

Rabies:

a persistent but preventable problem

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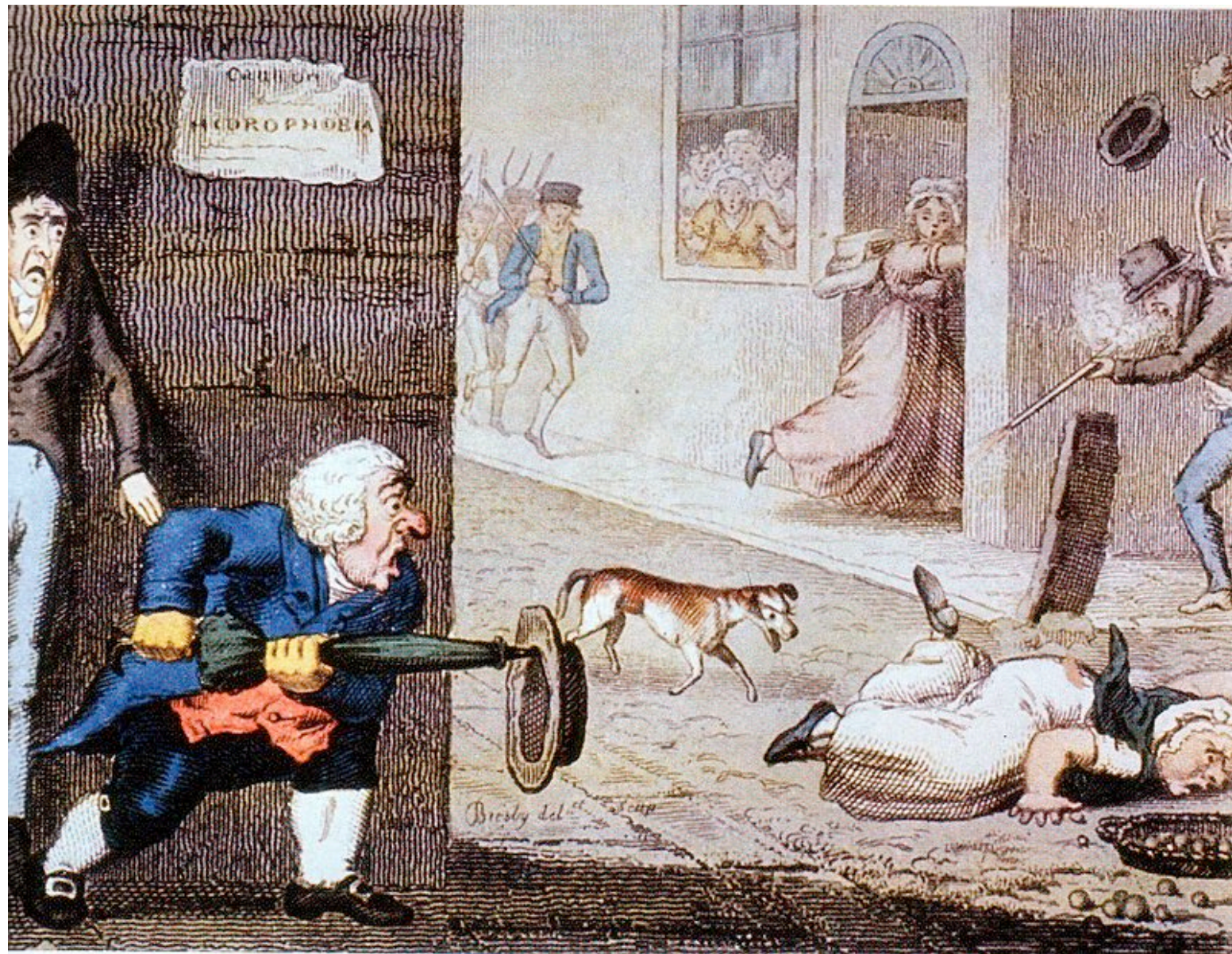
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South Africa: Louis Nel, Kevin Le Roux

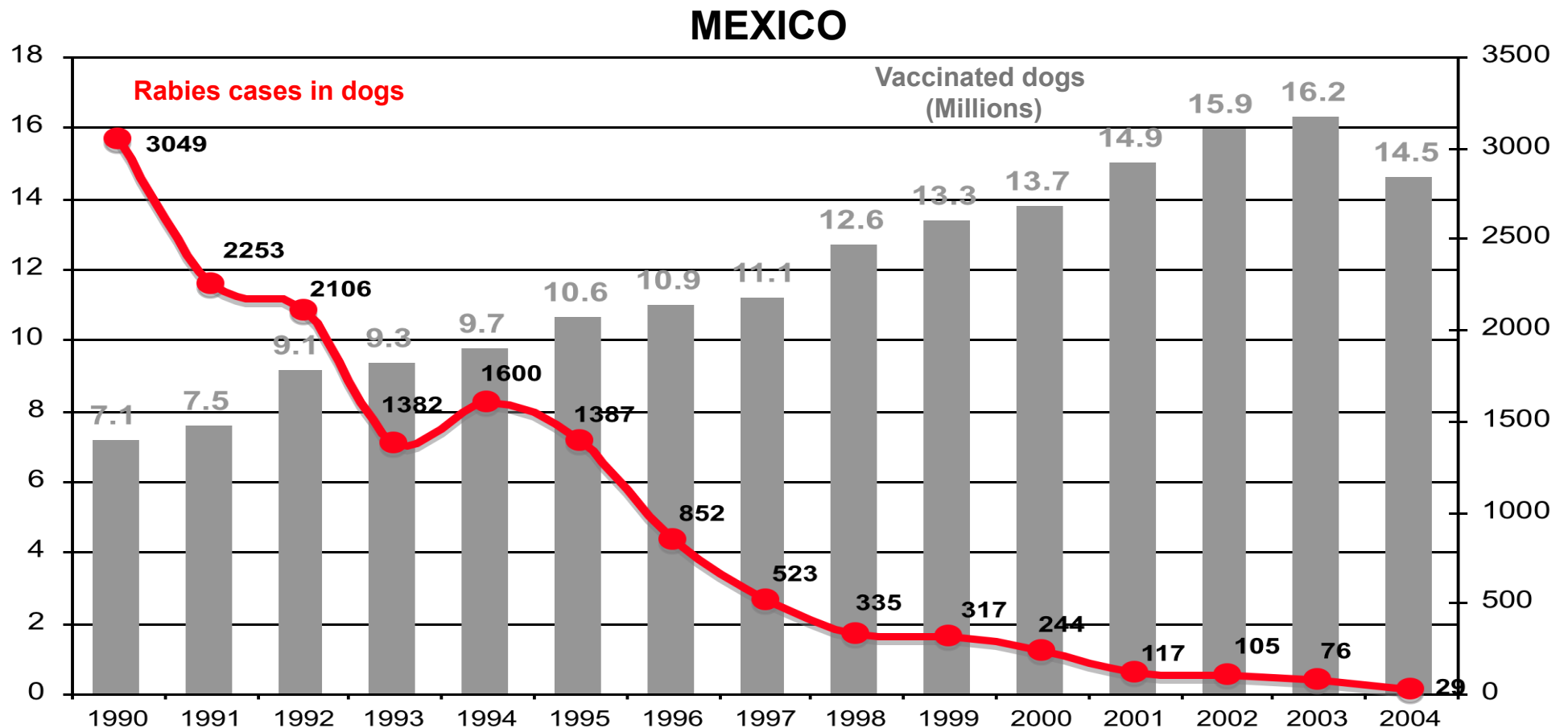




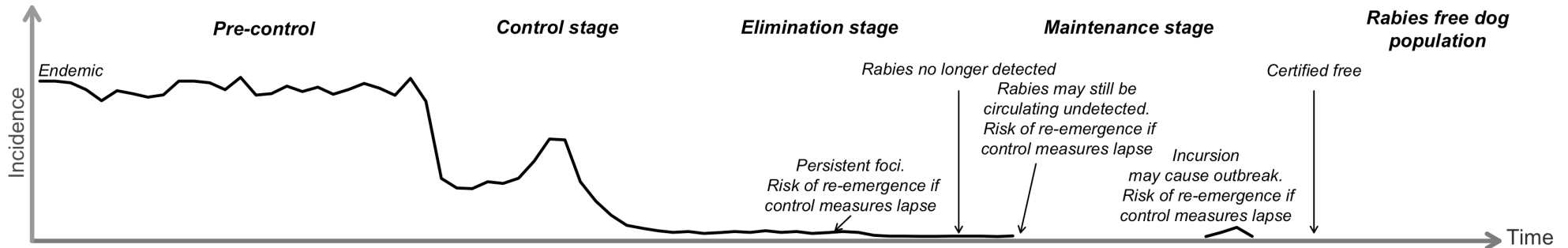


Rabies is entirely preventable

- Mass vaccination has repeatedly been shown to successfully control and eliminate rabies



The distribution of rabies today reflects insufficient (or inappropriate) interventions



AFRICA

>30,000 deaths
Highest death rate
\$0.75 billion losses
\$0.01pc on dog vaccination

ASIA

~30,000 deaths
25 million post-exposures
\$4 billion losses
\$0.03pc on dog vaccination

LATIN AMERICA

<200 deaths
\$0.3 billion losses
\$0.13pc on dog vaccination

HIGH-INCOME COUNTRIES

0 deaths (except rare imports)
Vaccination for travellers only
Routine vaccination or no dog vaccination

