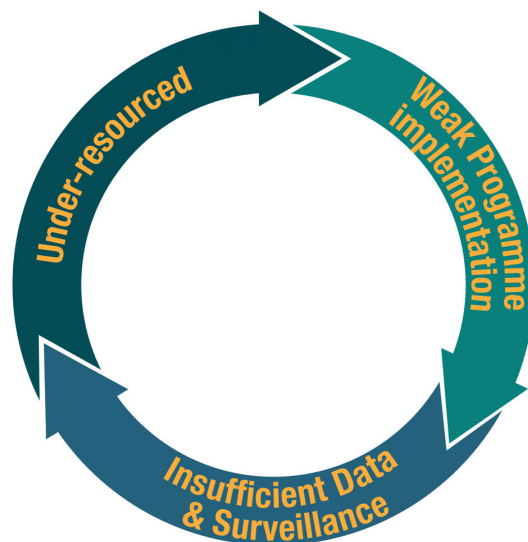
## Because eliminating rabies is a model for One Health collaboration

Engaging communities to build awareness of rabies, and vaccinate dogs to prevent human disease, requires close One Health collaboration between, at a minimum, the human and veterinary health sectors (9). The cooperative mechanisms required to prevent rabies are a model for One Health collaboration, and establish a basis for response to other existing or emerging zoonoses that may pose a pandemic threat. A One Health model is within reach for even low- and middle-income countries, and rabies disproportionately affects the world's most vulnerable people. The economic burden resulting from lost livestock and working animals directly affects resource-poor communities. A coordinated response between animal and human health systems not only has a positive impact on the livelihood of communities but also strengthens surveillance of rabies and other diseases in the human health system.

## Because the world wants to end neglect and inequality

In February 2015, the World Health Organization (WHO), the Food and Agriculture Organization of the United Nations (FAO), the World Organisation for Animal Health (OIE) and the Global Alliance for Rabies Control (GARC) united to launch the End Rabies Now campaign, which proposed a goal of zero human rabies deaths by 2030, worldwide. In December 2015, a global conference of international stakeholders endorsed the vision of zero human rabies deaths by 2030, or Zero by 30 (10).

The goal is perfectly aligned with the United Nations Sustainable Development Goal (SDG) 3 to “ensure healthy lives and promote well-being for all at all ages”,



**Figure 3.** Investment breaks the cycle of neglect

and specifically targets 3.3, to “by 2030, end the epidemics of ... neglected tropical diseases”; and 3.8, to “achieve universal health coverage ... and access to safe, effective, quality and affordable essential medicines and vaccines for all” (11).

As rabies disproportionately affects poor and rural communities, eliminating human deaths from rabies is also consistent with SDG 1 to “end poverty in all its forms” and the commitment of Member States to “leave no one behind” (11). The conviction to eliminate rabies is supported by WHO’s leadership priorities to increase access to essential medicines and focus on universal health coverage; the adoption in 2016 by the World Assembly of Delegates of OIE Resolution No. 26 on global elimination of dog-mediated rabies, mandating Member countries to collaborate and endorse Zero by 30 (12); and by FAO’s commitment to reduce rural poverty (13).

## WHY ELIMINATE RABIES NOW?

### Because we have come so far

For more than 4000 years, rabies has plagued human-kind. For centuries, the disease has inspired remedies dark and magical, from poultices made from the skulls of hanged men, to branding with Saint Hubert's Key (a metal nail, cross or cone) and cutting the attachment of the tongue, where the disease was thought to reside (2).

In the 1500s, it was suggested that human rabies was transmitted through broken skin via animal bites, and, in 1885, Louis Pasteur created the first effective human vaccine (14). This marked a turning point in rabies prevention and, with the advent of modern vaccines, the world has made enormous progress in fighting the disease. Successful interventions have eliminated dog-mediated human rabies in Western Europe, North America, Japan, South Korea and parts of Latin America and, recently, in smaller scale pilot programmes in Africa and Asia, saving thousands of lives (3, 15, 16) (Figure 4).

In Latin America and the Caribbean, the Pan American Health Organization (PAHO) has coordinated the regional programme to eliminate dog-mediated human rabies in urban (since 1983) and rural (since 1991) areas. By expanding access to post-exposure prophylaxis, completing mass dog vaccination campaigns, improving rabies diagnosis and surveillance, and increasing rabies awareness through educational campaigns and community involvement, the region saw an impressive and consistent decline in the number of human rabies cases. Between 1980 and 2010 the number of laboratory-confirmed dog rabies cases was reduced by 98% and that of human rabies deaths by 97% (Annex 2). These are children who lived, and who were spared a horrific death from a preventable disease.

### Because the mechanisms to eliminate rabies are now in place

During the past decade, the evidence base for rabies elimination has been put in place. Regional networks are active in engaging countries to support each other, exchange knowledge and build capacity; from neighbour to neighbour, as part of the global movement to eliminate rabies (3). These networks enable countries to access existing tools, share local expertise and report data through regional platforms, providing a supportive structure and basis for expansion to achieve global success.

The knowledge, tools and technology to eliminate human rabies deaths are available and have proven effective (Figure 4). Proof-of-concept programmes have demonstrated that rabies elimination is feasible using

existing tools, even in poor, endemic settings (Annex 2).

These programmes demonstrate feasibility in different country contexts. In Mexico, media and community engagement, mass dog vaccination campaigns, national rabies notification and a decentralized surveillance system have resulted in zero human rabies deaths. In KwaZulu-Natal, South Africa, training and awareness materials, dog vaccine banks, and free access to PEP have led to the elimination of human rabies. In Sri Lanka, mass dog-vaccination and sterilization campaigns, free PEP and a system of national notification of human and animal rabies cases implemented in 1990–2014 have reduced the number of human rabies cases by 85%.

### Because for the first time in history we are united to succeed

For the first time in history, the world has a goal to eliminate human rabies deaths by 2030.

For the first time in history, the world is united to coordinate and leverage the wealth of existing knowledge, tools and technology to achieve what we know is possible.

For the first time in history, we have a tangible opportunity to eliminate the pain, suffering and death inflicted by rabies on humanity since the beginning of written memory.

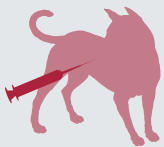
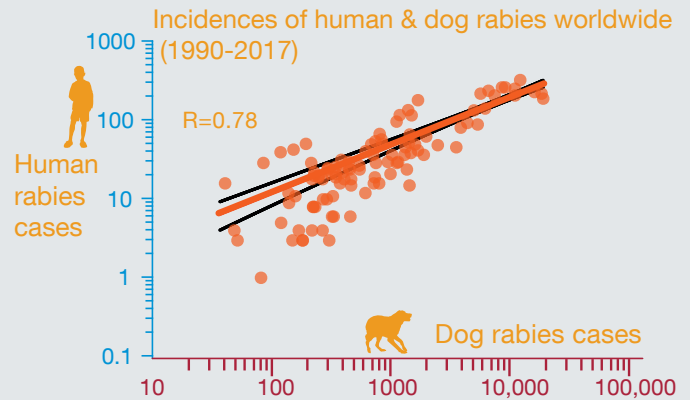
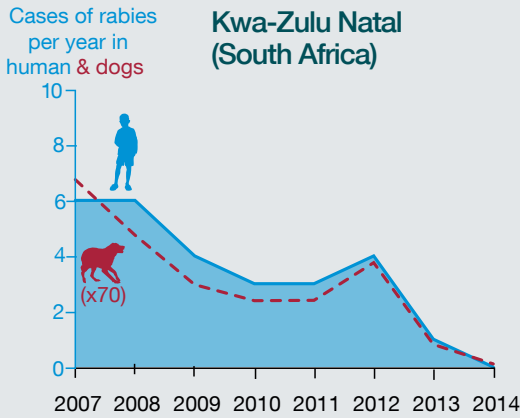
Together, for the first time, international health organizations are united against rabies, with the knowledge, tools and strategy to end the suffering inflicted by the disease. WHO, FAO, OIE and GARC are committed and are collaborating to empower, support and catalyse countries to own and implement rabies elimination programmes as we march towards the shared goal of Zero by 30.

This global strategic plan presents a coordinated, country-centric strategy to eliminate human deaths from dog-mediated rabies by 2030. It integrates rabies prevention with other healthcare interventions to strengthen health systems and engage stakeholders throughout the world in the fight to end rabies.

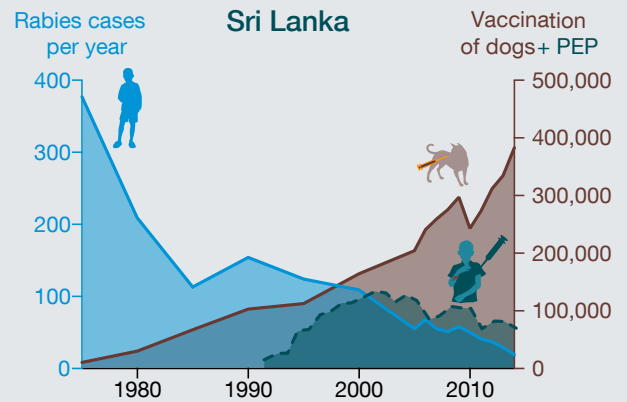
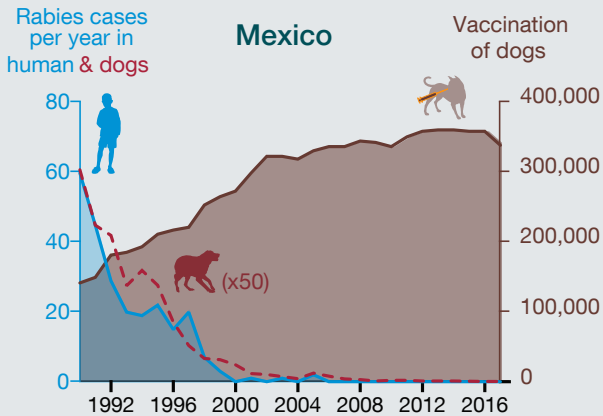
# Preventing human deaths by post-exposure prophylaxis (PEP) and dog vaccination



99% of human rabies is transmitted by bites of rabid dogs: dog & human rabies cases are closely linked



Dog vaccination stops rabies transmission from dogs to humans



**Figure 4.** The knowledge, tools and technology to eliminate human rabies deaths are available and proven to work

# BOX 1

## The four organizations United Against Rabies



**World Health Organization**



**Food and Agriculture Organization of the United Nations**



**WORLD ORGANISATION FOR ANIMAL HEALTH**



**Global Alliance for Rabies Control**

WHO, OIE and FAO already coordinate efforts to advance the One Health approach for several priority diseases, including rabies, within the Tripartite collaboration (9).

**The World Health Organization**, established in 1946, is tasked to build a better, healthier world for all.

- Global leadership for public health development to meet needs of disadvantaged populations.
- Nexus for governments, international organizations, NGOs, private sector and civil society.
- Provides technical support to countries and catalyses capacity-building.

**The Food and Agriculture Organization of the United Nations**, established in 1945, aims to eliminate hunger and food insecurity worldwide.

- Advocates for improved social and economic status of all people worldwide.
- Engages partners and stakeholders including governments, civil society and the private sector.
- Links what happens in local communities to regional and global initiatives.

**The World Organisation for Animal Health**, established in 1924, aims to improve animal health and welfare.

- Develops evidence-based international standards, guidelines and recommendations for disease control and animal welfare.
- Manages the OIE World Animal Health Information System (WAHIS) for animal disease notification.
- Promotes strengthening of Veterinary Services worldwide.

**The Global Alliance for Rabies Control**, established in 2007, is dedicated to eliminating deaths from rabies.

- Develops information, surveillance and training tools to increase country capacity for rabies control.
- Provides training and capacity building to countries and coordinates regional intersectoral rabies networks.
- Undertakes advocacy, education and communication campaigns (World Rabies Day, End Rabies Now).



# THE UNITED AGAINST RABIES COLLABORATION

## UNITED TO END THE NEGLECT

Until now, efforts to eliminate rabies have been fragmented across sectors and regions. In affected countries, elimination of the disease has been championed by few. National responses, where implemented, are often uncoordinated between the human and animal health sectors. Examples of best practice have emerged, but their hard-learned lessons have not been broadly shared.

We need to break the status quo: the time is now.

The rumblings for change began in 2015, when the world called for action by setting a global goal of zero human dog-mediated rabies deaths by 2030, world-wide.

The United Against Rabies collaboration is our unified response to this global call.

For the first time, four international partners – WHO, OIE, FAO and GARC – have united to break the status quo (Box 1). By leveraging the unique strengths and expertise of each organization in the field of rabies control,

our cross-cutting collaboration provides coordinated, global leadership to catalyse and empower countries to prevent human rabies deaths.

The world has the knowledge, tools and technologies needed to eliminate rabies: countries need a plan to put them into action, a strategy to mobilize resources and political will to get the job done. Through a coherent global strategy and harmonized, practical guidance and training, the United Against Rabies collaboration provides a structure and support for elimination. We will use our joint strengths to advocate for rabies prioritization, to engage stakeholders in the global fight and to build capacity to create an enabling environment for countries to succeed.

**Rabies elimination is no longer a dream.**

Now, for the first time, it is a goal with a strategy, and a global force united to see it through. Combined, we can leverage existing capacity in a new way: to empower, to engage and to enable countries to save human lives from this horrific but preventable disease.



