

# A generic framework for control, elimination and eradication of neglected tropical diseases (NTDs): Rabies

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# 17 Neglected Tropical Diseases

## Helminth Infections

- Soil-transmitted helminth infections
- Ascariasis-Trichuriasis-Hookworm
- Lymphatic filariasis
- Onchocerciasis
- Schistosomiasis
- Dracunculiasis (guinea-worm disease)
- Cysticercosis
- Echinococcosis
- Foodborne trematodes infections

## Bacterial Infections

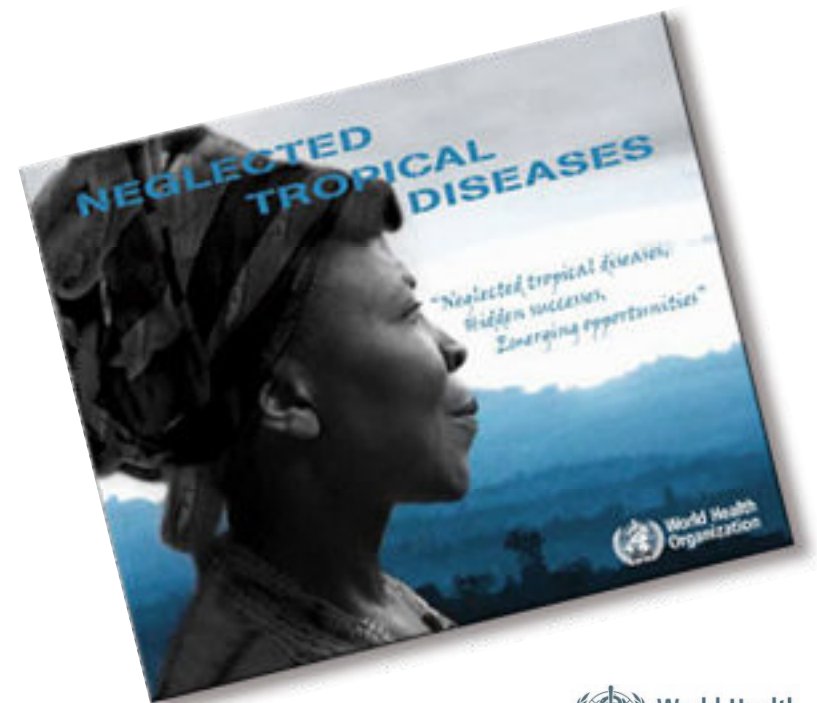
- Leprosy
- Trachoma
- Buruli ulcer
- Endemic treponematoses

## Viral Infections

- Dengue
- Rabies

## Protozoan Infections

- Leishmaniasis
- Human African trypanosomiasis
- Chagas disease



# Definitions

- **Control** - Reduction of disease incidence, prevalence, morbidity, and/or mortality to a locally acceptable level (potentially quantified) as a result of deliberate efforts; continued intervention measures are typically required to maintain the reduction.

**Elimination as a public health problem (EPHP)**- Effective control may lead to reduction of transmission and burden of disease such that a specific disease or impairment may cease to be of public health importance or even to zero incidence of that specific disease, leading to elimination.

- **Elimination (interruption of transmission, EOT)** - Reduction to zero of the incidence of infection caused by a specific pathogen in a defined geographical area as a result of deliberate efforts; **continued actions to prevent re-establishment of transmission may or may not be required.**
- **Eradication** - Permanent reduction to zero of the worldwide incidence of infection caused by a specific pathogen as a result of deliberate efforts with no more natural risk of reintroduction and therefore no more actions needed. Eradication requires a formal certification process.
- **Extinction** - Eradication of the specific pathogen such that it no longer exists in nature or the laboratory (and any use of the pathogen is not possible anymore).