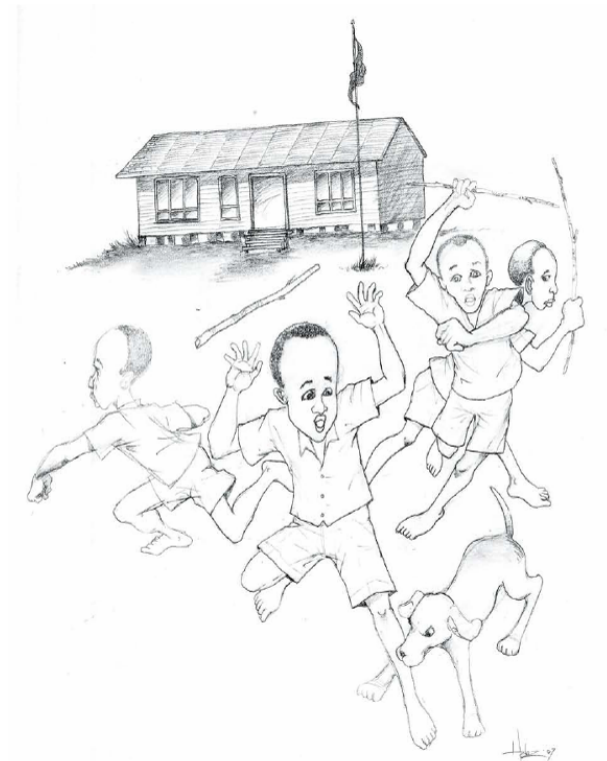
>70,000 deaths, 2 million DALYs & \$5 billion every year



- Operational research
- Cultural & Social Context
- Large-scale Interventions
- Policy

Epidemiology

- Community engagement
- Politics
- Media
- Perception of risk
- Communication of science



Epidemiology:

4. Massive viral replication in brain

3. Spread to central nervous system

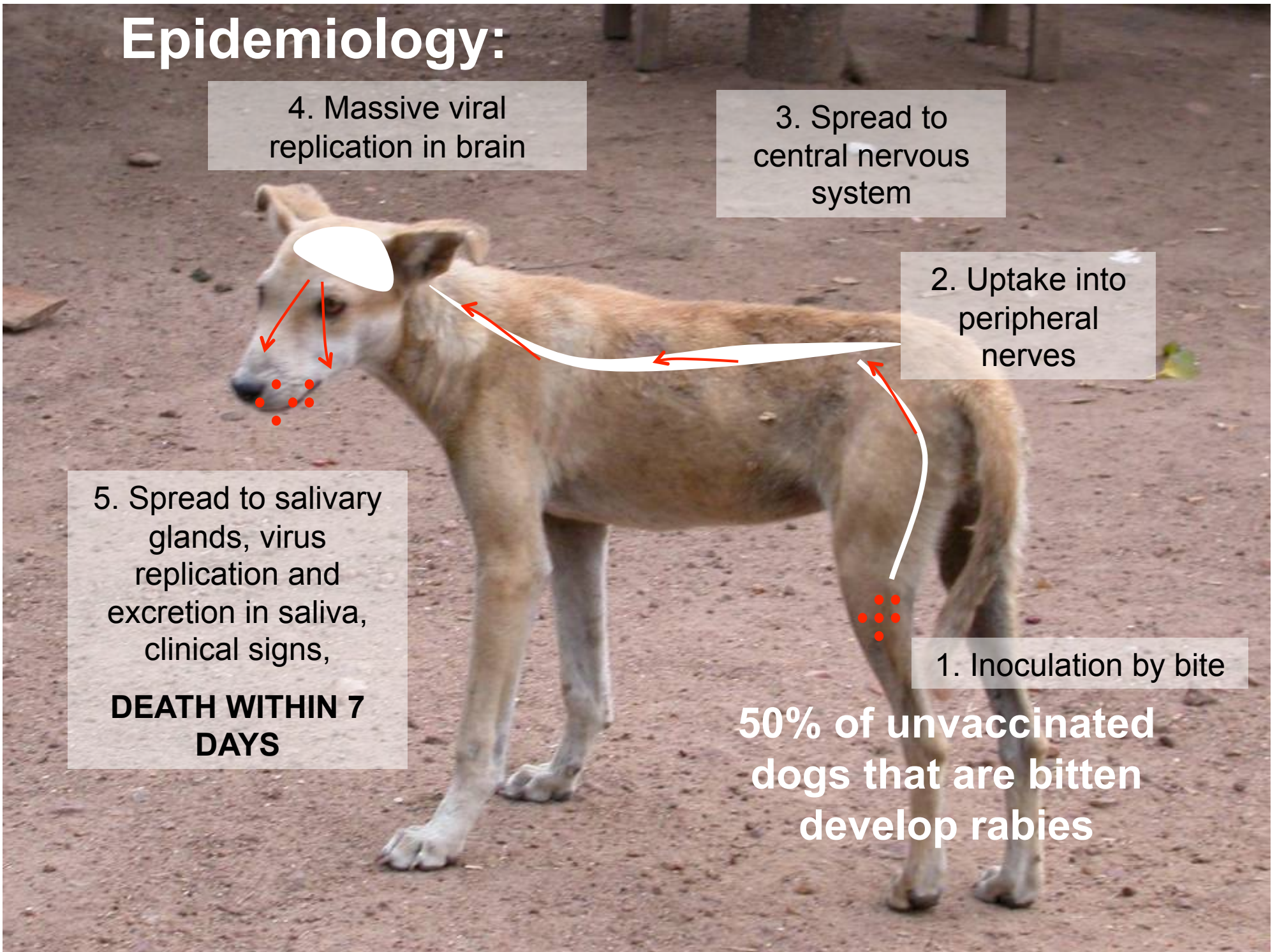
2. Uptake into peripheral nerves

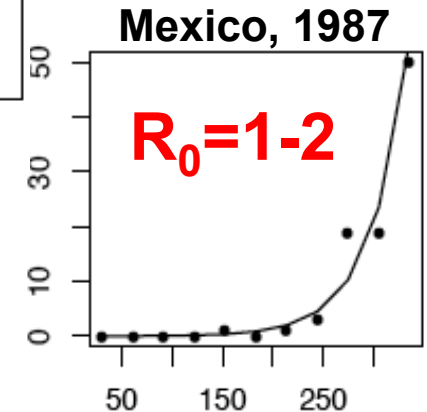
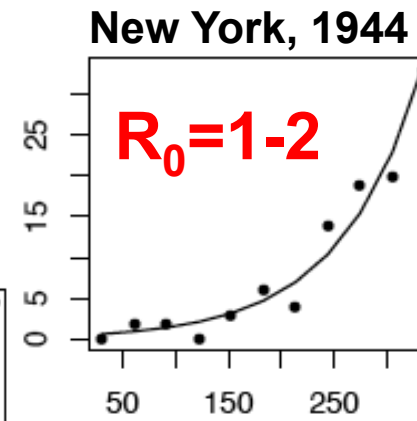
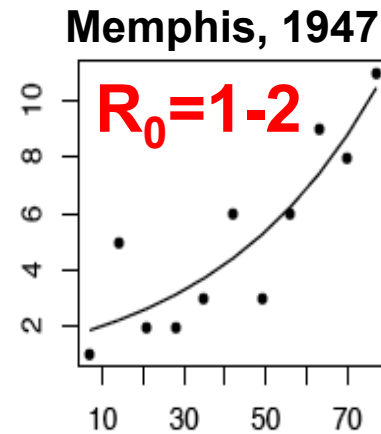
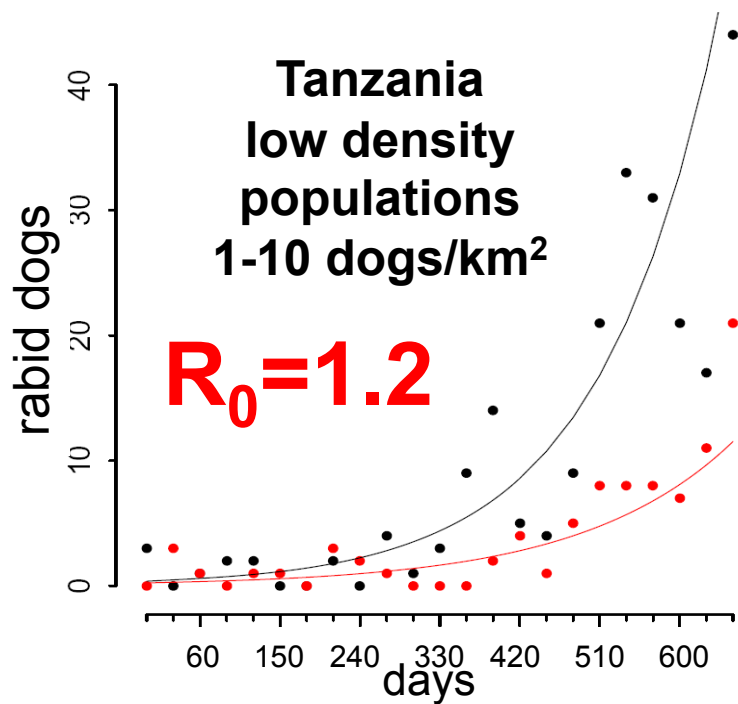
1. Inoculation by bite