World Rabies Day 2016 in Bhutan, 2016 (Photo credit: Yoenten Phuentshok)

## VISION TO REACH ZERO BY 30

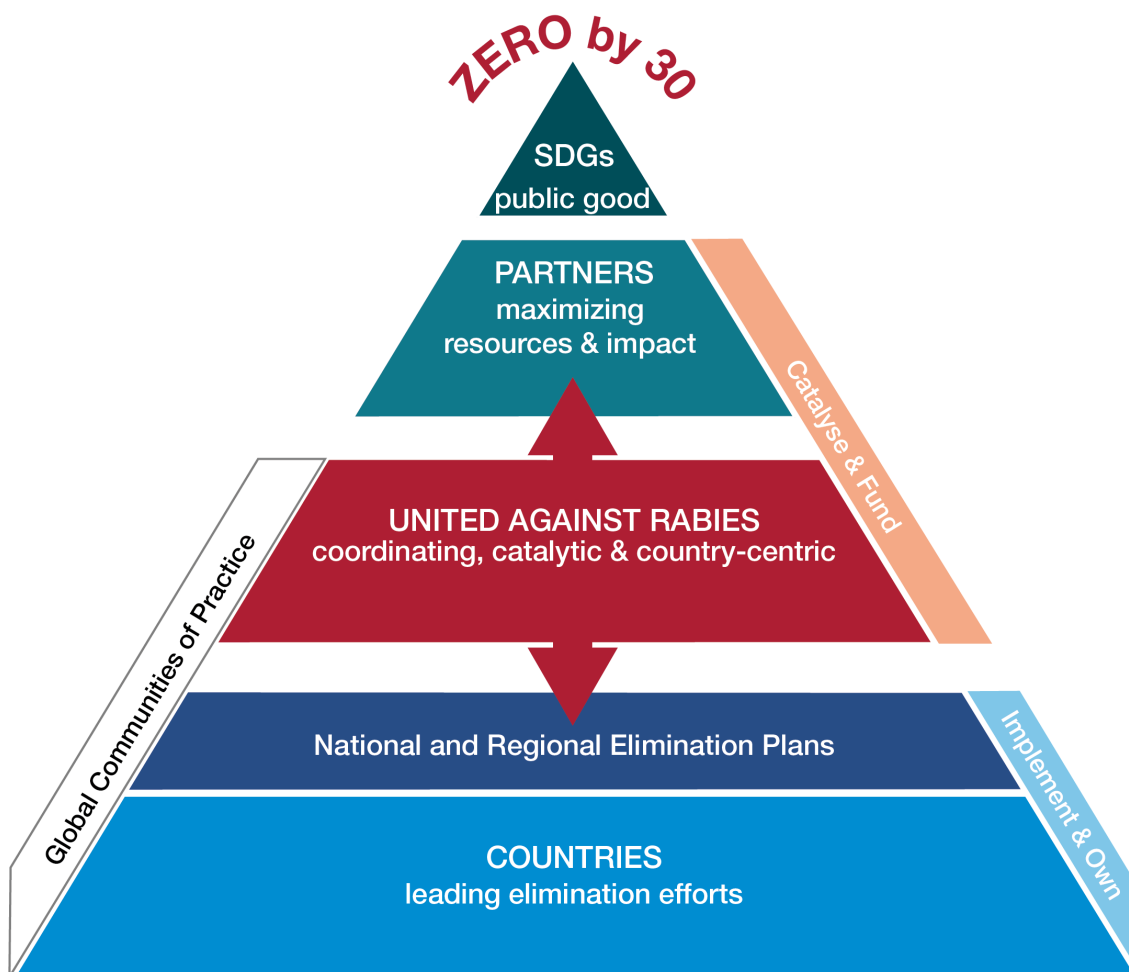
Our global strategic plan provides a harmonized, coherent foundation for rabies elimination that countries can adapt and own, as we support them to reach Zero by 30.

This plan puts countries at the centre through coordinated, global support to create national and regional rabies elimination plans, build capacity, integrate rabies control with other health initiatives, and strengthen health systems to reach the world's most underserved populations.

### The value proposition

Our collaboration engages stakeholders across countries and sectors, brings together public and private development partners, and catalyses communities, nations and regions to implement and own their rabies elimination plans (Figure 5).

Countries take control of and lead efforts to ensure ownership and accountability (**Box 2**). National and regional elimination plans will increase preparedness and surveillance and mobilize domestic resources. By fostering collaboration across ministries and enhancing national capacity at all levels, these plans will promote inclusion of dog bite treatments into health systems and increase access to dog and human vaccines, while developing a One Health approach. By maximizing resources and impact, countries can move towards their SDG targets while building a healthier future. The United Against Rabies collaboration will support these efforts by promoting rabies awareness and prevention and advocating for support and prioritization of rabies elimination. By establishing global norms and standards, coordinating global rabies elimination efforts and monitoring progress and results, the collaboration will drive elimination by maximizing the use of resources. For the first time, we are marching together, with synergy and structure, to coordinate our interventions and maximize the impact of investment in rabies elimination.



**Figure 5.** United Against Rabies is a country-centric, multi-stakeholder collaboration

# BOX 2

## Countries lead elimination efforts

Countries are at the centre of the global strategic plan to reach Zero by 30 because country-led national rabies elimination plans are the cornerstone of our approach. Developing and implementing their own national plans puts countries in the driver's seat, with global tools, structures and support at the ready to kick-start, fuel and accelerate progress towards national goals.

Rabies is already a priority disease in many endemic countries. Since 2014, of the 18 countries involved in One Health zoonotic disease prioritization workshops conducted across Africa, Asia, Eurasia and the Americas, 17 have prioritized rabies: rabies is the most commonly prioritized zoonosis worldwide (17).

Our phased approach builds on existing political will by starting with countries that already prioritize rabies and are active in its control (see section 7.1). Catalytic global structures will support these countries to own and implement pragmatic, sustainable national plans; providing impetus and means for country successes to inspire and drive regional and global elimination efforts.

Proven mechanisms are already in place to engage countries in rabies elimination. Rabies stimulus packages are helping to build local capacity by providing tailored support to kick-start community projects (18). Successful pilot projects have demonstrated that elimination is feasible, generating momentum for action and promoting investment for sustainability and growth.

The outputs of the Stepwise Approach towards Rabies Elimination, or SARE, provide practical guidance to countries and assist with the prioritization of national activities. Stimulus packages are tailored to respond to these priorities. Through the logical steps proposed to develop and implement national rabies control programmes, this approach responds to existing national control and elimination efforts by supporting countries to advance from stage zero (where no data are available) to stage five (where rabies elimination is maintained). Since 2015, 76 workshops involving 26 countries, including four in-country workshops, have been conducted using this stepwise approach (*Annex 7*).

The global strategic plan will bolster these existing initiatives as we catalyse countries to take ownership, use national elimination plans to meet country goals and, ultimately, reach Zero by 30.

## The theory of change

Although societal changes are needed to reach Zero by 30, achieving zero human rabies deaths worldwide is technically feasible. Our theory of change outlines what is required to make these changes and save lives, reduce expenditures, and validate rabies elimination in countries and regions.

The theory of change (*Annex 3*) is built upon three pillars: (i) operational capacity-building to strengthen health systems; (ii) education and advocacy to prevent human rabies deaths; and (iii) monitoring and evaluation to enable this global work. The logic framework (*Annex 4*) translates the steps of the theory of change into a blueprint for action by describing the key outcomes, outputs and major activities required to realize Zero by 30.

The value proposition and the theory of change outline how the United Against Rabies collaboration can act to drive elimination through effective use of vaccines, medicines, tools and technologies; reliable data to enable effective decision-making; sustained commitment to drive progress; and effective policies, guidance, governance and support (*Figure 6*).

## Objective 1:

**to effectively use vaccines, medicines, tools and technologies** to reduce the risk of human rabies through expanded dog vaccinations, improved awareness and education, and increased access to health care, medicines and vaccines for populations at risk.

## Objective 2:

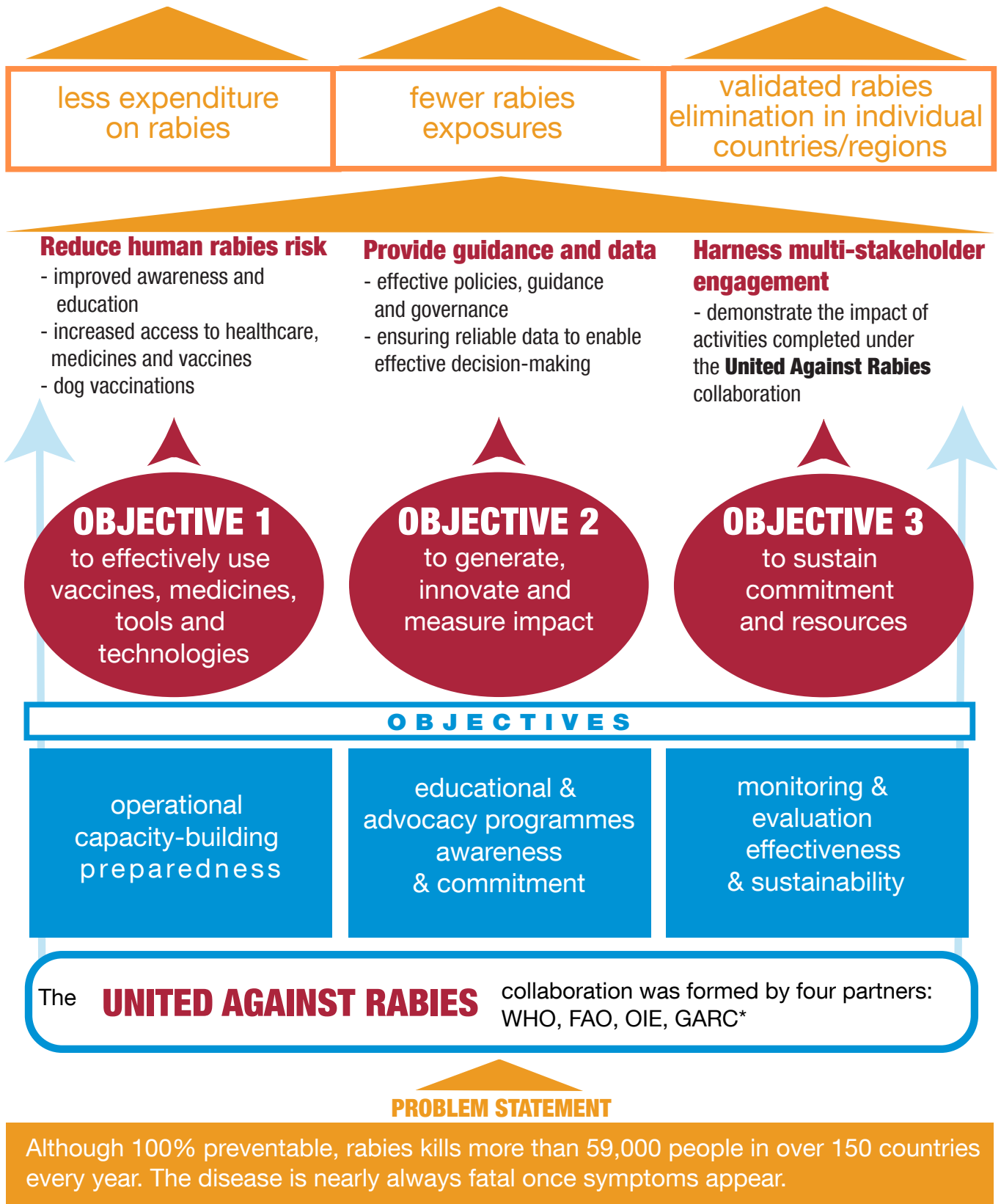
**to generate, innovate and measure impact** through (i) effective policies, guidance and governance by harmonizing international recommendations, frameworks and strategies and by building capacity in countries; and (ii) ensuring the availability of reliable data to enable effective decision-making by encouraging the use of technology and health innovations, and by refining tools for countries to monitor and report data, strengthen surveillance capacity and integrate reporting systems.

## Objective 3:

**to sustain commitment and resources** through multi-stakeholder engagement and by demonstrating the impact of activities completed under the United Against Rabies collaboration in national, regional and global rabies elimination programmes.

These objectives will help to ensure that dog vaccination programmes are effective and comprehensive, that vaccines and information reach populations at high risk of rabies, and that dog bite prevention strategies are widely implemented. A secondary aim of these objectives is to make available trained professionals in human and animal health and education alongside accurate and comprehensive rabies surveillance and programme monitoring. The following sections describe each of these objectives and how we intend to meet them.

# ZERO HUMAN DEATHS FROM DOG-MEDIATED RABIES BY 2030



\* World Health Organization (WHO), Food and Agriculture Organization of the United Nations (FAO), World Organisation for Animal Health (OIE), and Global Alliance for Rabies Control (GARC)

**Figure 6.** Our global strategic plan prioritizes the objectives defined in the theory of change



**It's this easy to pick up rabies!**

Rabies is a deadly disease but we can prevent it. Protect your self and your family

What is rabies?

Rabies

Dog vaccination and education campaign in Tanzania (Photo credit: Sarah Cleaveland)

# OBJECTIVE 1

## TO EFFECTIVELY USE VACCINES, MEDICINES, TOOLS AND TECHNOLOGIES

The fundamentals of rabies control are well established. We need wide-scale access to this knowledge, and capacity-building to allow countries to access and implement these tools in their communities.

### Outcome 1.1: rabies is prevented through increased awareness and improved education

People need to know about rabies to vaccinate dogs and seek care if they are exposed. Engaging communities to improve rabies education and awareness is essential to prevent human deaths (4). Global campaigns such as World Rabies Day and End Rabies Now already actively involve community leaders, and bring rabies to the fore-front through innovative local activities and events (19).

Moving forward, we will focus on education and awareness campaigns that leverage national best practices into relevant, locally appropriate communication

messages. We will provide tools, templates and guidance for countries to adapt for national campaigns and save lives by educating people at risk of rabies on the need to vaccinate dogs, when to suspect rabies in a dog or person and what to do in case of a bite.

Promoting bite prevention strategies and responsible dog ownership will further build awareness of the need to vaccinate dogs to prevent disease and limit potential exposure (20). Responsible dog ownership and rabies education will provide countries with adaptable, One Health strategies to build awareness and sustainably prevent rabies in animals and humans.

