Swiss TPH
Swiss Tropical and Public Health Institute
Schweizerisches Tropen- und Public Health-Institut
Institut Tropical et de Santé Publique Suisse

Epidemiology and Public Health
Human and Animal Health Unit

Towards rabies elimination in Africa

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Overview:

Rabies is endemic with varying incidence in West And Central Africa

Dogs are the main reservoir

Human post-exposure prophylaxis can reduce human mortality but not interrupt transmission.

Rabies elimination by dog mass vaccination is feasible

Dog rabies mass vaccination is less costly than human post-exposure prophylaxsis (PEP) after 10 years

Social and technical conditions

Political and legal conditions

Novel Financial Instruments: Development Impact Bonds (DIB)

Towards an African rabies elimination strategy

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GAVI:

Estimation of the burden of rabies

And optimisation of PEP in

Cchad, Mali and Côte d'Ivoire

→ GAVI Vaccine Investment Strategy (VIS 2018)

Preliminary results incidence

1st Follow-up	CI	MA	TD
Status	complete	complete	on-going
Response rate	47% urb:56, rur:42	71% urb:75, rur:67	64%
N households	3'784	6'229	1'548
Person-years	13'800	33'000	6'600
Incidence [1000 pers-yrs $^{-1}$]	1.5 urb:2.1, rur:0.9	0.8 urb:0.6, rur:1.0	8.0
Adjusted urban/rural (HH-size [a])	1.5 (2.0)	0.9 (1.5)	

[a] Only households with max 10 persons included in estimate

- Responding and non-responding households did not differ noteworthy in household size or dog ownership

The potential effect of improved provision of rabies post-exposure prophylaxis in Gavi-eligible countries: a modelling study

WHO Rabies Modelling Consortium*

Lancet Infect Dis 2019; 19: 102–11
Published Online November 21, 2018
http://dx.doi.org/10.1016/S1473-3099(18)30512-7

1 million deaths in the 67 rabies-endemic countries (2020 to 2035).
Current post-exposure prophylaxis prevents approximately 56 000 deaths annually.

Expanded access to, and free provision of PEP would prevent 489 000 deaths.

intradermal PEP requires similar amount of vaccine (about 73 million vials)
yet 17·4 million more people are vaccinated at $33 per disability-adjusted life-years.

Scaling up dog vaccination programmes could eliminate dog-mediated rabies over this time period.