5. Spread to salivary glands, virus replication and excretion in saliva, clinical signs,

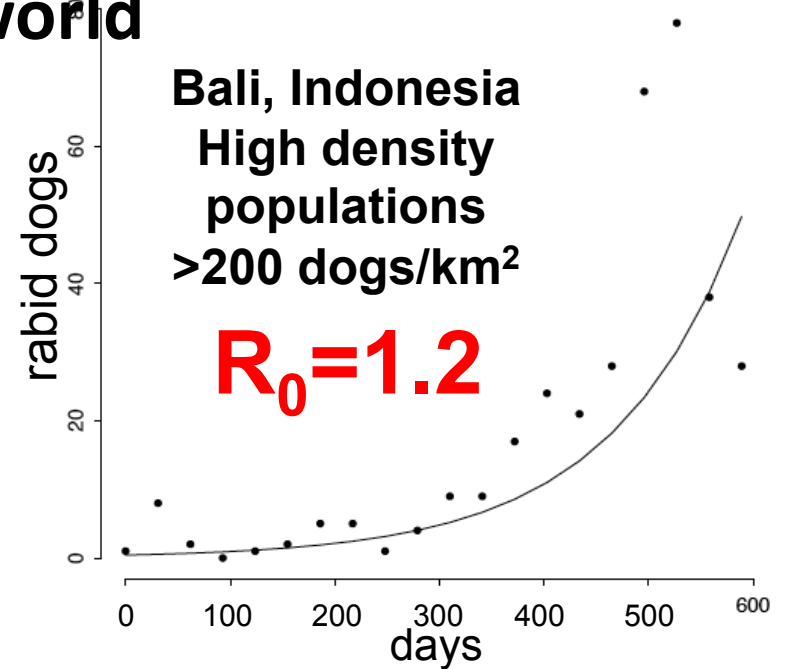
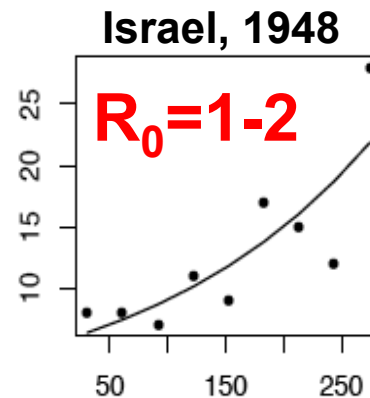
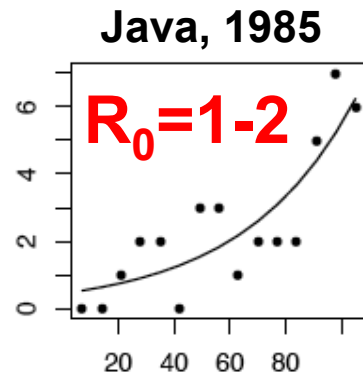
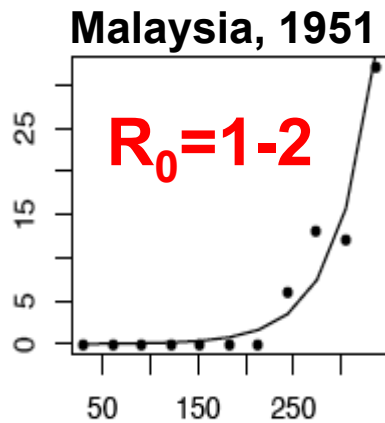
DEATH WITHIN 7 DAYS

50% of unvaccinated dogs that are bitten develop rabies





**Rabies transmission does not depend on density:
 $R_0 < 2$ around the world**



The role of wildlife?



Genetic, epidemiological & Intervention data show that domestic dogs (not wildlife) maintain rabies

Vaccinating dogs is cost-effective



ICER: \$300/life yr saved (WHO very cost-effective: \$2000)



Challenges (& Misperceptions)

- Rabies is a problem for medics
- Rabies is a problem for the vets
- Wildlife are responsible
- Our dogs are different
- Too many 'stray' dogs
- Dogs are too difficult to vaccinate
- Governmental change
- Community engagement
- Political pressures
- Unreasonable expectations

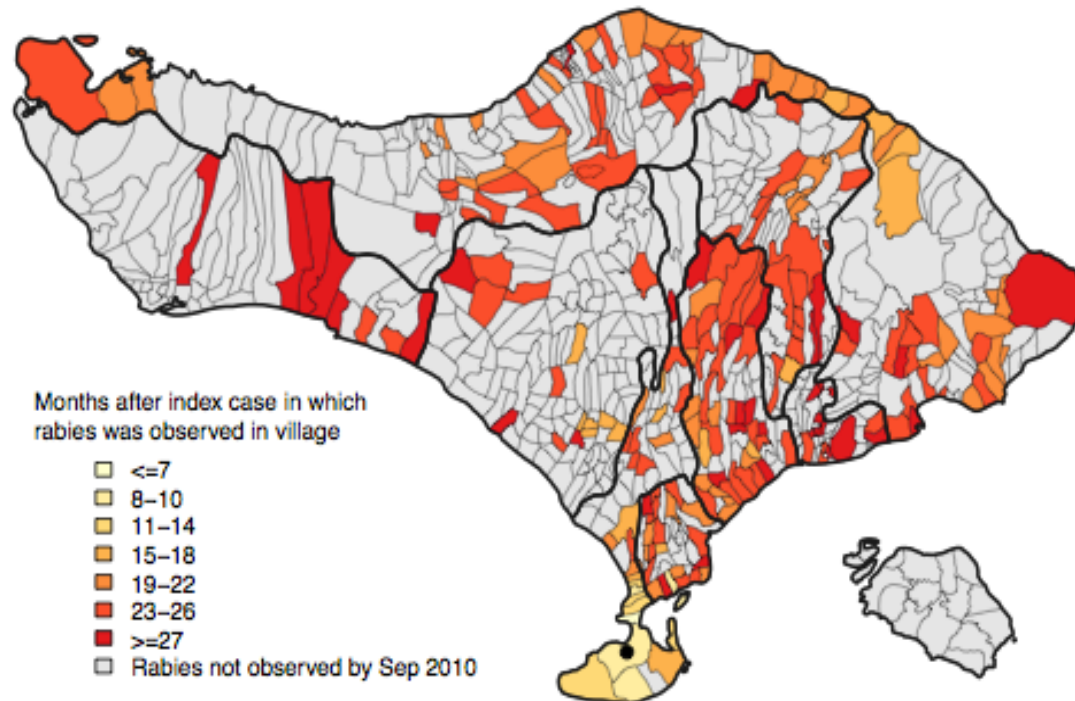
Rabies epidemic in Bali, Indonesia

Incursion in mid 2008

Rapid spread across island

>150 human rabies deaths

2 million USD /yr in post-exposure vaccinations



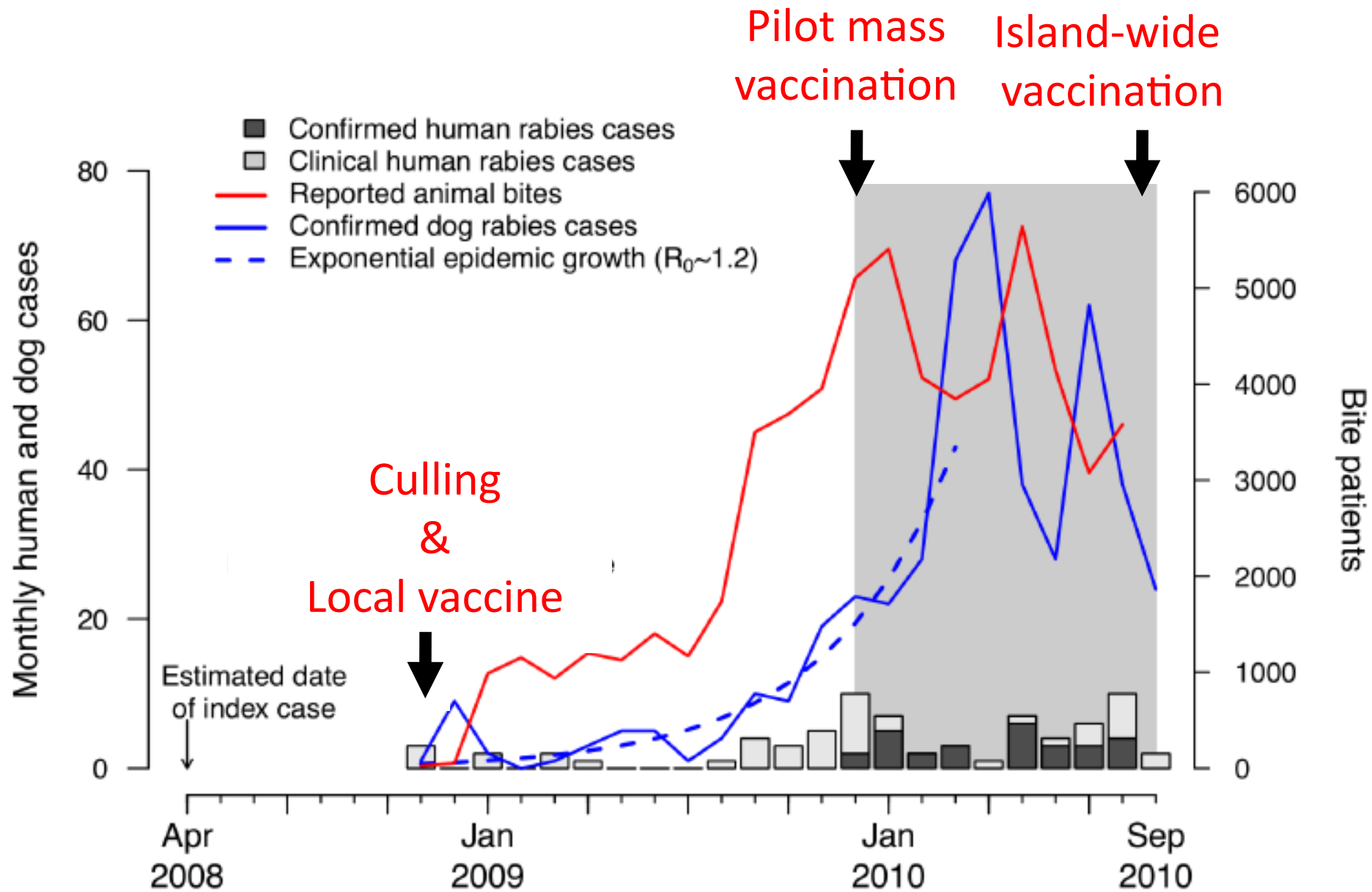
Too many dogs?



