
Global Alliance for Rabies Control
Partners for Rabies Prevention

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Background

• Growing global awareness and marked regional successes
• But rabies is still a low priority globally:

The Feasibility of Canine Rabies Elimination in Africa: Dispelling Doubts with Data

<table>
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<tr>
<th>Reason</th>
<th>Explanation</th>
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<td>LOW PRIORITY</td>
<td>Lack of accurate data on the disease burden and low recognition among public health practitioners and policy makers; lack of inclusion of rabies in global surveys of disease burden; only recent recognition of rabies as a neglected tropical disease; statements of rabies as an ‘insignificant human disease’</td>
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Re-evaluating the burden of rabies in Africa and Asia

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1. Probability model of human deaths

Bite from a suspect rabid dog

Exposure to rabid dog

P1

Bite site

P2 → Head/neck

P3 → Arm/hand

P4 → Trunk

P5 → Leg/foot

P6

Probability of developing clinical rabies

Rabies infection

P7

P8

P9

P10

Probability of receiving PEP

2. Linked economic model

Livestock losses 2.1%

Population control 4.5%

Dog vaccination 10.4%

Direct medical 40.5%

Indirect (patient-borne) 59.5%

PET 83.0%
Key differences:

Geographic area: global (vs. African & Asia)

Clusters based on socioeconomic, epidemiological, & geographic proximity
Country specific data used where available /exceptional
Generate country specific, testable predictions
Data: questionnaires

- Questionnaires developed for in-country Public Health, Animal Health and Laboratory experts and use with country reports
- Online (spanish, portuguese, french, russian):
- Focus groups at regional meetings (SEARG & AREB)
Data: published literature, databases & market data

- Compiled epidemiological database from published studies
- Used market data available from pharmaceuticals
- Extracted data from international databases:
  - WHO-CHOICE (healthcare): consultation & travel costs
  - IMF (economics): GDP, Price index, ppp
  - UN: demography, human development index
  - OIE WAHID, PAHO SIRVERA, Rabnet, eurosurveillance (surveillance databases)
RELIABLE DATA

• **HUMAN HEALTH**
  – PEP procedures and costs (RIG, vaccine type and regimens)

• **VETERINARY**
  – Animal vaccination & population control: strategies, costs, numbers

• **LABORATORY**
  – Diagnostics, infrastructure, surveillance, submissions & reporting: strategies, & costs

LIMITATIONS OF DATA REPORTING

VARIABLE DATA

Quantitative data:
Human cases, exposure incidence, use of PEP
Animal cases, confirmed and suspect cases, population sizes

*We aim to cross-ref and validate the variable data with published studies or pharmaceutical data, but also model these using proxies to generate testable predictions*
1) Exposure incidence

- Considerable variation (within & between countries)
- Increases with development (GDP or HDI) reflecting:
  - greater awareness with development
  - Outliers represent investment in PEP (high incidence) vs investment in dog vaccination (low incidence)
2) Probability of receiving PEP:

- Estimate the total number of people who didn’t receive PEP (1/5 die) to calculate this probability
- Depends if a person seeks PEP and if PEP is given at clinic

This probability depends on the level of development and is significantly related to both GDP and the human development index.

- Questionnaires also indicated frequent PEP shortages and fewer clinics in less developed countries.
3) Probability of a rabid animal bite

- We assume this depends on incidence which is determined by vaccination coverage in endemic areas

Data from:
Larghi et al. 1988
SIRVERA 2011
IX REDIPRA
RABNET
Preliminary results

~70,000 HUMAN RABIES DEATHS EACH YEAR

- **India**: 17,000
- **China**: 6,000
- **Africa**: 17,000
- **Americas**: 1,500
  - 95% from Haiti!
- **SE Asia**: 5,000
- **Eurasia**: 3,000
- **Middle East**: 350
- **Europe**: <20
- **Himalayas**: 11,000
- **China**: 6,000
- **SE Asia**: 5,000
- **India**: 17,000
- **North**: ~800
- **SADC**: ~5000
- **Francophone**: ~800
- **Congo Basin**: ~10500

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[Map showing distribution of rabies deaths across regions]
Annual Disability-adjusted life year (DALY) scores for WHO tropical disease cluster

- 70,000 human rabies deaths
- Annual human deaths from zoonoses

2 million DALYs lost to rabies
Comparison with other vaccine-preventable diseases

Number of deaths in Africa and Asia caused by main vaccine-preventable infectious diseases (source: WHO – GBD)

RABIES MAY EXCEED HEPATITIS IN TERMS OF VACCINE PREVENTABLE DEATHS
Economic burden of canine rabies

Rabies costs $4,000 million annually!

- $500 million on PEP
- $160 million on dog vaccination
- $800 million livestock losses
As per capita spending on dog vaccination increases, human rabies deaths decrease.
As per capita spending on PEP increases human rabies deaths decrease
Dog rabies control could pay for itself through savings in PEP

But there needs investment to save lives!
Preliminary conclusions

• The disease burden and death toll from rabies is substantial and warrants concerted global attention.

• Location-specific predictions are generated which could be tested through active surveillance studies.

• All rabies deaths can be prevented, but this requires more investment than is currently being made in Africa and in Asia.

• Investment in dog vaccination pays for itself with savings in PEP and can ultimately lead to elimination (e.g. Americas), whereas investment in PEP only leads to escalating costs (e.g. SE Asia).
Questionnaires online:

PUBLIC HEALTH

www.surveymonkey.com/s/NH75V25 (English)
www.surveymonkey.com/s/3VKPQ2S (Spanish)
www.surveymonkey.com/s/3Y2H9GR (French)
www.surveymonkey.com/s/37TRTYJ (Portuguese)

ANIMAL HEALTH:

www.surveymonkey.com/s/NQGNF6N (English)
www.surveymonkey.com/s/CBFZBZP (Spanish)
www.surveymonkey.com/s/3D7Q2QG (French)
www.surveymonkey.com/s/JKCVFXW (Portuguese)

LABORATORY:

www.surveymonkey.com/s/NPY7QSD (English)
www.surveymonkey.com/s/385CK8B (Spanish)
www.surveymonkey.com/s/39DFDNR (French)
www.surveymonkey.com/s/3VSK2NC (Portuguese)

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