### Outcome 1.1: Rabies is prevented through increased awareness and improved education

ACTIVITIES 2017–2020	EXPECTED OUTCOMES 2020
<p>Coordinate communication campaigns for World Rabies Day, in priority endemic countries</p> <p>Develop coherent strategies for responsible dog ownership and bite prevention education</p> <p>Engage partners, communities, and national and international media to build rabies awareness</p>	<p>Effective, locally adaptable communication and awareness tools and strategies</p> <p>Sustainable responsible dog ownership and bite prevention education programmes</p>

## Outcome 1.2: rabies is prevented through increased and effective dog vaccination

Dog vaccination is key to stopping rabies transmission between dogs, and from dogs to humans. By preventing transmission of rabies at its source, vaccinating dogs is a cost-effective and sustainable way to save lives (3, 21, 22) (Figure 7). We will build on existing tools and expertise to develop locally adaptable, best-practice guidance for implementing dog vaccination in countries and their communities. This will catalyse national strategies that improve dog vaccination capacity, and allow for streamlined integration of dog vaccination with other disease control initiatives.

Regional capacity-building workshops will enable countries to engage with and help their neighbours by sharing training, operational knowledge and novel strategies to address local challenges. These will help to strengthen regional networks as we help to coalesce local and national rabies interventions into unified and effective regional elimination strategies.

We will further support countries to conduct effective dog vaccination campaigns through (i) dog rabies biological banks to ensure consistent availability of

affordable, safe and effective vaccines (Annex 5); (ii) strengthening health and veterinary services to deliver effective dog vaccination campaigns, and enhance monitoring and reporting of dog rabies cases and dog vaccination coverage; and (iii) promoting innovative mechanisms to reach free-roaming dogs and increase dog vaccination coverage.

Access to rabies vaccines and biologicals is a key component of our global strategic plan, and triggers national programmes. For both human and animal diseases, biological banks have successfully improved access to affordable, safe and high-quality vaccines.

We encourage countries to forecast their own vaccination and supply chain needs as they initiate, implement and complete mass dog vaccination campaigns. Local, regional and global reporting structures will enable countries to share and learn from the data generated during campaigns. Countries can use these data to refine and improve implementation and thereby ensure that campaigns achieve sufficient vaccination coverage to prevent transmission of rabies disease to people.

## Outcome 1.2: Rabies is prevented through increased and effective dog vaccination

ACTIVITIES 2017–2020	EXPECTED OUTCOMES 2020
Leverage existing tools to support effective SOPs for dog vaccination at the country level	Coherent, standardized, evidence-based tools and strategies for effective dog vaccination
Organize regional workshops for coordinators to train in best practices and share lessons learned	Strengthened, vitalized and supportive regional networks
Establish a biological bank to increase access for affordable dog rabies vaccines	Improved availability and access to dog rabies vaccines (see Annex 4)
Support effective use of monitoring and surveillance data to validate vaccination coverage	Local, regional and global reporting structures established to facilitate data collection and sharing
Promote innovative approaches to enhance dog vaccination campaign coverage	



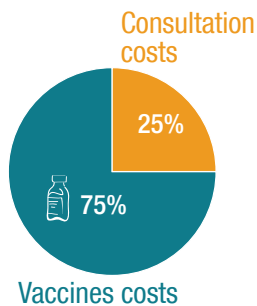
# Dog vaccination is key to stopping rabies transmission between dogs, and from dogs to humans

## Cost of rabies post-exposure prophylaxis and dog vaccination



### Indicative rabies treatment costs per patient in rabies endemic countries

Average costs: US\$ 108.07  
(min: US\$ 7.48 – max: US\$ 597.36)



Up to 80% savings with intradermal PEP regimens <sup>a</sup>

RIG is recommended for severe category III exposures <sup>b</sup>

Up to 99% of bite victims survive with prompt wound washing & vaccine without RIG

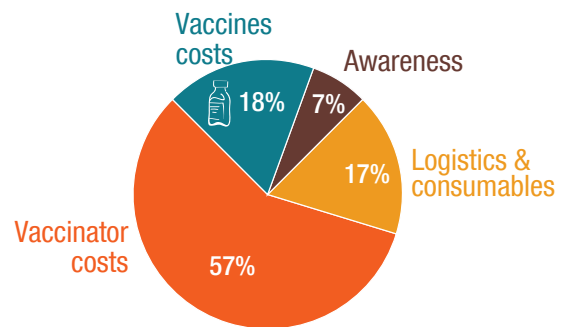
a) Full vaccine course at a medical centre consisting of four consultations and four vaccine vials administered through intramuscular injection (IM); 41 rabies endemic countries where data are available were used.

b) Single or multiple transdermal bites or scratches, licks on broken skin, contamination of mucous membrane with saliva from licks and exposure to bats.



### Mass dog vaccination cost per dog

Average costs: US\$ 4.03  
(min: US\$ 1.56 – max: US\$ 11.33 )  
n=10 published studies



**Figure 7.** Dog vaccination is key to stopping rabies transmission between dogs, and from dogs to humans

### Outcome 1.3: human deaths from rabies exposures are prevented by ensuring equitable, affordable and timely access to health care, medicines and vaccines

Timely, appropriate prophylaxis is almost 100% effective in preventing death from rabies. However, this basic care is not available in many endemic areas (3, 5). Expanding access to high-quality, affordable PEP for populations at risk of rabies relies on health systems capable of reaching the world's most underserved populations. In this way, supporting national plans that promote treating dog bites and rabies exposures in people contributes to achieving universal health coverage.

We will facilitate prudent use of rabies biologicals through standardized, pragmatic, evidence-based guidance for PEP, PrEP and RIG. Practical courses for health professionals on PEP administration, bite management and palliative care for clinical rabies cases

(where prophylaxis was not applied) will build capacity and further improve delivery of life-saving rabies PEP.

Through high-quality, safe, rabies biological banks, we will catalyse increased access to competitively priced, safe and efficacious vaccines and immunoglobulins for those who need them (*Annex 5*). We encourage countries to use their own PEP and rabies surveillance data to forecast vaccination needs and budget for biological purchases. Globally, we are advocating for inclusion of rabies PEP into the 2018 GAVI vaccine investment strategy (23). If successful, this would ensure free access to PEP in lower income, GAVI-eligible countries.

Countries also need a mechanism to prevent over-use of PEP, especially when successful control activities cause the incidence of rabies to decline. Bite prevention education (see outcome 1.1) and integrated bite case management (IBCM) are proposed as parallel strategies to reduce unnecessary costs and use of rabies biologicals (24). Bite prevention education aims to prevent dog bites in the first instance, while IBCM engages medical and veterinary sectors to assess the risk of genuine

exposure to rabies and the subsequent need for PEP (*Annex 6*). This provides a means for countries to reduce human treatment costs for rabies, as they concurrently reduce transmission risk through controlling rabies in dogs.

We will integrate last mile strategies to increase access of poor and rural populations to PEP into the global movement towards achieving universal health coverage, and support countries to evaluate and amend current practices for PEP procurement to ensure availability and access for all.

**Outcome 1.3: Human deaths from rabies exposures are prevented by ensuring equitable, affordable and timely access to healthcare, medicines and vaccines**

ACTIVITIES 2017–2020	EXPECTED OUTCOMES 2020
Support national plans that expand access to basic healthcare for all	Increased access to basic healthcare, especially for underserved populations
Leverage existing tools to support prudent use of PEP, PrEP and RIG by health services	Coherent, standardized, evidence-based tools and strategies for use of PEP, PrEP and RIG
Regional workshops to build capacity in best-practice rabies prevention and care	Improved availability and access to human rabies biologicals (see Annex 4–Banks)
Establish a biological bank to increase access to affordable human rabies biologicals	Mechanism to reduce rabies biological usage where rabies incidence is low (e.g. IBCM)
Promote the use of surveillance data for forecasting of vaccine needs	
Investigate bite prevention education and IBCM as strategies to reduce biological usage	

# OBJECTIVE 2

## TO GENERATE, INNOVATE AND MEASURE IMPACT

### OBJECTIVE 2.1 TO PROVIDE EFFECTIVE POLICIES, GUIDANCE AND GOVERNANCE

Coherent international standards and guidance reflect best practice in rabies control. We need to support countries to access and adapt this guidance to their local situation, and to monitor, assess and refine strategies with the greatest impact.

#### **Outcome 2.1: policies, guidelines, and governance to prevent human rabies deaths are created and adopted at regional and national levels**

Clear guidance, strategies and frameworks to prevent human rabies deaths provide a standardized structure for countries to adapt, own and implement. We will adapt existing knowledge, policies and tools into a coherent framework of standardized methods, operating procedures, guidance and governance, and incorporate them into universally available tools. This will ensure a consistent global approach to the surveillance, diagnosis and prevention of human and dog rabies.

Capacity-building and training to provide coordinated, comprehensive and complementary guidance to countries to support the development and delivery of national rabies control strategies. Training of human and animal health professionals will strengthen the effective use of vaccines, medicines and tools.

Harmonized international recommendations for rabies prevention in people and animals will streamline a One Health approach into policy development. We will update existing tools such as SARE (*Annex 7*) to provide coordinated, comprehensive guidance to countries (25). Our global approach will advocate for prioritization of rabies elimination, and provide a mechanism to tackle inequality in healthcare.

Efficient and effective governance of rabies elimination programmes will enable transparency at the national and regional levels, and encourage accountability. Based on global best practices and lessons learned from countries that have successfully combated rabies, we will provide guidance documents on how to clearly define the roles, responsibilities and accountabilities of persons and organizations involved in elimination activities to maximize the impact of investment.

Established reporting structures with defined linkages between departments will ensure continuity and progress of elimination activities in the context of changing political environments and personnel. We will support countries to set realistic and attainable goals, and to establish cross-sectoral working groups to advocate for and prioritize rabies elimination.

**Outcome 2.1:** Policies, guidelines and governance to prevent human rabies deaths are created and adopted at regional and national levels

<b>ACTIVITIES 2017-2020</b>	<b>EXPECTED OUTCOMES 2020</b>
<p>Review existing rabies guidelines and manuals to identify conflicts and gaps</p> <p>Engage countries and stakeholders to adapt existing tools for rabies prevention</p> <p>Develop and validate guidance for countries on roles, responsibilities and accountability</p>	<p>Coherent, standardized tools and strategies to prevent human rabies deaths</p> <p>Harmonized international recommendations for rabies prevention in humans and animals</p> <p>Established reporting structures and cross-sectoral working groups within countries</p>

## OBJECTIVE 2.2 TO ENSURE RELIABLE DATA TO ENABLE EFFECTIVE DECISION MAKING

### Outcome 2.2: appropriate technology and information are made available

Technology and health innovations will improve existing tools and programmes to produce practical, affordable technologies that simplify rabies case reporting, management, cost-effectiveness and reach. We will build on existing online resources such as the Rabies Blueprint and SARE (*Annex 7*), and develop appropriate additional technology for policy-makers, scientists, medical professionals, teachers and the public.

We will explore opportunities to improve rabies clinical diagnosis through e-learning courses and IT-based assessment tools, and how leveraging existing programmes such as toll-free numbers and village reporters can enhance decentralized rabies surveillance.

We will encourage countries to engage with national stakeholders to identify their own research needs, evaluate the potential for new innovations to be incorporated into health systems, and to find and share practical solutions, e.g. through cross-sectoral working groups

and regional workshops. Overall, we aim to stimulate innovation in vaccination strategies, diagnostics and supply chains, to meet current needs, with a focus on tools and technologies that can be applied universally and practically in resource-poor settings.

Improving rabies diagnostics will improve disease surveillance in humans and animals. Developing a reliable, safe, sensitive point-of-care diagnostic tool to detect viral infection in humans and animals after a bite exposure would overcome current diagnostic limitations (i.e. laboratory-based tests requiring sophisticated training, equipment and sample transportation). Through expert stakeholder consultations, we will seek support from the community of practice, and engage with countries, academia and industry to establish clear research priorities for rabies diagnostic tests.

We will update existing laboratory manuals to provide harmonized, current guidance for human and animal rabies diagnosis (using established WHO and OIE processes), and conduct practical regional workshops for programmatic training in rabies surveillance and diagnosis.

### Outcome 2.2: Appropriate technology and information are made available

ACTIVITIES 2017–2020	EXPECTED OUTCOMES 2020
Review current vaccine and diagnostic technologies to identify research gaps and needs	Innovative technological solutions in vaccines, diagnostics and supply chain
Review and update online tools for rabies education and elimination	Online tools for policy-makers, scientists, medical professionals, teachers and public
Engage stakeholders to promote innovation in rabies diagnosis and vaccine delivery	Coherent, standardized tools and strategies for robust rabies surveillance
Promote development of a reliable, safe, sensitive point-of-care diagnostic tool	
Update existing laboratory manuals to provide harmonized, evidence-based guidance	
Regional workshops to train technical staff in sampling, transport and laboratory diagnosis	

**Outcome 2.3: progress towards the goal is constantly and consistently monitored and reported**

Accurate and comprehensive monitoring for new rabies cases allows us to assess progress, validate rabies-free status, and target interventions and resources to areas where rabies is present. We will clarify best-practice surveillance systems for both human and animal rabies, and refine tools for countries to monitor and report data.

Through regional workshops, we will build surveillance capacity, share successes and lessons learned from proof-of-concept projects conducted by countries, and support the development of locally appropriate surveillance systems. Globally, we are promoting integrated reporting systems for human and animal surveillance data with a view to building a coordinated and comprehensive understanding of the rabies disease burden and the impact of interventions.

Reporting results and programme impacts allows us to identify interventions that work, demonstrate return on investment and assess progress towards our goals. We will support countries to collect and report programme data, and to use their own data to forecast vaccine needs, assess performance and target elimination approaches. We will establish processes to validate and verify progress towards zero human rabies deaths, and develop guidance for last mile strategies and how to maintain elimination once achieved.

**Outcome 2.3: Progress towards the goal is constantly and consistently monitored and reported**

ACTIVITIES 2017–2020	EXPECTED OUTCOMES 2020
Design and disseminate information on surveillance and data collection tools	Improved tools for rabies surveillance, data collection and analysis
Organize regional workshops to train technical staff in best-practice rabies surveillance	Integrated regional and global reporting systems for human and animal rabies data
Support establishment of clear reporting chains within human and veterinary health services	Regular programmatic monitoring at national and regional levels
Use surveillance data to demonstrate impact of investment in rabies elimination	Established process for validation and verification of reaching zero human rabies deaths
Engage countries to highlight importance of data reporting, and support them to improve	

# OBJECTIVE 3

## TO SUSTAIN COMMITMENT AND RESOURCES

Supporting the theory of change element: “sustained commitment drives progress”

By providing a coherent foundation for rabies control, our global strategic plan builds confidence in the feasibility of global elimination, and engages countries, stakeholders and development partners in the fight to end rabies. We will sustain commitment and drive progress through achieving the following outcomes:

### Outcome 3.1: key stakeholders are consistently and comprehensively engaged

Engaging stakeholders through effective advocacy encourages investment in elimination and creates an enabling policy environment. We will engage development partners from public and private sectors by demonstrating the value of investing in rabies elimina-

tion programmes. To prioritize areas where the burden of disease is highest, we will develop a regional advocacy strategy for Africa and Asia, and involve local leaders and international personalities to champion Zero by 30.