.....Culling

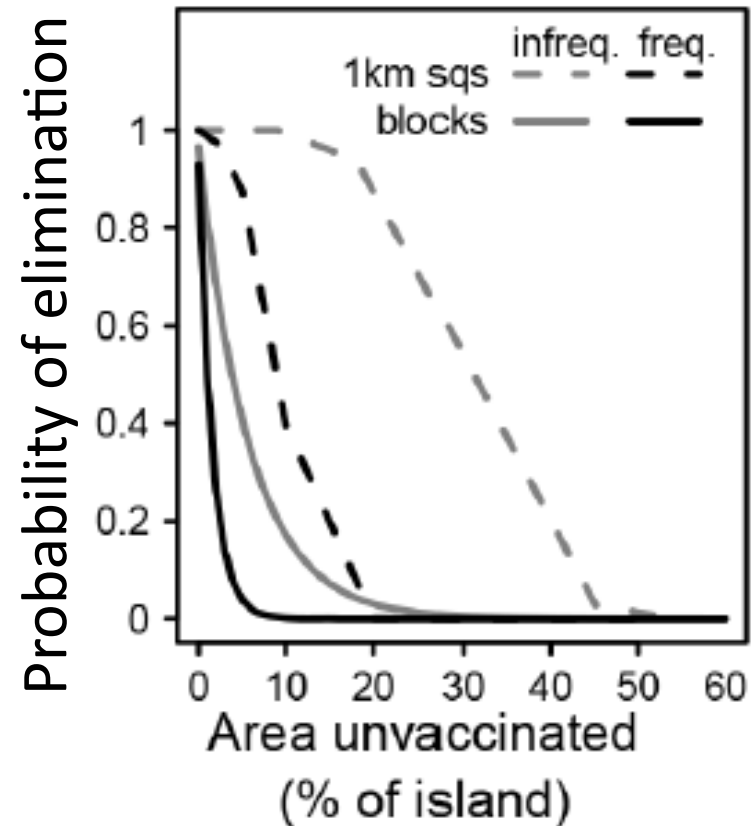
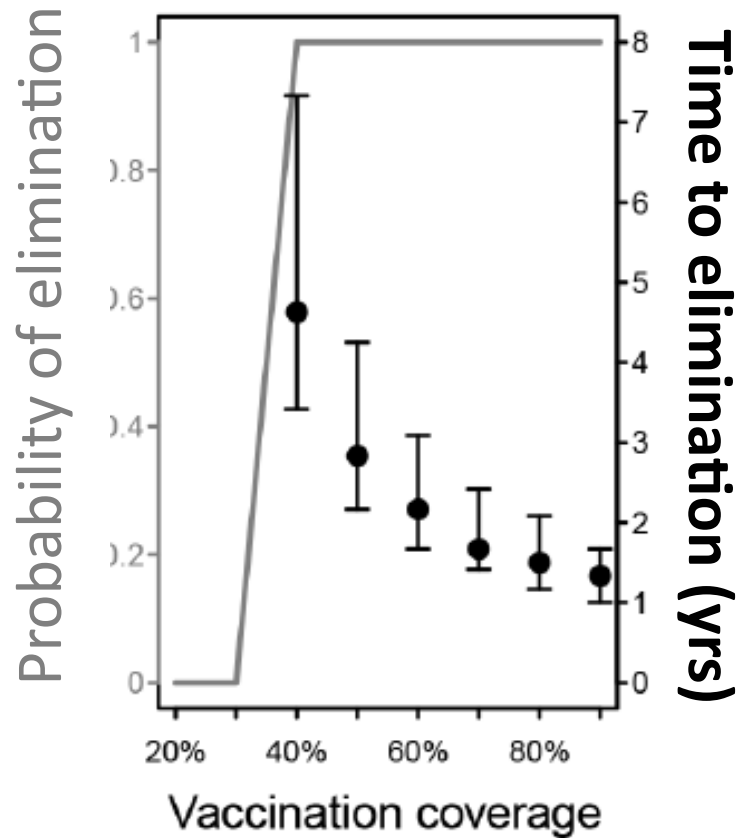


How to vaccinate >300,000 free-roaming dogs?



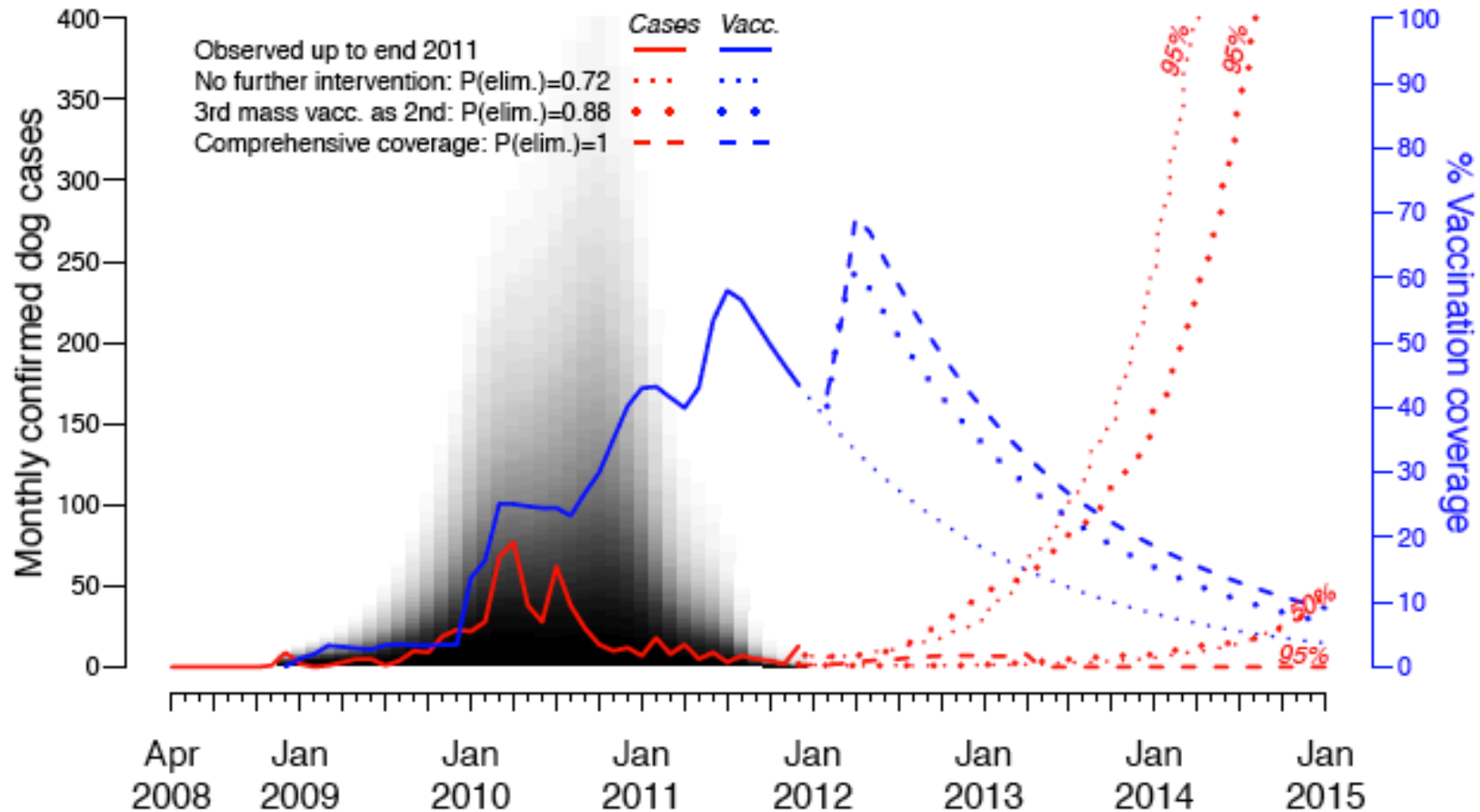
Impacts of Coverage and Completeness

>40% Coverage needed to eliminate rabies because of population turnover and stochasticity in transmission



Only small unvaccinated areas reduces the probability of elimination to <50%

Designing Programs for Eliminating Canine Rabies from Islands: Bali, Indonesia as a Case Study



Comprehensive Island-wide campaign essential for elimination
 To save 550 human lives & \$15 million over 10 yrs