# WHO Roadmap targets for eradicating and eliminating neglected tropical diseases

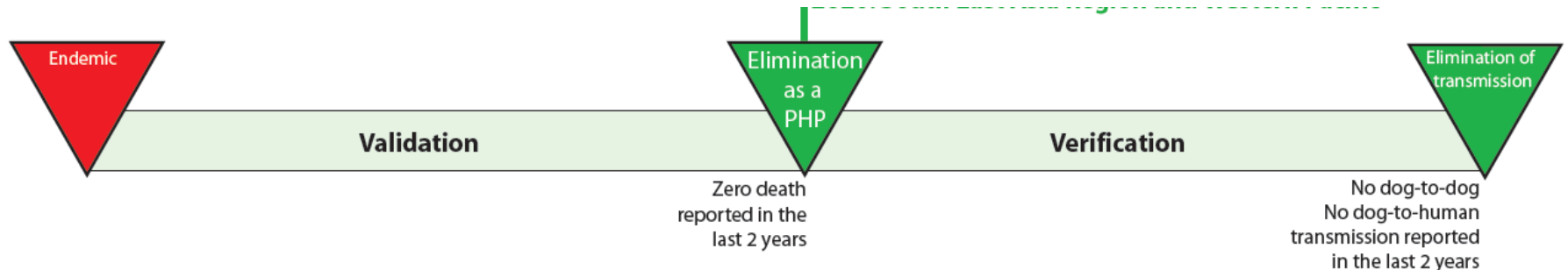
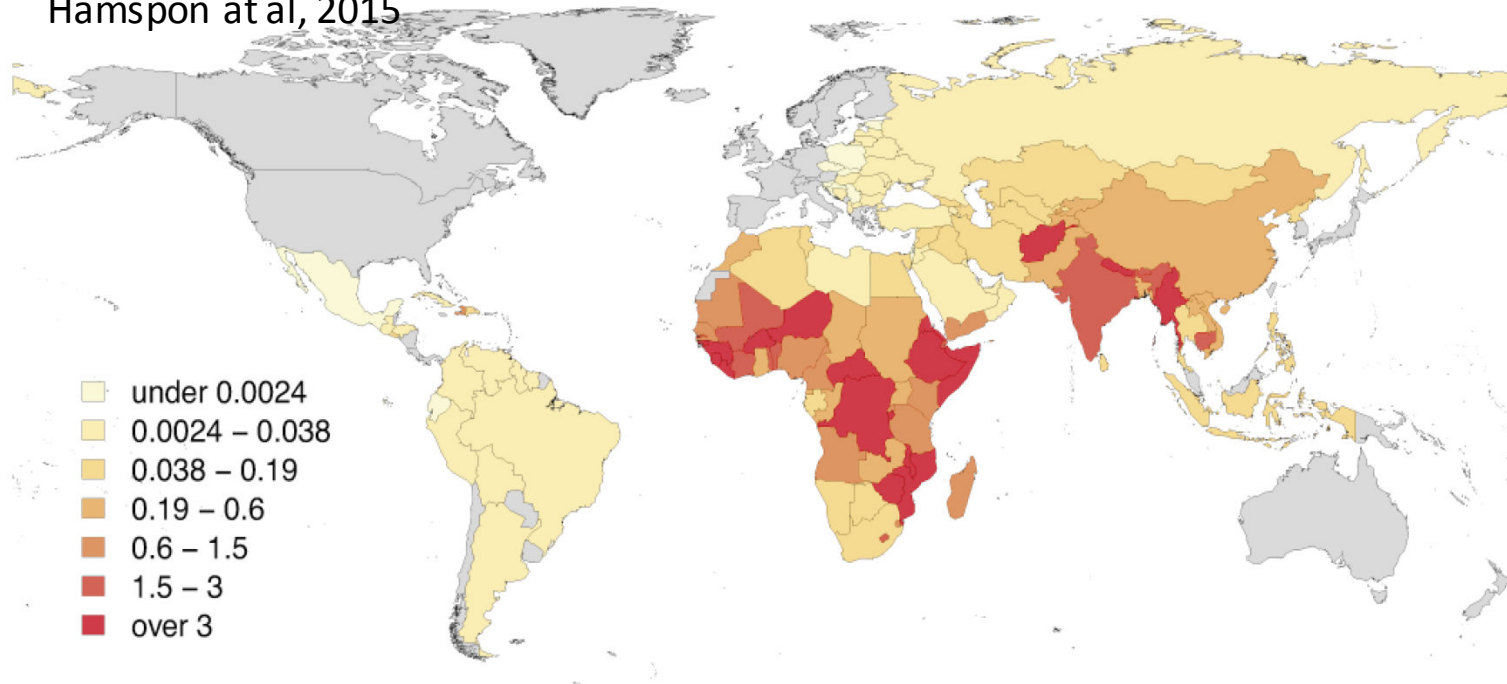
Disease	2015				2020			
	Eradication	Global elimination	Regional elimination	Country elimination	Eradication	Global elimination	Regional elimination	Country elimination
Rabies			EPHP or EOT ?? Americas				EPHP SE Asia & WPR	
Blinding trachoma						√ EPHP		
Endemic treponematoses (yaws)					√			
Leprosy						√		
Chagas disease			√ EOT Transmission through blood transfusion interrupted				√ EOT Intra-domiliary transmission interrupted in the Region of the Americas	
Human African trypanosomiasis				√ EPHP in 80% of foci		√ EPHP		
Visceral leishmaniasis							√ EPHP Indian subcontinent	
Dracunculiasis	√							
Lymphatic filariasis						√ EPHP		
Onchocerciasis			√ EOT Latin America					√ EOT Selected countries in Africa
Schistosomiasis			√ EOT Eastern Mediterranean Region, Caribbean, Indonesia and the Mekong River Basin				√ EOT Region of the Americas and Western Pacific Region	√ EOT Selected countries in Africa