Advocacy to highlight the feasibility of rabies elimination promotes rabies prioritization within countries. We will develop advocacy materials and strategies that demonstrate why rabies elimination is a global public good (8). These will promote a One Health approach, including community engagement to build rabies awareness, dog vaccination to interrupt rabies transmission and increased access to life-saving PEP for people.

We will support countries to synergize rabies elimination programmes with other healthcare interventions to strengthen health systems and improve outcomes for other diseases. We will provide guidance to countries on how to approach development partners for financing, enabling them to own and implement local programmes to achieve their elimination goals.

### Outcome 3.1: Key stakeholders are consistently and comprehensively engaged

ACTIVITIES 2017–2020	EXPECTED OUTCOMES 2020
<p>Design and implement partnership strategies with the public and sectors</p> <p>Roll out communication campaigns to endemic countries</p> <p>Support development of robust, integrated national rabies elimination plans</p>	<p>Investment in rabies elimination by countries, and regional and international partners</p> <p>Regional advocacy strategies, including for Africa and Asia</p> <p>National rabies elimination plans integrated to strengthen health systems</p>

### **Outcome 3.2: finances and other resources are effectively and efficiently used**

Ensuring funding to reach Zero by 30 is essential to plan, implement and maintain rabies elimination activities. Existing models for vaccine forecasting and investments have been adapted to identify and predict resource needs. We will use programme outcomes to advocate for investment and establish clear resource mobilization strategies. We will support countries to obtain and invest their own funds in rabies elimination activities to ensure ownership and success.

### **Outcome 3.2: Finances and other resources are effectively and efficiently used**

<b>ACTIVITIES 2017–2020</b>	<b>EXPECTED OUTCOMES 2020</b>
<p>Review mechanisms for resource allocation, cost-sharing mechanisms and fundraising</p> <p>Organize regional workshops to engage countries in developing resource mobilization strategies</p> <p>Map existing and innovative funding mechanisms</p> <p>Synergize rabies elimination with other programmes, and engage new partners</p>	<p>Detailed budget formulated including established models, supply landscapes and resource projections</p> <p>Sustainable resource mobilization strategies available for countries to finance national plans</p>



### **Outcome 3.3: results and impact of the United Against Rabies collaboration are regularly monitored and reported to key stakeholders**

Regular monitoring and reporting of our impact to key stakeholders will showcase programme achievements and key milestones, and demonstrate progress towards our three objectives and Zero by 30 (see section 8.1: Workplan delivery monitoring and evaluation). Evaluating our activities will allow us to refine and improve implementation in subsequent countries and phases. Financing strategies for the activities described within the logic framework are contained in our detailed budget (see Chapter 7: Budget and governance).

We will collaborate with experienced external fund-raisers to generate investment in elimination and seek additional financing for the purchase of initial stock for the rabies biological banks. We will foster synergies with other programmes and explore innovative funding mechanisms.

### **Outcome 3.3: Results and impact of the United Against Rabies collaboration are regularly monitored and reported to key stakeholders**

<b>ACTIVITIES 2017–2020</b>	<b>EXPECTED OUTCOMES 2020</b>
<p>Advocate globally, regionally and at the country level for investment in elimination</p> <p>Deliver a resource mobilization campaign</p> <p>Review implementation and lessons learned in Phase 1 to inform and refine Phases 2 and 3</p>	<p>Regular reporting of the activities and impact of the United Against Rabies collaboration</p> <p>Sustained financing of rabies elimination efforts to achieve Zero by 30</p>



Rabies vaccination in Indonesia  
(Photo credit: WHO / SEARO / Budi Chandra)

# BUDGET AND GOVERNANCE

## A PHASED APPROACH TO FUNDING ZERO BY 30

At present, 100 countries are endemic for dog-mediated rabies: we cannot go from zero to full elimination in one go, and neither can we start work in all countries at the same time. We need to take a pragmatic approach and break down our ambitious global goal of Zero by 30 into small, achievable targets. To do this, we propose a three-phased approach to elimination:

### Phase 1: START UP

Phase 1 is where we will build a strong foundation for rabies elimination by preparing normative tools and structures to catalyse action. We will start by engaging countries that have the greatest chance of success: countries where rabies is a priority disease; countries already active in rabies control; countries where pilot projects are already running; and countries we can learn from to improve future implementation.

Developing national and regional rabies elimination plans are core phase 1 activities. Anchoring rabies control within a national programme is critical to ensure country ownership and a budgeted, sustainable approach that is adapted to local conditions. Our work is to support and catalyse countries to prepare their own national plans and facilitate their coalescence into a coordinated regional effort to reach our global goal of Zero by 30.

Our global strategic plan details the funding requirements for the core activities of Phase 1 only. This will allow us to stay agile, and flexibly adapt our strategy to accommodate new opportunities, changing environments and lessons learned along the way (see 7.2 Budget requirements: phase 1).

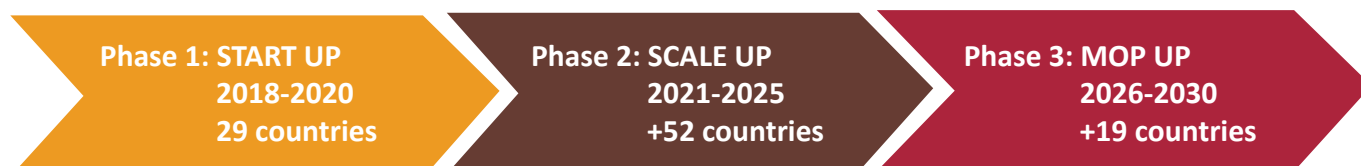
### Phase 2: SCALE UP

Phase 2 is where we expand to engage and involve most endemic countries in rabies elimination. Using the strong foundation established in Phase 1, refined and improved with learning and experience, we will expand our efforts and truly go global.

During this phase we will continue to support countries engaged in Phase 1, promoting the steady continuation of budgeted, sustainable national programmes as we begin the same process with many new countries. Promoting successes will maintain momentum and further inspire new countries to engage. Our focus will sharpen on regional elimination plans, by mobilizing countries to come together, build and implement a strategy for their region as we move towards Zero by 30.

### Phase 3: MOP UP

Phase 3 is where we engage remaining countries in the fight to eliminate rabies, and continue to support country efforts as communities, nations and regions advance to finish the job. This phase is the last mile. The lessons learned in phases 1 and 2 will be vital to ensuring the success of this final phase as the remaining 19 countries push towards rabies elimination. We will need to capitalize on all of the achievements from the first two phases and make Zero by 30 a reality.



## BUDGET REQUIREMENTS: PHASE 1

Our United Against Rabies collaboration is building a foundation for rabies elimination through normative, catalytic work to provide countries with the required support, tools and structures for success.

We estimate a total financial requirement for Phase 1 (start up: 2017–2020) of US\$ 16.5 million (see infographic: Budget overview for phase 1). This includes capacity-building to support countries to develop robust elimination strategies (36% of total budget); advocacy to prioritize rabies elimination (28% of total budget); and establishing coherent, harmonized global norms and standards (12% of total budget).

Our role is to catalyse change; to streamline investment between and across sectors, and support countries to develop and implement national plans that are pragmatic and evidence-based. Financing and implementing national rabies elimination plans at the country level is not included in our budget. Countries will be able to use their plans to mobilize domestic and international resources to finance and implement control activities.

Investing in rabies means health systems capable of reaching underserved populations. We will support countries to develop robust financing strategies for rabies elimination that are effective, sustainable and integrated into national programmes to strengthen health systems overall. International organizations are mandated to work to end rabies. “Zero human rabies deaths by 2030” is the target that together, we are working to achieve.

## BUDGET REQUIREMENTS: BEYOND 2020

In the long term, we estimate a total cost of US\$ 49.7 million (including the US\$ 16.5 million for phase 1) to implement the three phases of our global strategic plan and reach Zero by 30. This estimate takes into consideration various scenarios and modelling estimates, and assumes no evolution of the disease or change in proposed activities and that associated costs will remain constant over time. Twenty-nine countries are budgeted for inclusion in phase 1, however country selection will be made in the work planning based on the criteria outlined in section 7.1.

Most importantly, this estimate does not include financing for implementation of national rabies elimination plans at the country level. As part of our strategy, each country will be supported to devise the most disease appropriate action to reach zero human deaths by or before 2030. This will be done through the national rabies elimination plans. Countries will have to identify the resources and means, both domestic and international, to reach their own elimination goals. Our role is to support the countries to prepare and deliver on their national elimination plans.

We will review the projected budget towards the end of Phase 1, using the experience and data generated to revise estimates for Phase 2 (scale up: 2021–2025) and Phase 3 (mop up: 2026–2030) (see Figure 8). Phase 1 will establish the groundwork to streamline implementation of phases 2 and 3.

Reaching zero will have a huge impact on the lives and livelihoods of children and families around the world, but we cannot stop there. We will need to break transmission between dogs altogether, and maintain freedom from the disease. This is the beginning: the partners in the United Against Rabies collaboration are already working together, and with countries, to coordinate and catalyse global change. Investment in our global strategic plan will accelerate growth in and delivery of our united approach, as we make rabies elimination a reality.

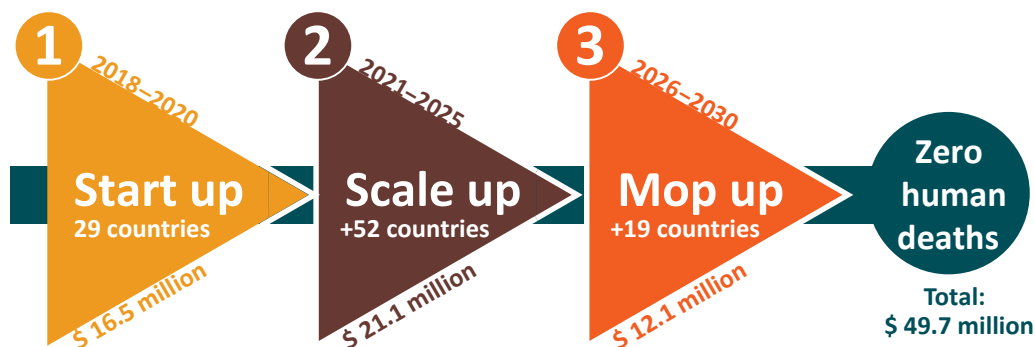


Figure 8. Three-phased approach to elimination

# Budget overview for Phase 1

Total cost for Phase 1: US\$ 16.5 million

Objective 1

US\$ 6.77 million

Million  
**\$ 1.96**

Increased awareness & improved education

**\$ 1.33**

Increased & effective dog vaccination

**\$ 3.48**

Ensure equitable, affordable & timely access to healthcare, medicines & vaccines

**\$ 3.00**

Policies & guidelines are created & adopted at regional & national levels

**\$ 2.30**

Appropriate technology & innovation are made available

**\$ 1.79**

Progress is constantly & comprehensively monitored & reported

**\$ 1.68**

Key stakeholders are consistently & comprehensively engaged

**\$ 0.67**

Finances & other resources are effectively & efficiently used

**\$ 0.29**

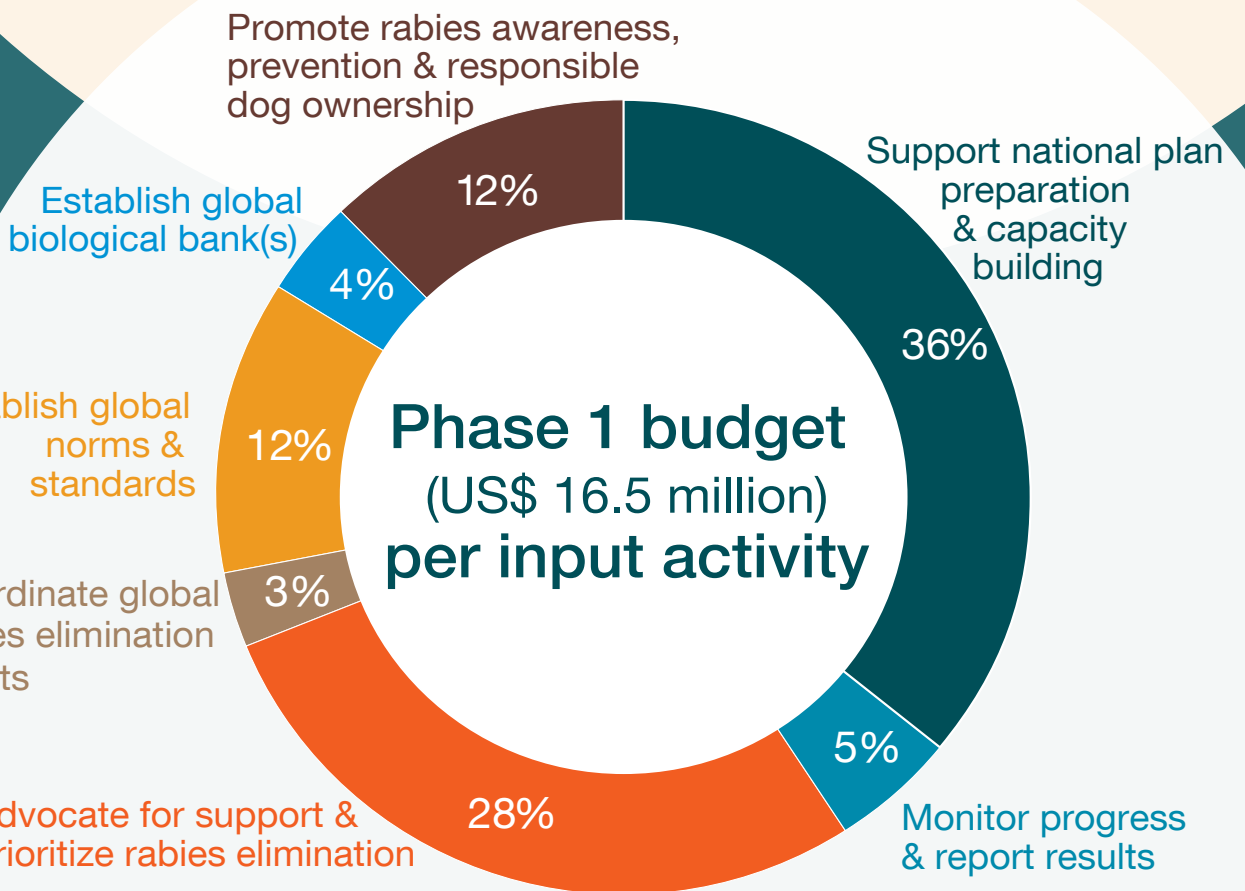
United Against Rabies' activities are transparently reported to key stakeholders

Objective 2

US\$ 7.09 million

Objective 3

US\$ 2.64 million



## GOVERNANCE

The United Against Rabies collaboration proposes to establish a Global Steering Group (GSG) comprised of one representative from each of the partner organizations WHO, OIE, FAO and GARC. This will be an agile core unit capable of responding to changing environments and needs.