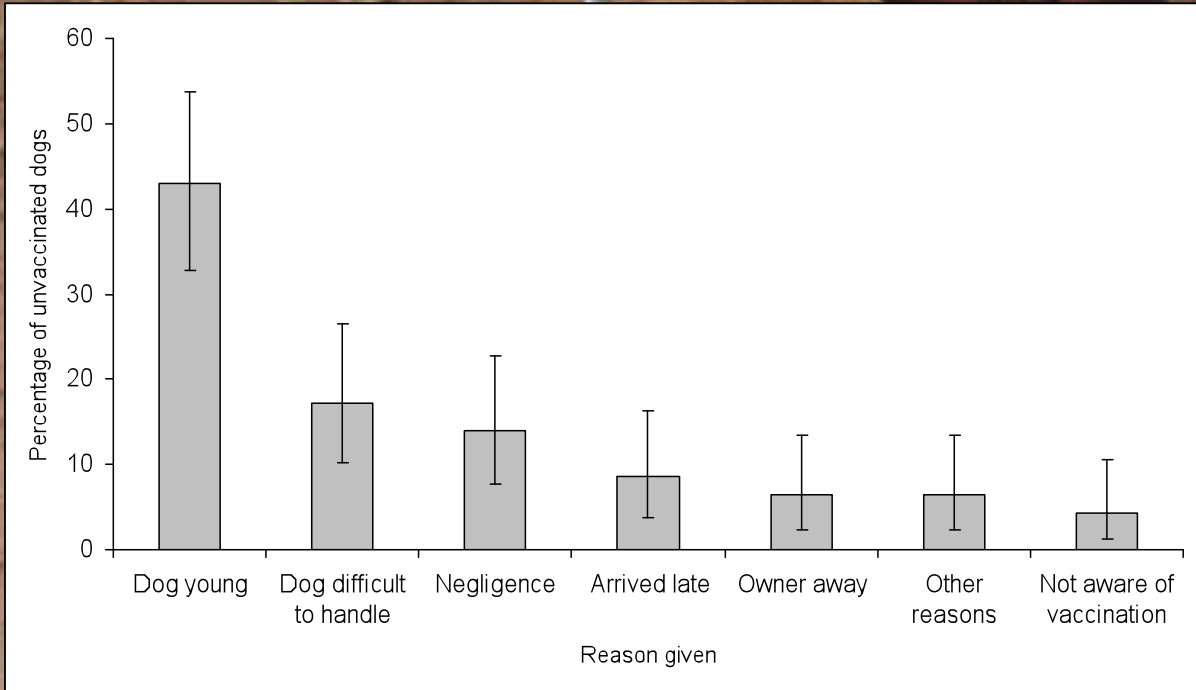
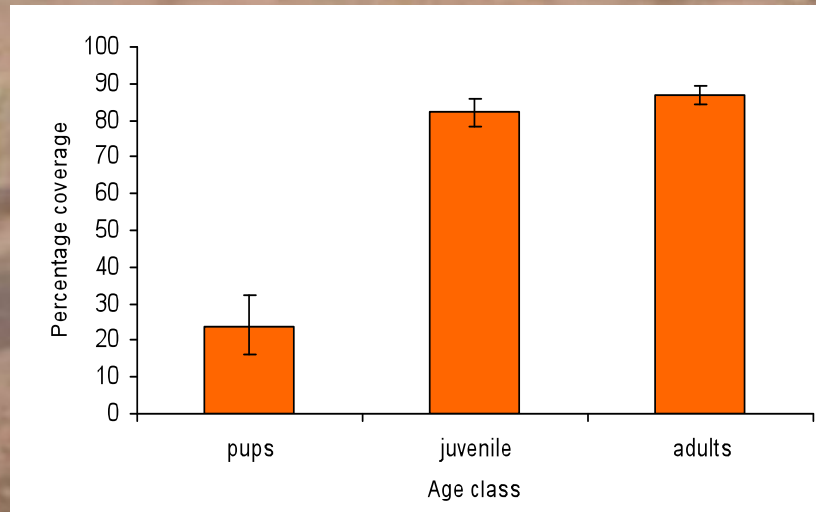
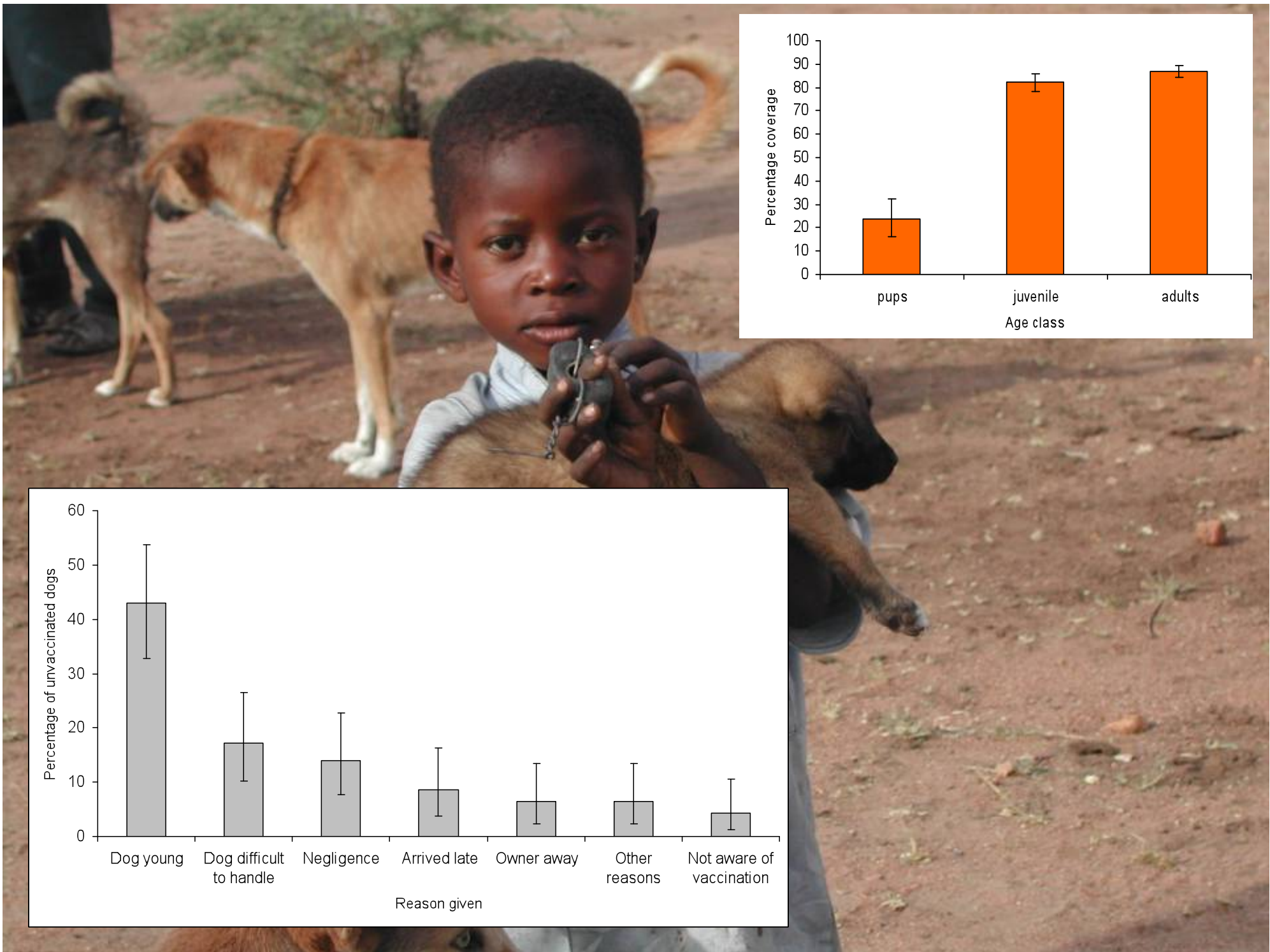
<2% of dogs are unowned





Most dogs can be easily brought for vaccination



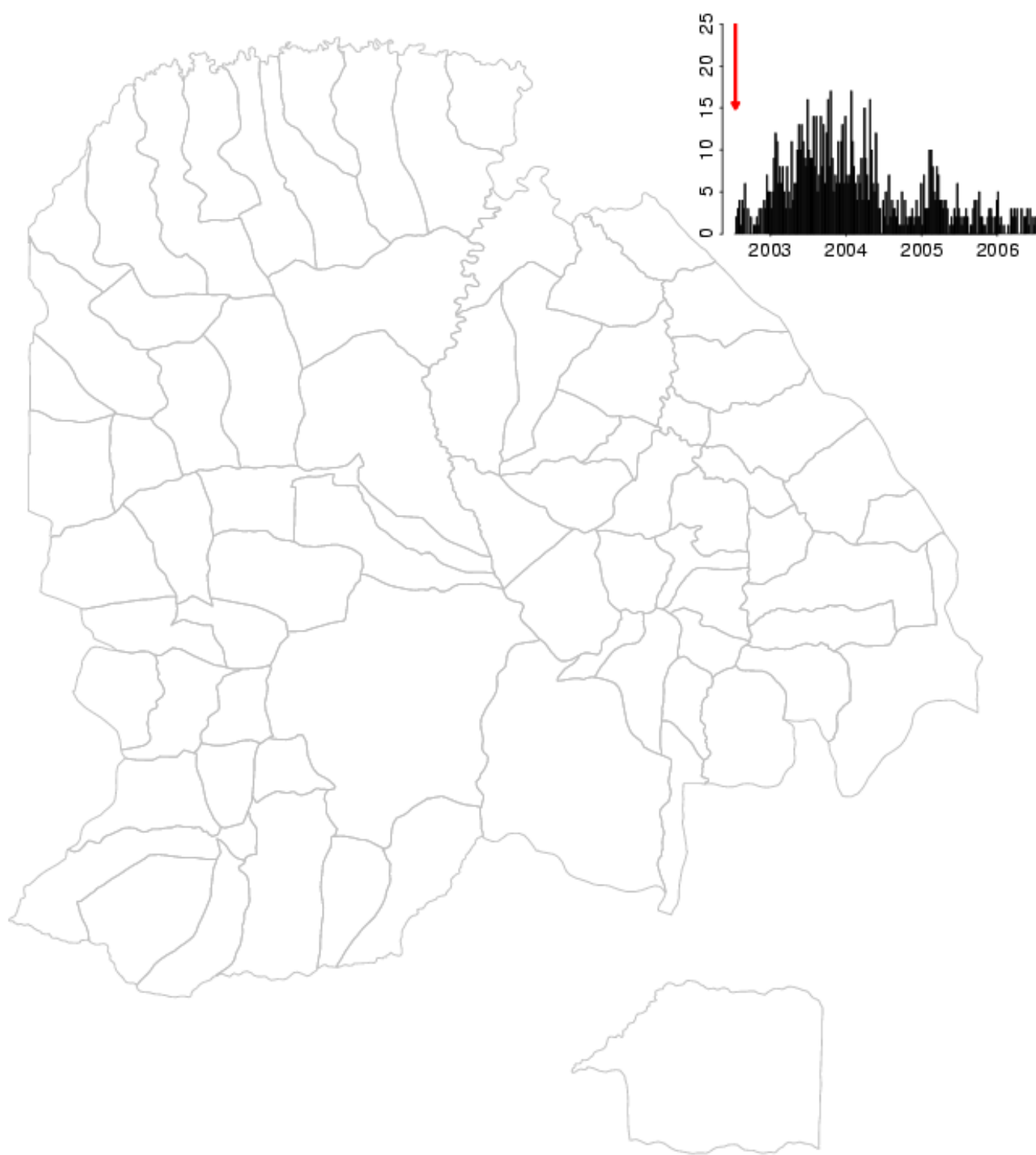


Challenges (& Misperceptions)