EOT, elimination of transmission;  
EPHP, elimination as a public health problem.

# Elimination as a public health problem = zero deaths

**Per capita death rate** per 100 000 persons (grey= free of rabies)

Hamson et al, 2015



# Standard operating procedure

Status	Applicable Term	Geographical Area	Reviewing Authority	Acknowledged by
<b>Eradication</b>	Certification	Global	International Commission established by WHA resolution	DG/WHA
<b>Elimination with interruption of transmission of organism</b>	Verification	Geographical region and Country	Ad hoc international team for verification	RD Record in WER/GHO DG (when regionally achieved)
<b>Elimination of a disease as a Public Health Problem</b>	Validation	Country (sum of sub-national units)	Regional Programme Review Group and/or Ad hoc regional group	RD Record in WER/GHO DG (when regionally or globally achieved)

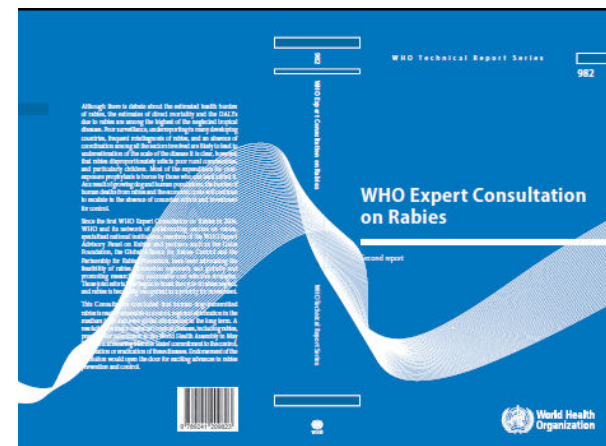
# Countries would need to build and provide a dossier

## Essential elements of country dossier

- Historical perspective: disease endemicity, interventions
- Epidemiological surveillance and evidence, coverage of interventions sustained over time
- Assessment of risk or resurgence/ reintroduction
- Surveillance capacity: capacity of primary health care system to identify and treat
- Sustained prevention measures

## Disease specific elements of country dossier

- Clear definition: EPHP or EOT (not end points but a status)



# Elements of dossier content for validation/ verification

- Notifiable
- Access to laboratory, Adequate samples
- Adequate and representative surveillance
- Effective import policy and cross-border plan
- No case of indigenously acquired infection due to a dog rabies virus confirmed in humans, during 2 years.
- Any autochthonous positive case shown by molecular characterization to be a spillover from wildlife.
- A statement of commitment and description of post elimination surveillance strategy
- Data made available to PAHO / WHO
- *EOT verification will need to be intertwined with OIE process*



# Examples of verification of elimination

- Malaria Elimination
- Elimination of Chagas Disease in the Americas
- Elimination of Vaccine-preventable Diseases
  - Polio
  - Measles, Rubella and Congenital Rubella Syndrome (CRS)
- HIV and Congenital Syphilis
- Tuberculosis