The nominated representative will be knowledgeable and sufficiently senior to take programmatic and governance decisions on behalf of their institution. The GSG will elect a Chairperson from one of the four partner organizations for a two-year term either automatically, sequentially or by vote.

Where possible and required, the GSG will engage external working groups of experts, key stakeholders, development partners, country representatives and academics. This flexible, needs-based approach will allow for effective, evidence-based decision-making without large and unwieldy governance mechanisms.

The decisions taken by GSG members are not legally binding to their respective institutions, but rather, bind the partners in consensus towards a common goal. A key responsibility of the GSG will be to link the global strategic plan to a workplan with clear roles and responsibilities among partners. In this regard, the GSG will take all programmatic, financial and resource decisions related to delivering the global work plans for the United Against Rabies collaboration.



Mass dog rabies vaccination Payatas Manila  
(Photo credit: Gelay Conception / GARC)

# MONITORING OUR PROGRESS AND MANAGING RISKS

## WORKPLAN DELIVERY MONITORING AND EVALUATION

Countries are at the core of our global strategic plan. They have primary responsibility for implementing the activities detailed in their national rabies elimination plans. National plans should be referred to for details of national responsibilities, targets and progress indicators.

Using the objectives described in the global strategic plan as a basis, we will develop a detailed workplan to guide implementation. This will include a monitoring framework with defined, aligned, milestones to measure progress. The United Against Rabies collaboration will implement activities according to this workplan and assess progress against the major objectives outlined in our global strategic plan.

We will provide yearly reports on quantitative and qualitative outputs, and review our shared tools, templates and guidance at regular intervals. We will publish a summary of lessons learned at the end of each phase, and use this knowledge to inform and adjust activities and budget for the subsequent phase. Each year, partners in the United Against Rabies collaboration will invite stakeholders from countries, regions, academia and the public and private sectors to share progress and contribute expertise as we advance towards Zero by 30.

## RISK MITIGATION

### Our biggest risk is a slow start

We, as the four organizations forming the United Against Rabies collaboration, are working together, and will continue to work together, to reach Zero by 30, irrespective of funding. Zero by 30 provides a mid-term

horizon that requires immediate action. Recent modelling work shows that this goal is attainable if the supportive mechanisms critical to its success are put into place right now (26).

The world has lived with rabies for too long. We need to harness the momentum of the present global landscape and seize this opportunity to end human rabies deaths. Successful elimination efforts in countries supported in Phase 1 will ensure rapid progress towards the global goal and generate momentum to drive further country engagement.

The global strategic plan is a catalytic proposal: investment in this plan will accelerate the growth, delivery and impact of our activities. We advocate for investment in rabies to strengthen health systems and save lives, and are working with countries to develop sustainable resource mobilization strategies to implement national plans.

### Strong systems are sentinels

Disease outbreaks can divert attention and resources from core disease prevention programmes. Our cross-sector approach promotes national elimination plans and puts health systems' strengthening at their core. By building country capacity and integrating rabies control with other measures to strengthen health systems, we will demonstrate the value of country ownership of disease control and encourage countries to invest further in successful disease control programmes.

Health and surveillance systems with the capacity to detect and prevent endemic diseases, especially in underserved rural areas, are sentinels for detecting and responding to emerging diseases. Robust national rabies control programmes can integrate with epidemic response mechanisms to increase access and reach to populations at risk.



Chinese child with her dog  
(Photo credit: World Animal Protection)



# CONCLUSION

Reaching Zero by 30 will save the lives of children and the livelihoods of adults. Vulnerable rural communities will not carry the heavy economic burden imposed by the disease, from lost income or livestock. Most importantly, no one will ever suffer in pain and die from this preventable disease.

Investing in rabies strengthens health systems, improves equity and access to healthcare and contributes to sustainable development. The capacity-building required for rabies elimination is an investment not only in the elimination of a fatal but preventable disease but also in building capacity in the world's most neglected regions and improving access to health services within these communities.

For the first time in history, we are united to leverage existing knowledge, tools and technology in a new way. Now is the time to act, when we can gather the political will to engage and empower and make the societal changes we need to reach Zero by 30.

The United Against Rabies collaboration is already working with countries to coordinate and catalyse global change. Investing in the elimination of rabies will accelerate progress, as the world works to make this goal a reality by 2030.

Rabies elimination is feasible: the time to act is now.



# REFERENCES

1. Hampson K, Coudeville L, Lembo T, Sambo M, Kieffer A, Atlan M et al. Estimating the global burden of endemic canine rabies. *PLoS Negl Trop Dis*. 2015;9:e0003709. doi:10.1371/journal.pntd.0003709.
2. Baer GM. The natural history of rabies, 2nd edition. Boca Raton (FL): CRC press; 1991.
3. WHO Expert Consultation on Rabies: third report. Geneva: World Health Organization; 2018 .
4. Hampson K, Dobson A, Dushoff J, Magoto M, Sindoya E, Cleaveland S. Rabies exposures, post-exposure prophylaxis and deaths in a region of endemic canine rabies. *PLoS Negl Trop Dis*. 2008;2:e339. doi:10.1371/journal.pntd.0000339.
5. Wilde H. Failures of post-exposure rabies prophylaxis. *Vaccine*. 2007;25:7605–9. doi:10.1016/j.vaccine.2007.08.054.
6. Coleman PG, Dye C. Immunization coverage required to prevent outbreaks of dog rabies. *Vaccine*. 1996;14:185–6. PMID:8920697.
7. Knobel DL, Cleaveland S, Coleman PG, Fèvre EM, Meltzer MI, Miranda MEG et al. Re-evaluating the burden of rabies in Africa and Asia. *Bull World Health Organ*. 2005;83:360–8.
8. Rationale for investing in elimination of dog-mediated human rabies. Geneva: World Health Organization; 2015 ([http://apps.who.int/iris/bitstream/10665/185195/1/9789241509558\\_eng.pdf](http://apps.who.int/iris/bitstream/10665/185195/1/9789241509558_eng.pdf)).
9. Rabies is a tripartite (WHO–FAO–OIE) priority. Paris: World Organisation for Animal Health; 2014.
10. Global elimination of dog-mediated rabies: report of a global rabies conference, 10–11 December 2015. Geneva: World Health Organization; 2016 ([http://apps.who.int/iris/bitstream/10665/204621/1/WHO\\_HTM\\_NTD\\_NZD\\_2016.02\\_eng.pdf](http://apps.who.int/iris/bitstream/10665/204621/1/WHO_HTM_NTD_NZD_2016.02_eng.pdf)).
11. United Nations Sustainable Development Goals. In: Sustainable Development Knowledge Platform [website]. New York (NY): United Nations; 2015 (<https://sustainabledevelopment.un.org/>).
12. Resolutions adopted by the World Assembly of Delegates of the OIE during its 84th General Session (22–27 May 2016). Paris: World Organisation for Animal Health; 2016 ([http://www.oie.int/fileadmin/Home/eng/About\\_us/docs/pdf/Session/2016/A\\_RESO\\_2016\\_public.pdf](http://www.oie.int/fileadmin/Home/eng/About_us/docs/pdf/Session/2016/A_RESO_2016_public.pdf)).
13. Strategic work of FAO to reduce rural poverty. Rome: Food and Agriculture Organization of the United Nations; 2017 (<http://www.fao.org/3/a-i6835e.pdf>).
14. Rupprecht CE, Hanlon CA, Hemachudha T. Rabies re-examined. *Lancet Infect Dis*. 2002;2:327–43. PMID:12144896.
15. Scott TP, Coetzee A, de Balogh K, Wright N, Nel LH. The Pan-African rabies control network (PARACON): a unified approach to eliminating canine rabies in Africa. *Antiviral Res*. 2015;124:93–100. doi:10.1016/j.antiviral.2015.10.002.
16. Nel LH, Taylor LH, Balaran D, Doyle KA. Global partnerships are critical to advance the control of neglected zoonotic diseases: the case of the Global Alliance for Rabies Control. *Acta Trop*. 2017;165:274–9. doi:10.1016/j.actatropica.2015.10.014.
17. One Health zoonotic disease prioritization workshop. Atlanta (GA): United States Centers for Disease Control and Prevention, National Center for Emerging and Zoonotic Infectious Diseases; 2017 (<https://www.cdc.gov/onehealth/pdfs/one-health-zoonotic-disease-prioritization-workshop-508.pdf>).
18. Stimulus package for eliminating dog-mediated human rabies: a concept. Geneva: World Health Organization; 2016 (<http://apps.who.int/iris/bitstream/10665/254044/1/WHO-HTM-NTD-NZD-2016.6-eng.pdf>).
19. Balaran D, Taylor LH, Doyle KAS, Davidson E, Nel LH. World Rabies Day – a decade of raising awareness. *Trop Dis Travel Med Vaccines*. 2016;2:19. doi:10.1186/s40794-016-0035-8.
20. Fahrion AS, Taylor LH, Torres G, Müller T, Dürr S, Knopf L et al. The road to dog rabies control and elimination—What keeps us from moving faster? *Front Public Health*. 2017;5:103. doi:10.3389/fpubh.2017.00103.
21. Fitzpatrick MC, Hampson K, Cleaveland S, Mzimhiri I, Lankester DVM, Lembo T et al. Cost-effectiveness of canine vaccination to prevent human rabies in rural Tanzania. *Ann Intern Med*. 2014;160:91–100. doi:10.7326/M13-0542.
22. Meslin FX, Briggs D. Eliminating canine rabies, the principal source of human infection: what will it take? *Antiviral Res*. 2013;98:291–6. doi:10.1016/j.antiviral.2013.03.011.
23. Kallenberg, J. Gavi's vaccine investment strategy. In: WHO Product Development for Vaccines Advisory Committee (PDVAC) meeting -2017 [presentation]. Geneva: World Health Organization; 2017 ([http://www.who.int/immunization/research/meetings\\_workshops/PDVAC\\_2017\\_GAVI\\_VIS\\_Kallenberg\\_GAVI.pdf](http://www.who.int/immunization/research/meetings_workshops/PDVAC_2017_GAVI_VIS_Kallenberg_GAVI.pdf)).
24. Undurraga EA, Meltzer MI, Tran CH, Atkins CY, Elheart MD, Millien MF et al. Cost-effectiveness evaluation of a novel integrated bite case management program for the control of human rabies, Haiti 2014–2015. *Am J Trop Med Hyg*. 2017;96:1307–17. doi:10.4269/ajtmh.16-0785.
25. Developing a stepwise approach for rabies prevention and control. FAO/GARC Workshop, Rome, 6–8 November 2012 [FAO Animal and Health Proceedings, No. 18]. Rome: Food and Agriculture Organization of the United Nations; 2012 (<http://www.fao.org/3/a-i3467e.pdf>).
26. Wallace RM, Undurraga EA, Blanton JD, Cleaton J, Franka R. Elimination of dog-mediated human rabies deaths by 2030: needs assessment and alternatives for progress based on dog vaccination. *Front Vet Sci*. 2017;4:9. doi:10.3389/fvets.2017.00009.

# ANNEX 1

# What is rabies?

## EPIDEMIOLOGY

Rabies is present on all continents, except for Antarctica, where it is estimated to cause more than 59 000 deaths each year (1) (Figure A1.1). Global mortality estimates are highest in Asia and Africa. Dogs are responsible for 99% of human cases; however, bats are thought to be the original animal reservoir (2, 3). Rabies transmission via wildlife other than bats is considered rare.

## PATHOGENESIS AND CLINICAL DISEASE

Rabies is an acute encephalitis or meningoencephalitis caused by infection with a *lyssavirus* (2). The virus is present in the saliva of infected animals, and is transmitted through contact between the virus and wounds or other mucosal surfaces.

Infection establishes within the peripheral nervous system, spinal cord and brain. Clinical signs relate to inflammation and brain damage, and include hyperactivity, hallucinations and hydrophobia (furious rabies), or paralysis and coma (paralytic rabies), followed by death. In most cases, the incubation period is 2–3 months but can vary from 5 days to more than 1 year.

Rabies is fatal once clinical signs appear. It differs from many other infections in that clinical disease can be prevented through timely immunization, even after exposure to the infectious agent.