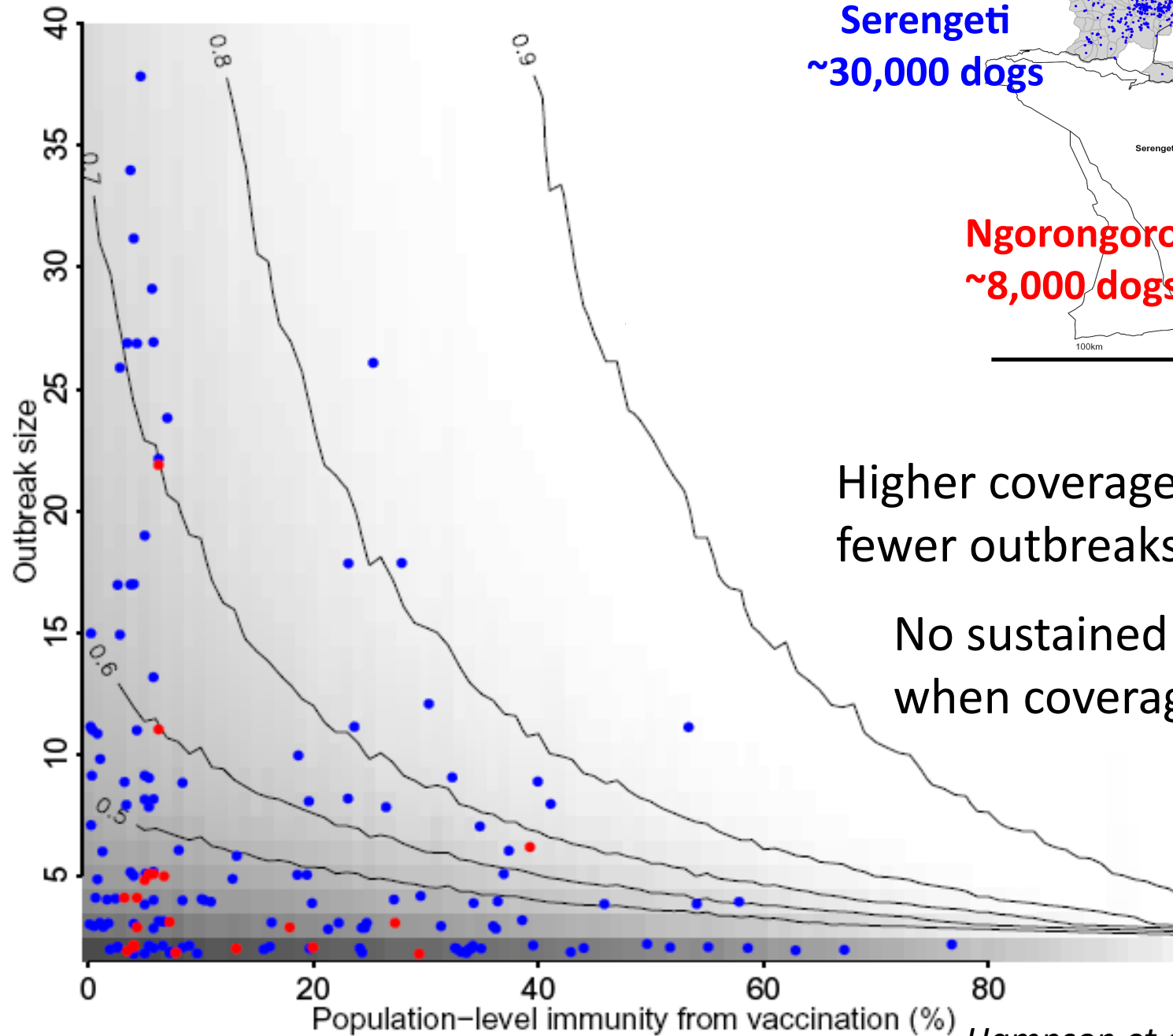
- ~~Rabies is a problem for medics~~
- ~~Rabies is a problem for the vets~~
- ~~Wildlife are responsible~~
- ~~Our dogs are different~~
- ~~Too many 'stray' dogs~~
- ~~Dogs are too difficult to vaccinate~~
- Governmental change
- Community engagement
- Political pressures
- Unreasonable expectations



Contact tracing used to capture detailed patterns of transmission

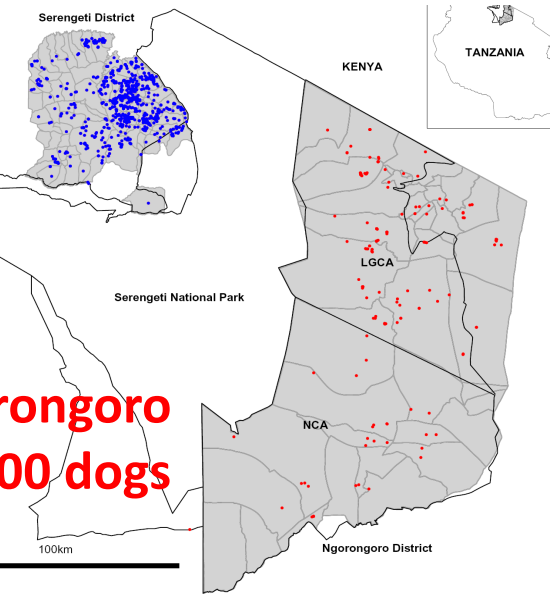


Coverage reduces outbreak size & duration



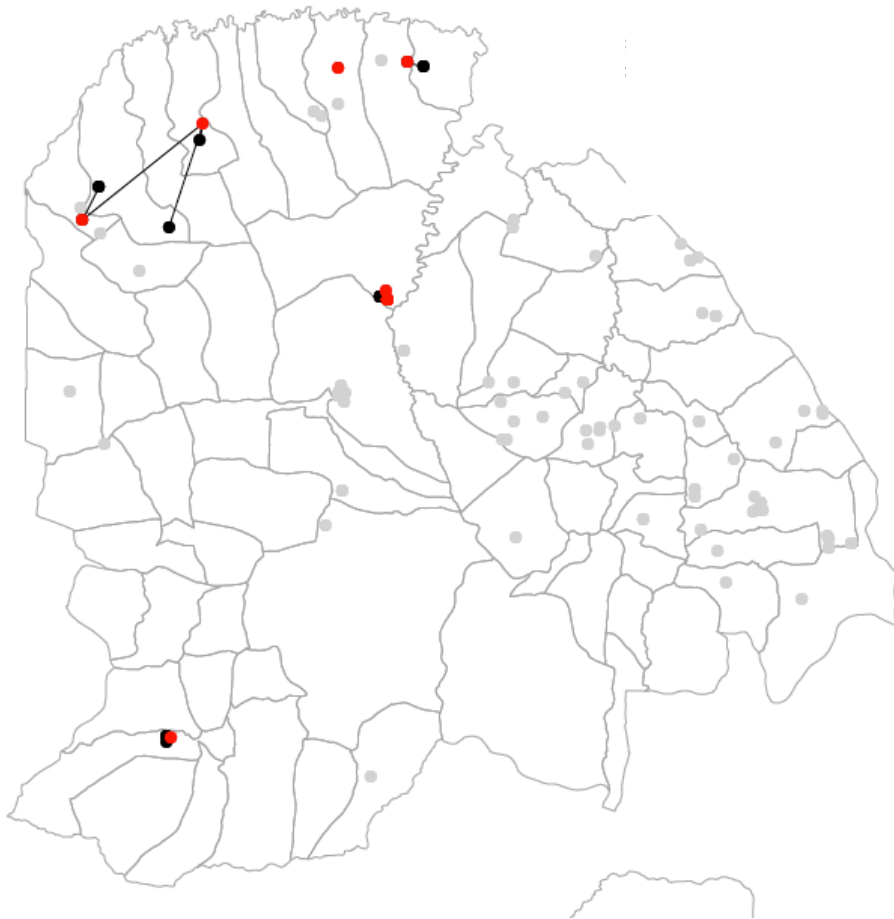
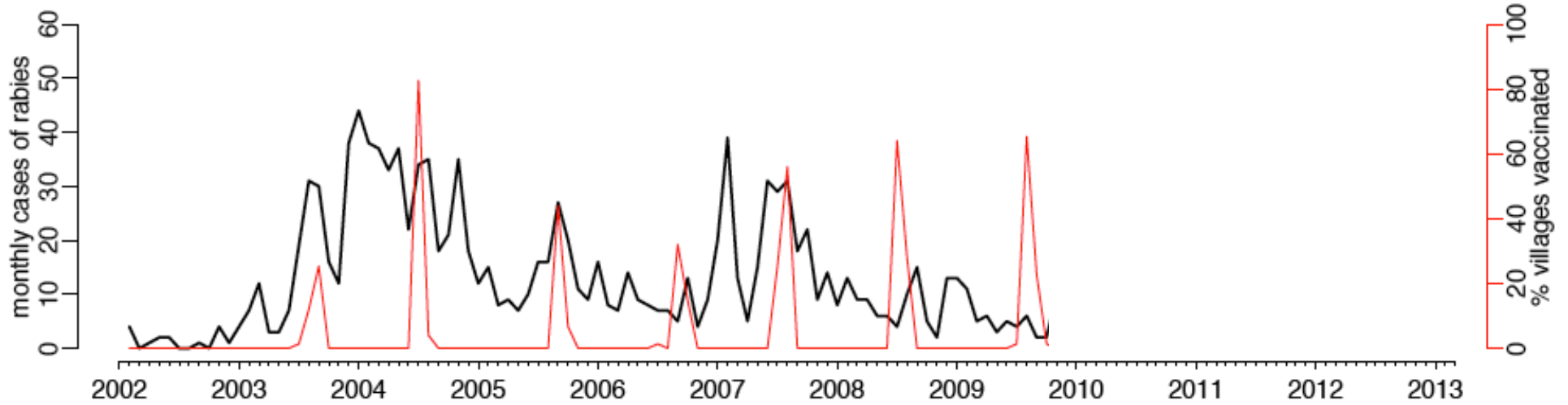
Serengeti
~30,000 dogs