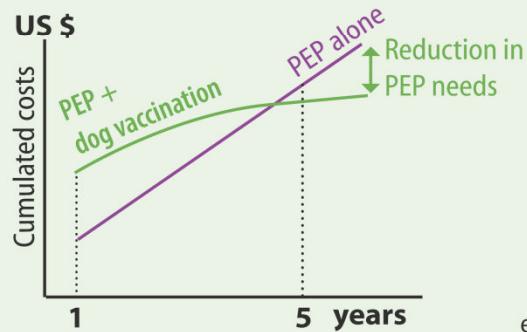
# Proof of principle

## Stop rabies at its source through DOG VACCINATION It is sustainable and cost effective

- Reduces bite incidence and PEP use
- Reduces the probability of fatalities when no PEP access
- One dog vaccine costs **~10x less** than one full course of PEP!

### Mass dog vaccination campaign

#### Short term investment for long term benefit



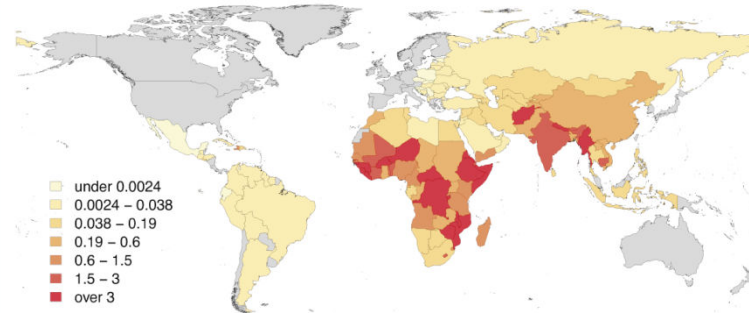
Modified from Tenzin et al., 2012



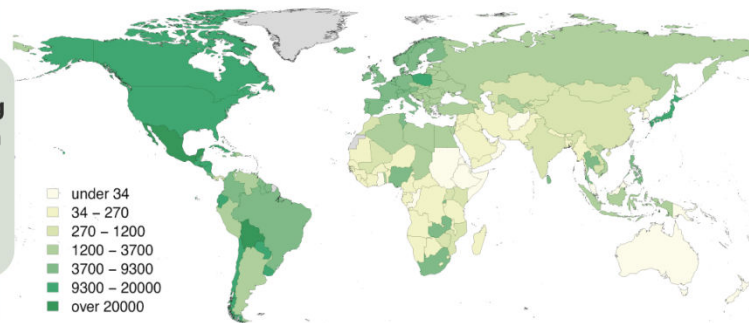
Vaccination of **70% of dog population** is enough to eliminate the virus in an area at risk

Countries investing in dog vaccination were able to **eliminate human rabies**

Per capita death rate per 100 000 persons (grey= free of rabies)



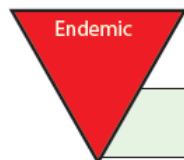
Expenditure on dog vaccination (per 100 000 persons; USD)



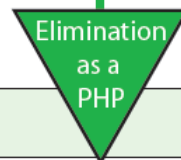
Source: Hampson et al., 2015

Adjust strategy to  
break transmission

Adjust strategy to  
maintain status

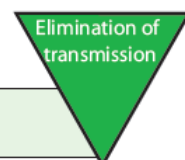


Validation



Zero death reported in the last 2 years

Verification



No dog-to-dog  
No dog-to-human  
transmission reported in the last 2 years

# Global elimination of dog-mediated human rabies

Global conference, 10-11 December 2015, WHO Headquarters, Geneva, Switzerland



Haiti 2010

1. **Disseminate results of the proof of concept** for the elimination of dog-transmitted rabies in different settings and explore **expansion and sustainability** in other endemic areas;
2. **Build support and case for investment** to progress towards rabies elimination from national, regional, global and other stakeholders including the private sector;
3. Promote a **One Health** inter-sectoral collaboration approach between the human and animal health and other sectors;
4. Shape the **forward vision agenda** with shared purpose including with donors and stakeholders for the elimination of dog-transmitted human rabies.

# NTDs in the Sustainable Development Goals



- **Target 3.3:** By 2030, end the epidemics of AIDS, TB, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable diseases

Proposed indicator: Number of people requiring interventions against NTDs

- **Target 3.8:** Achieve UHC, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all

Coverage of NTD interventions as a tracer for equitable access to UHC