## DIAGNOSIS

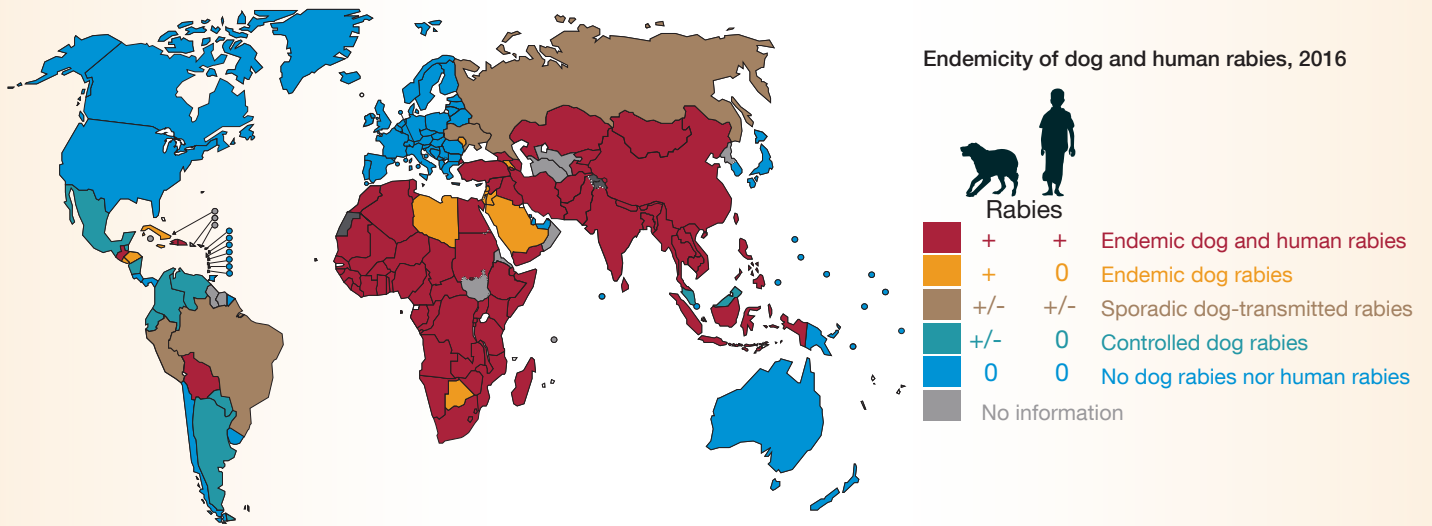
Clinical diagnosis of rabies is informed by patient presentation and history of exposure to a suspected rabid animal (2). Laboratory confirmation of human rabies can be performed ante-mortem or post-mortem on saliva, spinal fluid or tissue biopsies to detect intact virions, viral genomic RNA and antibody or antigen.

## PREVENTION

Prompt administration of post-exposure prophylaxis, consisting of thorough wound washing, rabies immunoglobulin in severe cases, and a series of human rabies vaccines, is highly effective in preventing death in persons exposed to the rabies virus (2). Vaccinating dogs in parallel to PEP provision is an effective, low-cost strategy to prevent transmission of rabies virus from dogs to humans. Education and awareness are key to prevent bites from rabid animals, promote dog vaccination and encourage people to seek timely treatment if exposed to rabies.

## REFERENCES

1. Hampson K, Coudeville L, Lembo T, Sambo M, Kieffer A, Attlan M et al. Estimating the global burden of endemic canine rabies. *PLoS Negl Trop Dis*. 2015;9:e0003709. doi:10.1371/journal.pntd.0003709.
2. WHO Expert Consultation on Rabies: third report. Geneva: World Health Organization; 2018.
3. Knobel DL, Cleaveland S, Coleman PG, Fèvre EM, Meltzer MI, Miranda MEG et al. Re-evaluating the burden of rabies in Africa and Asia. *Bull World Health Organ*. 2005;83:360–8.



**Figure A1.1.** Endemicity of dog-mediated human rabies (2)

# ANNEX 2

## Successful regional elimination in Latin America and the Caribbean, and proof-of-concept programmes in Africa and Asia

Successful rabies control programmes have been implemented throughout the world, demonstrating that elimination is technically feasible in different country contexts.

In Latin America and the Caribbean, the Pan American Health Organization (PAHO) has coordinated a regional programme to eliminate dog-mediated human rabies in urban areas (since 1983) and rural areas (since 1991).

Concerted efforts across the region have focused on expanding access to post-exposure prophylaxis (assisted by a revolving regional vaccine fund) (1), completing mass dog vaccination campaigns, improving rabies diagnosis and surveillance, and increasing rabies awareness through educational campaigns and community involvement (2). These activities led to an impressive and consistent decline in

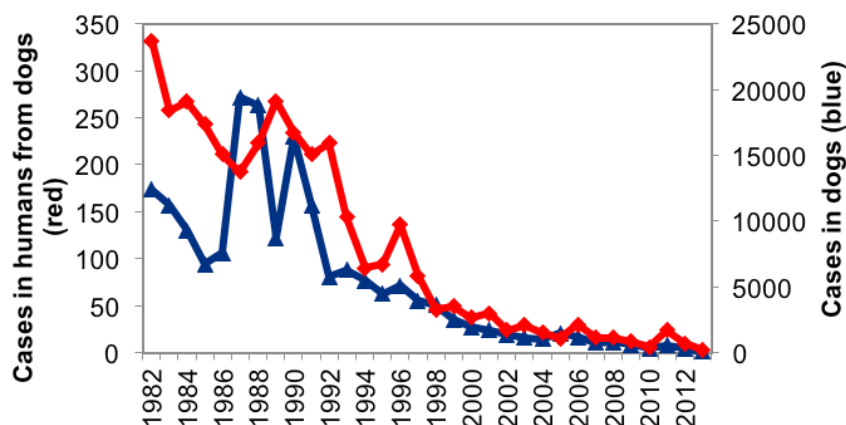
the number of human rabies cases reported across the region between 1980 and 2010:

- > 98% reduction in laboratory-confirmed dog rabies cases (from 25 000 to < 300)
- > 97% reduction in human rabies deaths (from 350 to < 10) (2) (Figure A2.1).

In 2016, only eight dog-mediated human rabies cases were reported in the region, all in Haiti (3).

At the heart of this region-wide success is the political commitment, dedicated vaccine budget and mass dog vaccination programmes enacted in all countries, and technical support from PAHO.

Biennial Regional Meetings of Rabies Program Directors (REDIPRAs) were crucial for strategic governance, collaboration and support between countries and to ensure robust regional surveillance (through the Regional Information System for Epidemiological Surveillance of Rabies, or SIRVERA) (3).



**Figure A2.1.** Numbers of human and dog rabies cases reported in Latin America and the Caribbean (1982–2012) Data courtesy of PANAFTOSA, Veterinary Public Health – PAHO/WHO

**Table A2.1.** Examples of successful rabies elimination programmes

<b>Location (reference)</b>	<b>Activities</b>	<b>Outcomes</b>
Latin America and the Caribbean 1980–2013 (2, 4)	<ul style="list-style-type: none"> <li>• Development of regional programmes for rabies control involving mass dog vaccinations, PEP provision, surveillance and education programmes</li> <li>• Regional surveillance system (SIRVERA)</li> <li>• Centralized operational strategy</li> </ul>	<ul style="list-style-type: none"> <li>• &gt; 97% reduction in human rabies cases region-wide</li> <li>• Zero dog-mediated human rabies reported in 28 of 35 countries</li> </ul>
Bangladesh 2010–present (5)	<ul style="list-style-type: none"> <li>• Over 5-fold increase in government investment to sustain and expand rabies control activities in 2017-2022</li> <li>• Capacity building: training dog vaccinators and dog catchers</li> <li>• Switch from dog population control to mass dog vaccination campaigns</li> <li>• Free PEP for bite victims</li> </ul>	<ul style="list-style-type: none"> <li>• &gt;90% reduction in human rabies cases</li> </ul>
Mexico 1990–2000 (2)	<ul style="list-style-type: none"> <li>• Media and community engagement</li> <li>• Mass dog vaccination campaigns</li> <li>• National rabies notification Decentralized surveillance system</li> </ul>	<ul style="list-style-type: none"> <li>• Zero human rabies deaths</li> </ul>
Philippines (Visayas) 2010–present (6, 7)	<ul style="list-style-type: none"> <li>• Rabies prevention, education and awareness activities</li> <li>• Establishment of a national rabies database</li> <li>• Mass dog vaccination campaigns</li> <li>• Use of dog vaccine banks</li> <li>• Free PEP for bite victims</li> </ul>	<ul style="list-style-type: none"> <li>• &gt; 80% decrease in human rabies cases from 2008 to 2013; &gt; 40% reduction from 2008 to 2015</li> <li>• Two provinces, five island municipalities and five smaller islands declared rabies-free</li> </ul>
South Africa (KwaZulu-Natal) 2007–2014 (7)	<ul style="list-style-type: none"> <li>• Training and awareness materials for medical staff and the public</li> <li>• Dog vaccine banks and strategic dog vaccination in high-risk “corridors”</li> <li>• Free PEP for bite victims</li> <li>• Rabies stimulus packages to support expansion of control activities</li> </ul>	<ul style="list-style-type: none"> <li>• Elimination of human rabies in KwaZulu-Natal</li> <li>• Expansion of control activities to neighbouring areas such as Eastern Cape, Lesotho and Swaziland</li> </ul>
Sri Lanka 1990–2014 (8)	<ul style="list-style-type: none"> <li>• National notification of human and animal rabies cases</li> <li>• Mass dog vaccination and sterilization campaigns</li> <li>• Free PEP for bite victims</li> </ul>	<ul style="list-style-type: none"> <li>• &gt; 85% reduction in human rabies cases</li> </ul>
United Republic of Tanzania (south-east) 2010–2015 (9)	<ul style="list-style-type: none"> <li>• Novel mobile phone surveillance system</li> <li>• Mass dog vaccination campaigns</li> <li>• Cost-saving switch from intramuscular to intradermal PEP</li> </ul>	<ul style="list-style-type: none"> <li>• &gt;75% reduction in animal bite cases (proxy for rabies exposure) across project sites</li> <li>• Local elimination of human cases on Pemba Island by 2014</li> </ul>

Furthermore, this experience highlighted the following:

- Different countries have different capabilities to implement rabies elimination plans. Setting short-term goals is easier to reconcile with country budgets, and prevents donor fatigue.
- Data gaps and inconsistent indicators of progress hamper control efforts. A robust regional database, such as SIRVERA, helps to ensure consistent monitoring across countries, and renew commitment to elimination.
- There is no room for inefficiency in the last mile of elimination. Operational research into maximizing the cost-effectiveness of last mile strategies is under way.

Moving forward, an understanding of capacity strengthening priorities, and integration of canine rabies control into the regional action plan, should deliver the impetus and the resources required to eliminate rabies in the region by 2022.

Table A2.1 highlights key activities and outcomes of a selection of rabies elimination programmes in Africa, Asia, and Latin America and the Caribbean.