Ngorongoro
~8,000 dogs

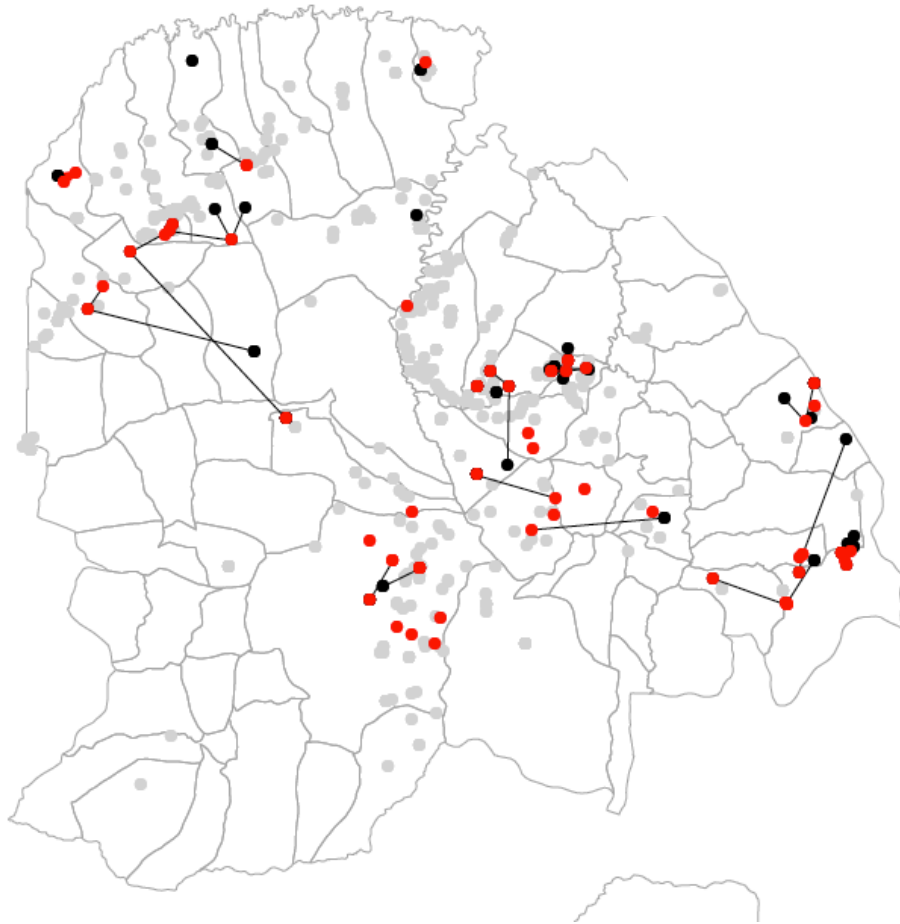
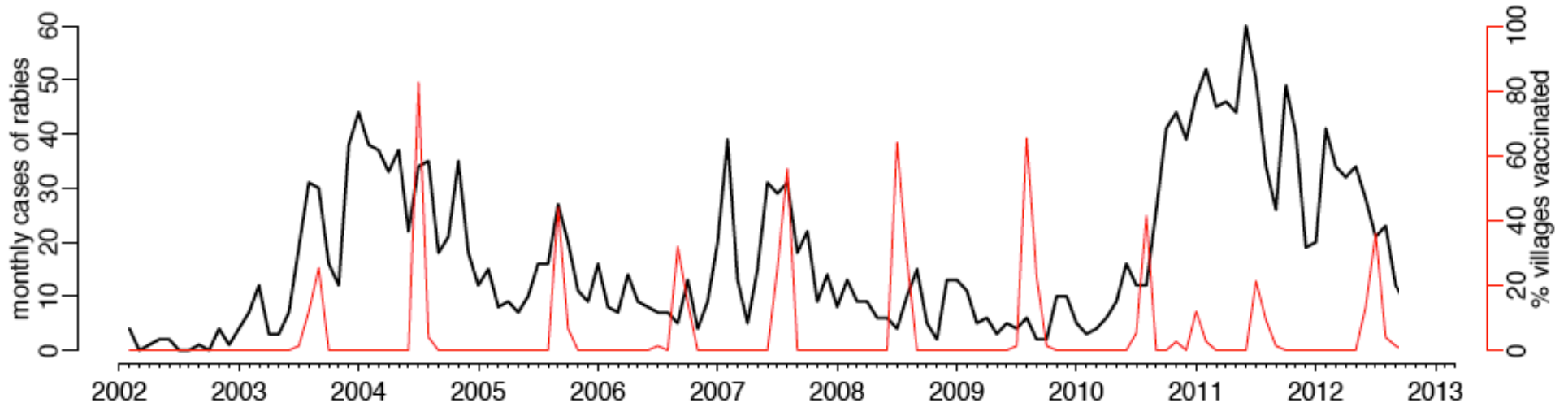


Higher coverage results in fewer outbreaks

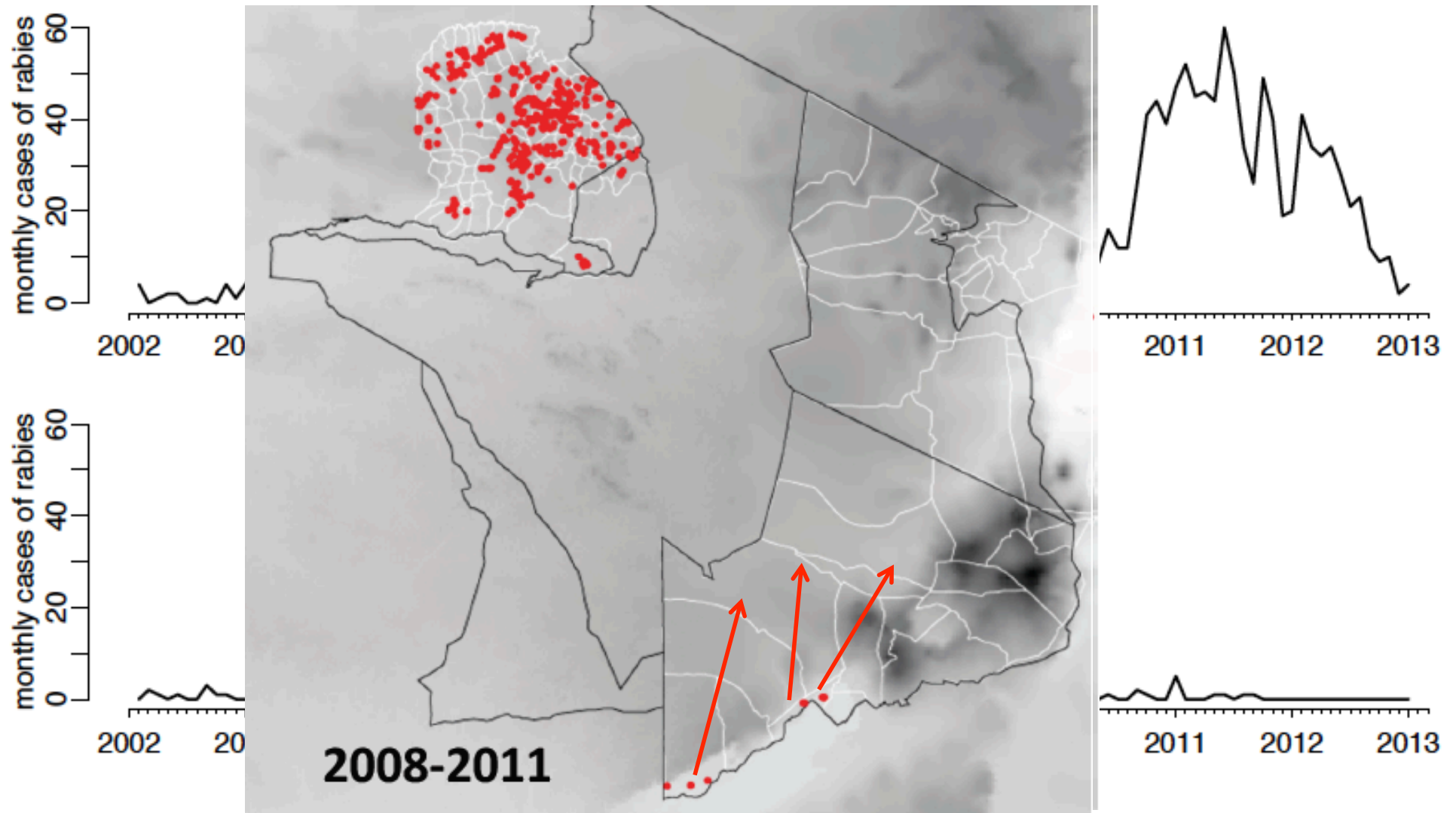
No sustained outbreaks when coverage >70%



Sustained (though imperfect) vaccinations lead to significant declines in rabies incidence



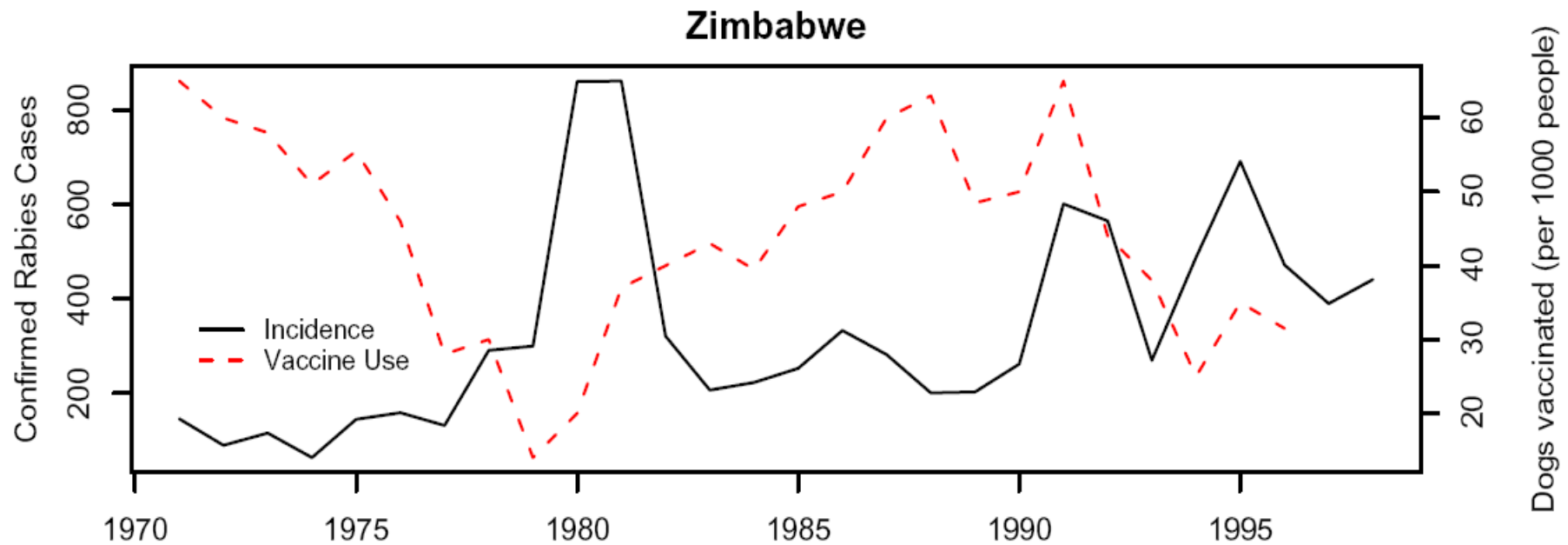
**lapse in programme
(change in district
veterinary officer)
lead to resurgence**



Contrast to neighbouring district where rabies locally eliminated with occasional incursions

Why does rabies persist?