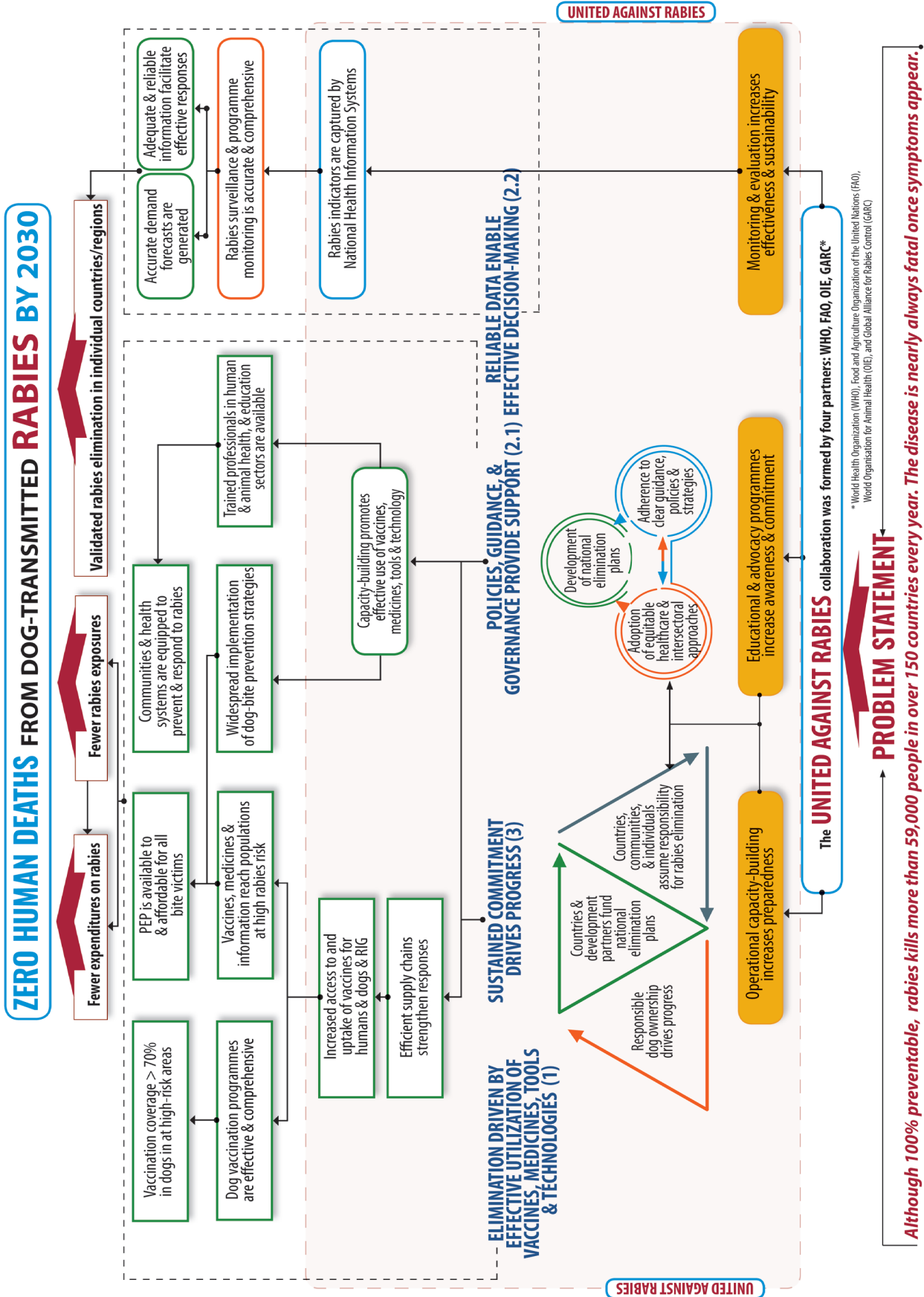
## REFERENCES

1. PAHO revolving fund. In: PAHO/WHO [website]; 2016 ([www.paho.org/revolvingfund](http://www.paho.org/revolvingfund)).
2. Vigilato MAN, Clavijo A, Knobl T, Silva HMT, Cosivi O, Schneider MC et al. Progress towards eliminating canine rabies: policies and perspectives from Latin America and the Caribbean. *Philos Trans R Soc Lond B Biol Sci.* 2013;368:20120143. doi: 10.1098/rstb.2012.0143.
3. Del Rio Vilas VJ, Freire de Carvalho MJ, Vigilato MAN, Rocha F, Vokaty A, Pompei JA, Molina Flores B et al. Tribulations of the last mile: sides from a regional program. *Front Vet Sci.* 2017;4:4. doi:10.3389/fvets.2017.00004.
4. Vigilato MAN, Cosivi O, Knöbl T, Clavijo A, Silva HMT. Rabies update for Latin America and the Caribbean. *Emerg Infect Dis.* 2013;19:678–9. doi:10.3201/eid1904.121482.
5. The Rabies Elimination Program of Bangladesh. In: WHO/Neglected tropical diseases [website]. Geneva: World Health Organization; 2017 ([http://www.who.int/neglected\\_diseases/news/Bangladesh-rabies-elimination-program/en/](http://www.who.int/neglected_diseases/news/Bangladesh-rabies-elimination-program/en/)).
6. Lapiz SMD, Miranda MEG, Garcia RG, Daguro LI, Paman MD, Madrinan FP et al. Implementation of an intersectoral program to eliminate human and canine rabies: the Bohol Rabies Prevention and Elimination Project. *PLoS Negl Trop Dis.* 2012;6:e1891. doi:10.1371/journal.pntd.0001891.
7. Rationale for investing in elimination of dog-mediated human rabies. Geneva: World Health Organization; 2015 ([http://apps.who.int/iris/bitstream/10665/185195/1/9789241509558\\_eng.pdf](http://apps.who.int/iris/bitstream/10665/185195/1/9789241509558_eng.pdf)).
8. Harischandra PL, Gunsekera A, Janakan N, Gongal G, Abela-Ridder B. Sri Lanka takes action towards a target of zero rabies death by 2020. *WHO South East Asia J Public Health.* 2016;5:113.
9. Mpolya EA, Lembo T, Lushasi K, Mancy R, Mbunda EM, Makungu S et al. Toward elimination of dog-mediated human rabies: experiences from implementing a large-scale demonstration project in southern Tanzania. *Front Vet Sci.* 2017;4:21. doi:10.3389/fvets.2017.00021.



# ANNEX 3

## The theory of change



# ANNEX 4

## The logic framework for the United Against Rabies collaboration

Objective 1: Elimination driven by effective utilization of vaccines, medicines, tools and technologies		
Outcomes	Outputs	Major activities
1.1 Rabies is prevented through increased awareness and improved education	1.1.1 Strategies put in place to educate and create awareness for rabies prevention	Establish awareness and educational campaigns Implement dog bite prevention strategies
	1.1.2 Localized tools and strategies created to promote responsible dog ownership	Encourage and educate about responsible dog ownership Conceptualize cultural differences that impact the societal role and value of dogs (e.g. ecology, human interaction)
1.2 Rabies is prevented through increased and effective dog vaccination	1.2.1 National strategies created and capacity improved for dog vaccination programmes	Optimize vaccination strategies Initiate capacity-building for dog vaccination Ensure rabies control strategies reach both confined and free-roaming dog populations Ensure ≥ 70% “at-risk” population coverage
	1.2.2 High-quality dog vaccine banks established and vaccines delivered to countries	Complete design, modelling and validation for stocks and vaccine banks Complete safety and quality checks for vaccine stocks and banks, where relevant Complete inspection of vaccine stocks and banks along supply chain, where relevant
	1.2.3 Countries supported to conduct effective dog vaccination campaigns	Identify and reach previously undetected or hard-to-reach dog populations Ensure appropriate structures and technologies are utilized Ensure efficiency of supply chain Ensure trained personnel are available to respond Implement programmes to match vaccine need with vaccine demand Promote guidelines for effective dog population management
1.3 Human deaths from rabies exposures are prevented by ensuring equitable, affordable and timely access to health-care, medicines and vaccines	1.3.1 Improved treatment, and effective prevention, of potential and confirmed rabies exposures in humans	Promote the most safe, efficacious and efficient PEP techniques and IBCM Ensure PEP availability in primary point of care Train staff to assess and manage animal bite cases Employ accurate demand vaccine forecasting techniques Increase access to and affordability of RIG Promote less and fewer out-of-pocket expenditures for individuals Increase palliative care availability for end-stage patients
	1.3.2 High-quality and safe biological banks and stocks for humans established	Complete design, modelling and validation for stocks Establish communications, advocacy and engagement for bank(s) Define bank(s) relationship to supply chain Complete safety and quality checks for stocks Complete systematic inspection of vaccine stocks along supply chain
	1.3.3 Last mile strategy implemented to reach high-risk human populations	Identify and reach underserved human populations Ensure appropriate structures and technologies are utilized Ensure efficiency of supply chain Ensure trained personnel are available to respond Ensure vaccine need matches vaccine demand

## Objective 2.1: Policies, guidance and governance provide support

Outcomes	Outputs	Major activities
2.1 Policies and guidelines, and governance to prevent human deaths from rabies exposure are created and adopted at regional and national levels	2.1.1 Clear guidance, strategies, priorities and legal frameworks at global, regional and national levels provided to prevent human deaths	<p>Complete WHO and OIE recommendations and FAO guidelines</p> <p>Define guidelines for regulatory framework</p> <p>Update and embed stepwise approach to national rabies elimination policies and plans in line with the global framework</p> <p>Implementation of One Health approach embedded within strong human and animal health services</p>
	2.1.2 Efficient and effective governance of regional and national rabies elimination programmes established	<p>Establish cross-sectoral working group</p> <p>Establish roles, responsibilities and accountability</p>
2.2 Appropriate technology and information are made available	2.2.3 Technology and health innovations to eliminate human deaths from rabies fostered	<p>Incorporate existing tools and leverage existing programmes</p> <p>Promote ICT-based enablers including surveillance tools</p> <p>Promote supply chain innovations</p> <p>Promote innovation into new vaccines and vaccine strategies</p> <p>Promote innovative rapid and sensitive diagnostics</p> <p>Promote dog population management tools (e.g. movement control, contraceptive technology, identification)</p>

## Objective 2.2: Reliable data enables effective decision-making

Outcomes	Outputs	Major activities
2.3 Progress towards the goal is constantly and consistently monitored and reported	2.3.1 Robust disease surveillance in human and animals established, supported by improved diagnostics procedures	<p>Initiate capacity-building for laboratory diagnostics</p> <p>Train staff in surveillance and diagnostic methods</p> <p>Promote innovative strategies for surveillance and diagnostic methods</p>
	2.3.2 Accurate and comprehensive monitoring for new rabies cases	<p>Identify, define and monitor indicators (e.g. bites, deaths, PEP usages, and clinical and laboratory data)</p> <p>Conduct constant and consistent surveillance of cases</p> <p>Ensure documentation of bite cases</p> <p>Monitor dog populations (e.g. numbers, geography, demographics, vaccination status)</p> <p>Establish and enhance reporting framework and reporting chain</p> <p>Assess baselines to evaluate progress and target responses</p> <p>Conceptualize social factors that negatively affect reporting</p> <p>Identify and reach areas in need of additional support</p> <p>Identify and use shortcomings as teaching and learning opportunities</p>
	2.3.3 Regular and high-quality results reporting on programme impacts	<p>Conduct frequent performance measurements</p> <p>Measure progress towards rabies elimination</p> <p>Showcase proof-of-concept programmes</p> <p>Demonstrate connections between programme and saving human lives</p> <p>Demonstrate cost-effectiveness and return on investment</p> <p>Create and utilize verification dossier for reaching zero human rabies cases</p> <p>Establish “final inch” strategies</p> <p>Generate plans for maintenance of rabies elimination once achieved</p>

## Objective 3: To sustain commitment and resources

Outcomes	Outputs	Major activities
3.1 Key stakeholders are consistently and comprehensively engaged	3.1.1 Increased stakeholder commitment through effective advocacy	Implement advocacy materials, roadmaps and strategies for all stakeholders Expand the range of and engage unique stakeholders within all sectors
	3.1.2 Sustained advocacy to highlight importance and feasibility of rabies elimination	Establish communications and engagement programmes Promote recognition of rabies as a global public threat and foster goodwill for elimination Generate recognition of dog vaccination as the most effective way to achieve rabies elimination
3.2 Financial and other resources are effective and used efficiently	3.2.1 Funding commitments to reach zero human deaths from rabies ensured and sustained	Complete and utilize vaccine demand modelling, supply landscapes and market economic projections Establish clear resource mobilization strategies Encourage countries to invest their own funds Utilize rabies and programme impacts to leverage success
	3.2.2 Sustainable programme financing strategies created, resources mobilized and use monitored	Generate an adequate supplementary budget and complete costings based on available data Promote and facilitate cost-sharing mechanisms (e.g. PPPs) Identify innovative funding mechanisms Foster synergies with other programmes Identify innovative funding mechanisms
3.3. Activities of the United Against Rabies collaboration are transparently reported to key stakeholders	3.3.1 Results and impact of United Against Rabies collaboration regularly monitored and reported to key stakeholders	Review of United Against Rabies activities in countries and regions using programme indicators Annual review and publication of all activities and budget of the United Against Rabies collaboration

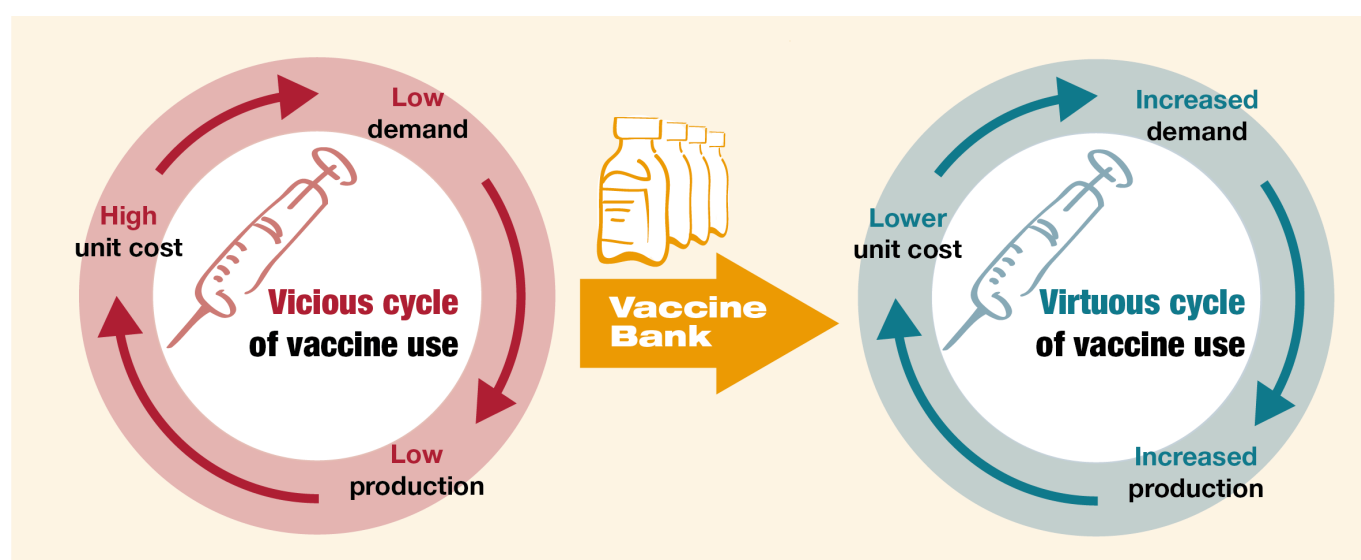
# ANNEX 5

## Human and animal rabies biological banks

### CATALYSING ACCESS TO LIFE-SAVING RABIES BIOLOGICALS

Access to rabies vaccines and biologicals is a key component of the global strategic plan, and triggers national programmes. For both human and animal diseases, biological banks have improved access to affordable, safe and quality-assured vaccines, stimulated programme activities at all levels for all stakeholders and helped to convert a vicious cycle of vaccine use to a virtuous cycle (1) (Figure A5.1).

We propose a similar mechanism to increase timely access to affordable human and dog vaccines and rabies immunoglobulins to prevent human rabies deaths.



**Figure A5.1.** Vaccine banks convert a vicious cycle of vaccine use to a virtuous cycle

### HOW THE RABIES BIOLOGICAL BANKS WILL WORK

Biological banks provide a procurement and distribution mechanism for underutilized biologicals, giving a catalytic push to help countries improve access to life-saving vaccines and rabies immunoglobulins. Centralized procurement and distribution reduces transaction costs, simplifies delivery, ensures a stable supply of quality-assured vaccine, increases production and brings pressure on price in exchange for volume. Our proposal draws on mechanisms and lessons learned from previous stockpiles for human diseases

such as cholera, meningitis and yellow fever, and the existing dog rabies vaccine bank of OIE (see Vaccine banks in action for examples).

We propose the following:

- Tenders to supply vaccines or rabies immunoglobulin will be issued to suppliers with high-quality products, who can manufacture sufficient biological quantities and ensure timely delivery.
- Rabies biologicals will be dispatched directly to countries through organizations and agencies purchasing biologicals for in-country activities, following existing, defined WHO and OIE processes when appropriate.

**Human rabies biologicals** will follow existing best practices established by WHO, including:

- clearly established criteria for release of vaccine to countries;
- standardized request forms;
- assured product quality through WHO prequalification processes;
- effective monitoring and evaluation of biological usage; and
- guidance on data required for reporting and evaluation of biological usage.

**Dog rabies vaccines banks** established according to international standards will benefit from guidelines, recommendations and best practices established by OIE (2). Countries may use the banks to procure quality-assured dog rabies vaccines at a preferential rate for use in mass vaccination campaigns.

Existing rabies models will inform initial estimates of biological needs to supply the banks (3, 4).

## **BIOLOGICAL BANK'S BUDGET**

We anticipate the biological banks to be a self-sustaining revolving fund.

Establishing the global human and dog rabies biological banks will require an initial investment to support activities related to supply chain, safety checks for human biologicals, modelling global rabies biological requirements, and establishing communications, advocacy and engagement.

To counterbalance currently poor vaccine forecasting and assure manufacturers of vaccine uptake and delivery, financing for the initial purchase of human and dog rabies biologicals to supply the banks will be independent of the financing call for the global strategic plan.

## **VACCINE BANKS IN ACTION**

Existing vaccine stockpiles such as the global cholera stockpile and the OIE dog rabies vaccine bank have created impetus for stakeholders to address neglected diseases by incentivizing ownership and realization of effective disease control programmes.

## **AN EXAMPLE OF A GLOBAL STOCKPILE**

Cholera, a disease of vulnerable populations, is responsible for global pandemics and explosive outbreaks. It is endemic in 50 countries, and poses a risk to an estimated 1.5 billion people worldwide. In 2013, WHO

established the oral cholera vaccine (OCV) stockpile to improve outbreak preparedness and response, and expand vaccine coverage in high-risk areas and populations (5).

During the first three years of operation, the stockpile procured and distributed more cholera vaccine than in the previous 15 years combined (*Figure A5.2*). Through careful management, production of cholera vaccine has since increased in step with demand. An anticipated 17 million doses of OCV were produced and consumed in 2017, with the potential for production to increase to 25 million doses per annum and an ensuing reduction in cost per dose in exchange for volume.

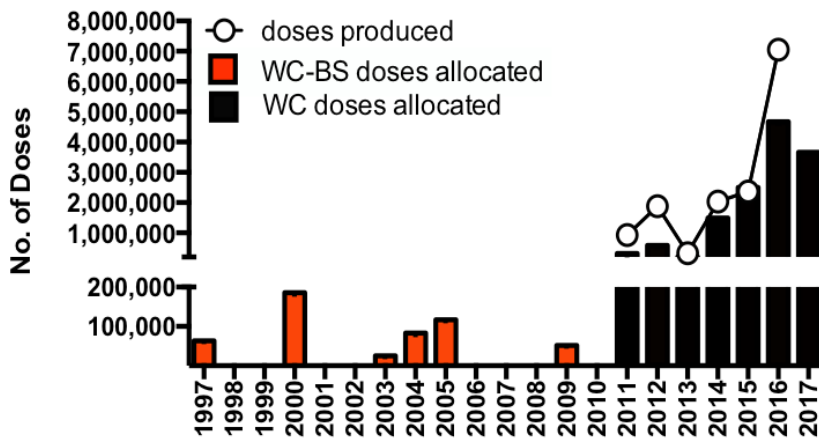
The outcomes of creating the OCV stockpile are greater than simply a procurement and distribution mechanism for vaccine. The stockpile stimulated GAVI investment of US\$ 150 million, brought an additional vaccine manufacturer to market, generated programme activity in-country, and catalysed the formation of the Global Task Force for Cholera Control. Together, these outcomes have contributed to a fundamental shift from disease response, to active prevention and control.

## **WORLD ORGANISATION FOR ANIMAL HEALTH (OIE) VACCINE BANKS**

In 2012, OIE established a regional vaccine bank to increase access to quality-assured, affordable dog rabies vaccines for use in planned vaccination campaigns. The OIE bank is operational in Asia and Africa and, as of December 2017, has supplied more than 19 million dog rabies vaccines to 28 countries (7). This includes 5 million doses purchased by OIE (with donor funds), 0.3 million doses purchased directly by countries and 13.8 million doses purchased by WHO for country operations.

The OIE Rabies Vaccine Bank can be compared to a supply agreement. It is managed as a combination between a rolling stock (held by the vaccine manufacturers) and production on demand: vaccines are produced and delivered, in response to official country (or WHO) requests approved by OIE, by vaccine suppliers pre-selected through an international call for tender.

Access to the OIE Rabies Vaccine Bank by OIE Member countries is subject to the existence of a national rabies disease control strategy and supported by a justificatory rationale for the use of the vaccines (e.g. to address an emergency outbreak, as a stimulus to launch a national strategy). Access should be temporary, and thus a sustainability plan is also required. Upon receipt and use of the vaccines, the beneficiary must provide a detailed report on the use of the vaccines, including impact and lessons learned.



**Figure A5.2.** Doses of oral cholera vaccines used worldwide (1997–2017)  
 WC-BS: whole cell/recombinant-B-unit oral cholera vaccine  
 Source: reference (6)

## REFERENCES

1. Abela-Ridder B, Martin S, Gongal G, Engels D. Rabies vaccine stockpile: fixing the supply chain. *Bull World Health Organ.* 2016;94:635.
2. Vaccine banks. In: OIE terrestrial manual 2016. Paris: International Organisation for Animal Health; 2016 [version adopted by the World Assembly of Delegates of the OIE in May 2016]:1.1.10 ([http://www.oie.int/fileadmin/Home/eng/Health\\_standards/tahm/1.01.10\\_VACCINE\\_BANKS.pdf](http://www.oie.int/fileadmin/Home/eng/Health_standards/tahm/1.01.10_VACCINE_BANKS.pdf)).
3. Hampson K, Coudeville L, Lembo T, Sambo M, Kieffer A, Attlan M et al. Estimating the global burden of endemic canine rabies. *PLoS Negl Trop Dis.* 2015;9:e0003709. doi:10.1371/journal.pntd.0003709.
4. Wallace RM, Undurraga EA, Blanton JD, Cleaton J, Franka R. Elimination of dog-mediated human rabies deaths by 2030: needs assessment and alternatives for progress based on dog vaccination. *Front Vet Sci.* 2017;4:9. doi:10.3389/fvets.2017.00009.
5. Oral cholera vaccine stockpile for cholera emergency response. Geneva: World Health Organization; 2013 ([http://www.who.int/cholera/vaccines/Briefing\\_OCV\\_stockpile.pdf](http://www.who.int/cholera/vaccines/Briefing_OCV_stockpile.pdf)).
6. Pezzoli L. Deployments of the oral cholera vaccine stockpile, 2013–2017. *Wkly Epidemiol Rec.* 2017;32:437–52.
7. Vaccine Banks. In: OIE: protecting animals, preserving our future [website]. Paris: World Organisation for Animal Health; 2016 (<http://www.oie.int/support-to-oie-members/vaccine-bank>).

# ANNEX 6

## Integrated bite case management (IBCM)

### WHAT IS IBCM?

Dog bites, licks and scratches are extremely common, but not all dogs are rabid. Even in areas where canine rabies is endemic, most of these exposures are not from rabid animals. Integrated bite case management, or IBCM, offers a means to determine whether a dog bite is likely to constitute exposure to rabies, and therefore if post-exposure prophylaxis is, or is not, indicated (1).

Providing PEP for suspected or possible rabies exposures, as opposed to providing PEP for all dog bite victims regardless of risk, has huge potential to reduce unnecessary use of rabies biologicals. This is particularly important in situations where the incidence of rabies in dog populations is low (e.g. following successful control interventions), but rabies awareness, treatment-seeking behaviour and therefore treatment costs for people bitten by dogs remain high.

IBCM provides a strategy for countries to reduce human treatment costs for rabies, as they concurrently reduce transmission risk through control of rabies in dog populations.

### HOW DOES IBCM WORK?

IBCM requires clear communication between human and animal health sectors to (i) determine the risk of rabies in the biting animal; and (ii) use this information to assess the risk of rabies exposure in the bite victim, and provide treatment accordingly. Animals involved in human exposure that are not available for assessment are considered rabies-suspect.

Determining whether rabies exposure is suspected considers risk factors such as:

- Rabies epidemiology in the country – is rabies present where the bite occurred?
- Severity of exposure – multiple, deep bites, and bites to the head or neck are higher risk
- Clinical features of the biting animal – does it appear rabid?
- Vaccination status of the biting animal – vaccinated animals are unlikely to have rabies
- Laboratory testing results – to confirm or rule out rabies in the biting animal

Timely medical and veterinary responses improve case detection rates and ensure appropriate case management. Investigating suspect rabid animals further helps to prevent human rabies deaths by actively identifying rabies exposures, and can improve surveillance quality overall.

### IBCM IN ACTION

In a pilot programme conducted in Haiti, IBCM was more cost-effective (i.e. lower cost per death averted) and associated with better health outcomes (i.e. more lives saved) than no IBCM. Further research is needed to assess the feasibility and impact of IBCM in a variety of settings and its potential for up-scaling.

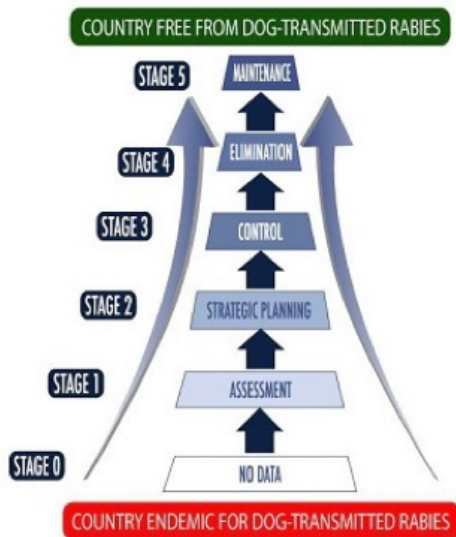
### REFERENCES

1. Undurraga EA, Meltzer MI, Tran CH, Atkins CY, Elheart MD, Millien MF et al. Cost-effectiveness evaluation of a novel integrated bite case management program for the control of human rabies, Haiti 2014–2015. *Am J Trop Med Hyg.* 2017;96:1307–17. doi:10.4269/ajtmh.16-0785.



# ANNEX 7

## The stepwise approach towards rabies elimination



**Figure A7.1** The five stages of SARE

The stepwise approach to rabies elimination, or SARE, is a tool to assist countries to develop national plans, enhance intersectoral collaboration and measure progress towards rabies elimination (1). We can adapt SARE to reflect the coherent, best practice approach to rabies elimination integral to our global strategic plan.

Linked to practical guidance provided by the Blueprint for Rabies Prevention and Control (<http://rabiesblueprint.org/>), SARE guides countries through the stages of increased control of dog-mediated rabies. It defines the criteria for moving from one stage to the next: countries progress from Stage 0 (endemic with little data or control capacity) to Stage 5 (zero human rabies deaths) (Figure A7.1).

Four activities are key across all stages:

- dog vaccination;
- rabies awareness and communication;
- making PEP available and accessible; and
- capacity to diagnose rabies and monitor incidence

SARE is a self-assessment tool that enables countries to evaluate what stage they are at, prioritize next steps to guide policy-makers and objectively assess progress. It has proven value as a planning tool for individual countries, and for the development of common regional elimination strategies.

Created by GARC and FAO, all partner organizations of the United Against Rabies collaboration were involved in its conception, and support its use by providing SARE training in more than 40 countries.

### SARE IN ACTION: A CASE STUDY FROM ETHIOPIA

Ethiopia is estimated to have the second largest number of rabies deaths of all African countries. In 2016, the Ethiopian government hosted an intersectoral meeting to assess progress towards elimination of dog-mediated rabies at national and regional levels.

Participants undertook a self-assessment using the SARE scoresheet, which allowed activities within several categories to be marked as accomplished or pending (2). Categories included: legislation; surveillance; education and communication; prevention and control; and cross-cutting issues. This exercised enabled overall assessment of capacity for rabies control, and analysis of how control measures were being applied across the country.

The assessment identified several critical gaps, including poor inter-sectoral collaboration and limited availability of and access to dog vaccine. Strengths included the existence of a surveillance system for rabies, and legislation for outbreak declaration and response. Overall analysis showed that Ethiopia is still in the early stages of rabies control (Stage 0.5/5). SARE enabled key gaps in capacity to be identified and prioritized. This will allow the national rabies elimination plan to be accelerated, and Ethiopia to progress more rapidly towards zero human rabies deaths by 2030.

### REFERENCES

1. Developing a stepwise approach for rabies prevention and control. FAO/GARC Workshop, Rome, 6–8 November 2012 [FAO Animal and Health Proceedings, No. 18]. Rome: Food and Agriculture Organization of the United Nations; 2012 (<http://www.fao.org/3/a-i3467e.pdf>).
2. Coetzer A, Kidane AH, Bekele M, Hundera AD, Pieracci EG, Shiferaw ML et al. The SARE tool for rabies control: current experience in Ethiopia. *Antiviral Res.* 2016;135:74–80. doi:10.1016/j.antiviral.2016.09.011.

# RABIES IS A MAJOR PUBLIC HEALTH PROBLEM



**Fatal** once symptoms appear



**One death** every 9 mins worldwide

**59 000** deaths / year



**99 %**

of human cases result from **dog bites**



**4 out of 10 deaths** are in **children**

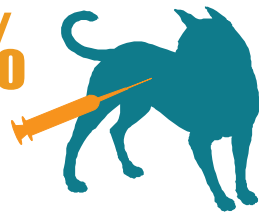
## Human rabies is 100% vaccine-preventable

Thorough **washing** of the wound with soap, and **vaccine injection** save lives



## Dog vaccination can eliminate human rabies

Vaccinating **70%** of dogs in high-risk areas **breaks** rabies transmission cycle



## Raising awareness is essential

To prevent dog bites  
To ensure prompt medical help  
To increase responsible dog ownership



## Elimination is feasible and cost effective

- Tools and technical knowledge exist
- Throughout the world, most domestic dogs are accessible for mass vaccination campaigns
- Proof-of-concept programmes demonstrate feasibility in different country contexts
- All communities should benefit from our ability to eliminate rabies

References: WHO second Expert Report, WHO fact sheet 99, Rabies: rationale for investing in the global elimination of dog-mediated human rabies



ISBN 978-92-4-151383-8



9 789241 513838