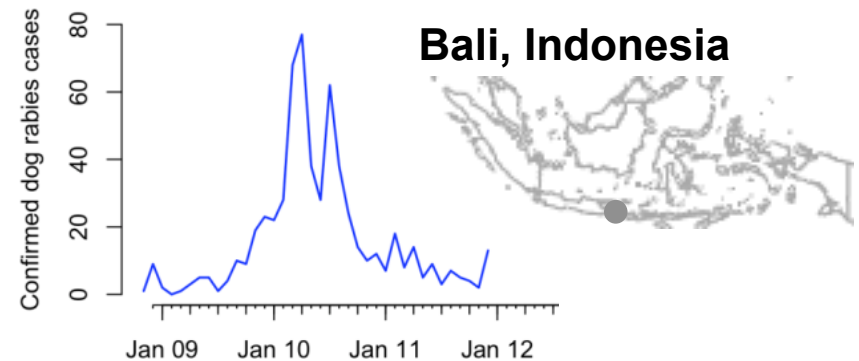
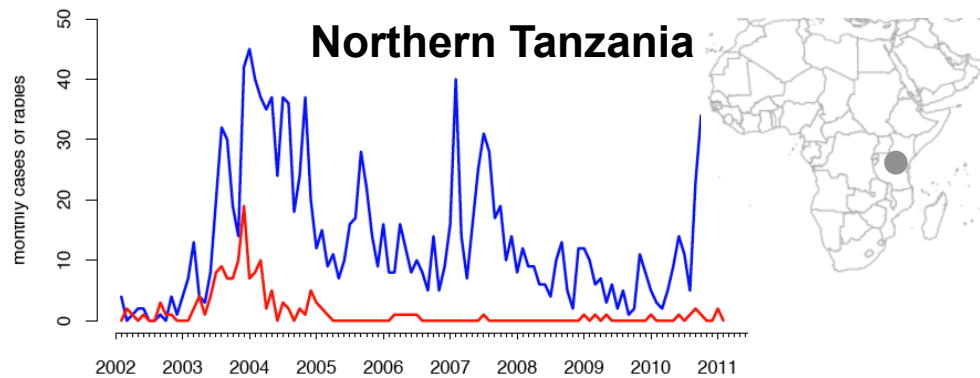
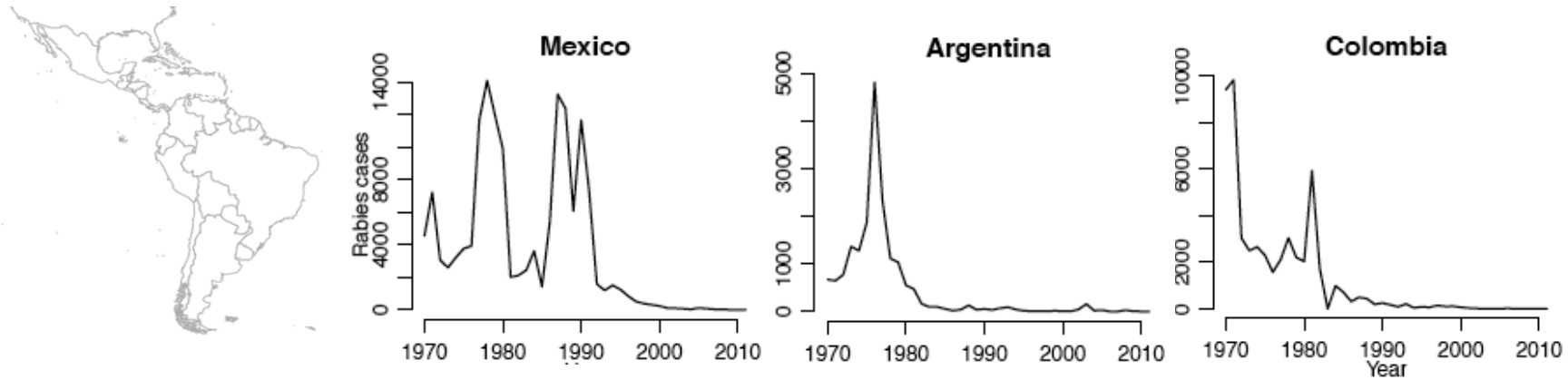
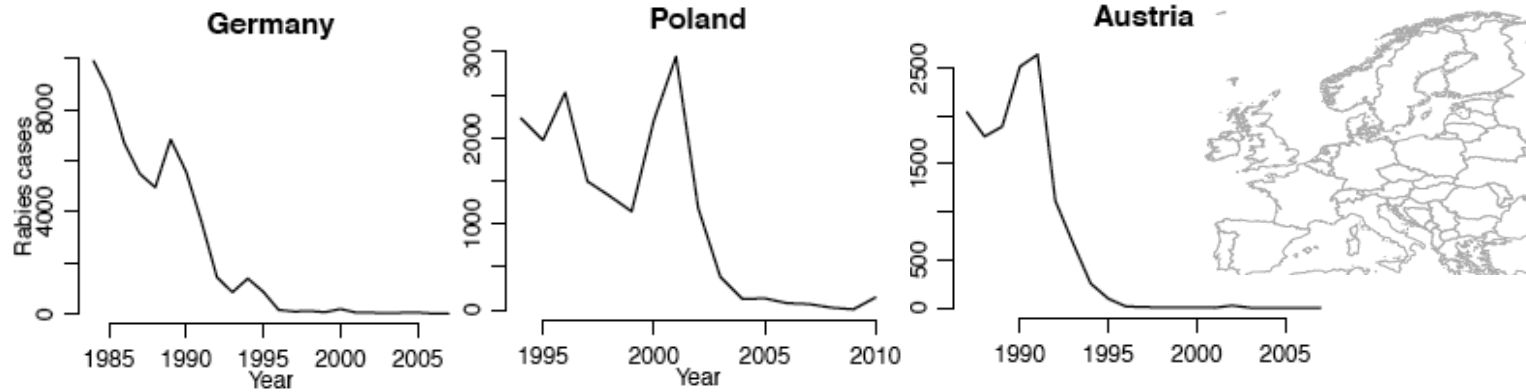
'A decline in rabies is no grounds for relaxing vigilance. LA opponents of vaccination cited the decline of rabies cases in 1954 to prove that vaccination was unnecessary, but an outburst in 1955 raised the 1954 rate of 0.44 rabid dogs per 10,000 population to 4.16. The tendency to forget rabies between attacks serves to exaggerate the cyclical nature of the hazard. During a scare dogs are vaccinated. After it, vaccination is allowed to lapse until there is no significant immune barrier to the introduction of infection.' Tierkel 1956



A lack of sustained commitment and reactive control leads to periodic epidemics



The protracted endgame

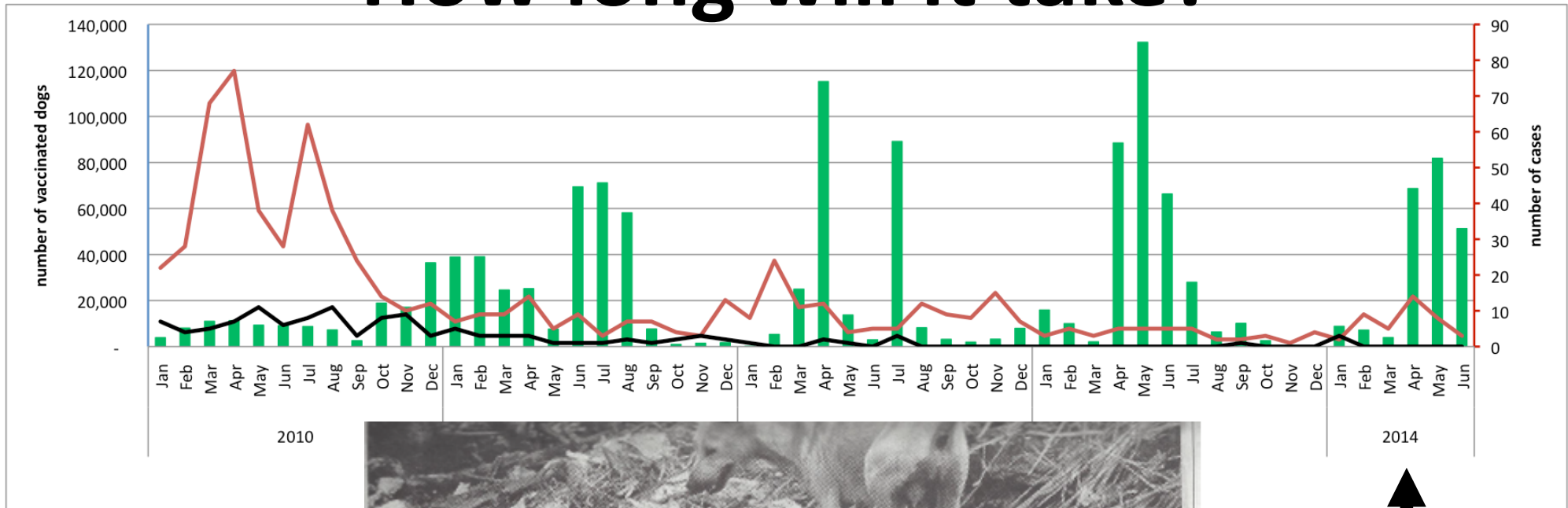


How long will it take?

- Community engagement determines whether rabies is controlled and how quickly
 - Changing governments
 - Administrative & financial hurdles
 - Too many campaigns is tiring
 - Too many campaigns and people lose faith

Levels of sustained effort directly impact economic costs and health benefits

How long will it take?



Beware of rabies: A stray dog scavenges in a pile of garbage. Bali Governor Made Mangku Pastika said on Thursday that the provincial Husbandry Agency must implement the 2009 Bylaw on the prevention of rabies to curb rabies on the island.

Stray dogs must be culled, Bali governor says

Ni Komang Erviani
THE JAKARTA POST/DENPASAR

Bali Governor Made Mangku

» Bali rabies team must implement bylaw firmly in an attempt to curb rabies on the island

unaware of the rules. This had resulted in a high cost for rabies prevention.

The epidemic led the Bali admin-



Relapse of rabies?

Or better surveillance?

CONCLUSIONS

Likelihood of success depends on vaccination:

Coverage, Completeness, Maintenance

Financial, political & community commitment is key!

How can this be maintained as elimination is approached?