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Swiss TPH

U.S.T.T.B

Afrique One
Aspire

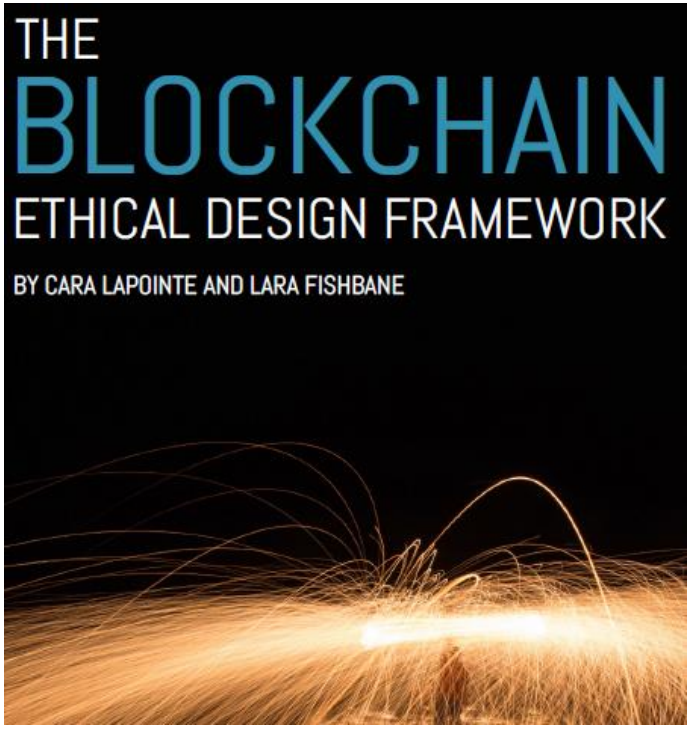
EDCTP

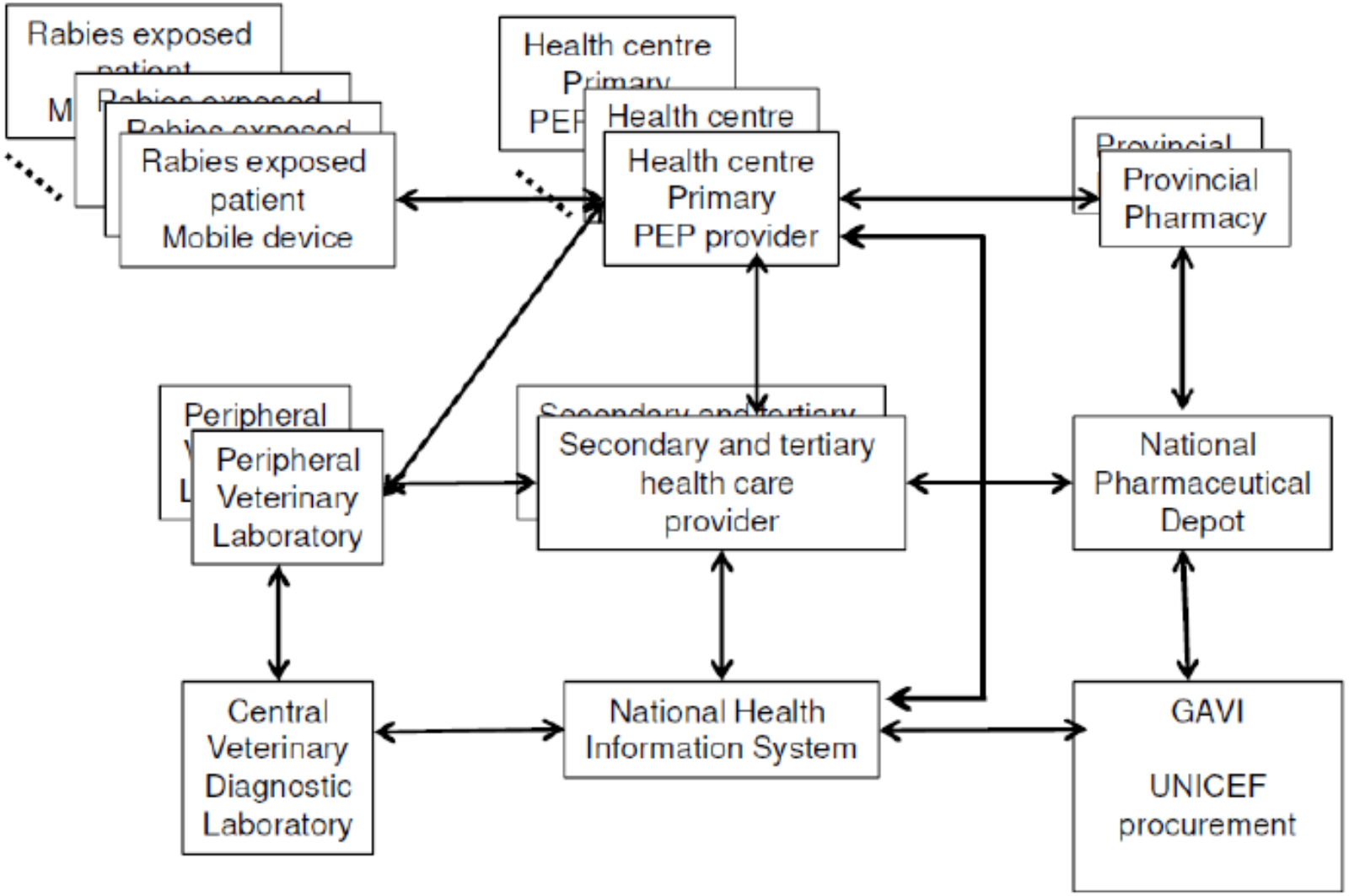
Institut Pasteur

Blockchain high coverage rabies post-exposure prophylaxis to achieve zero human rabies deaths in Africa

Approche du projet

1) Etablissement du blockchain pour approvisionner la PPE durablement selon la stratégie d'investissement en vaccins de GAVI (VIS) en collaboration avec les acteurs.
2) Initiation de la PPE intradermale (ID-PEP)
3) Etablir la participation et une communication de haut niveau entre tous les acteurs en santé publique et santé animale




Rabies exposed patient Mobile device
Health centre Primary PEP provider
Provincial Pharmacy
Peripheral Veterinary Laboratory
Secondary and tertiary health care provider
National Pharmaceutical Depot
Central Veterinary Diagnostic Laboratory
National Health Information System
GAVI
UNICEF procurement

Base de donnés de l’application et blockchain

Application et base de donnés	**Blockchain**
Saisie d’un enreigstrement patient 1	Block1(9.1.2020) age
Traitement PEP du patient 1	Block2(9.12.2020) 1 dose
Saisi du résultat diagnostic du chien	Block3(10.12.2020) chien positif

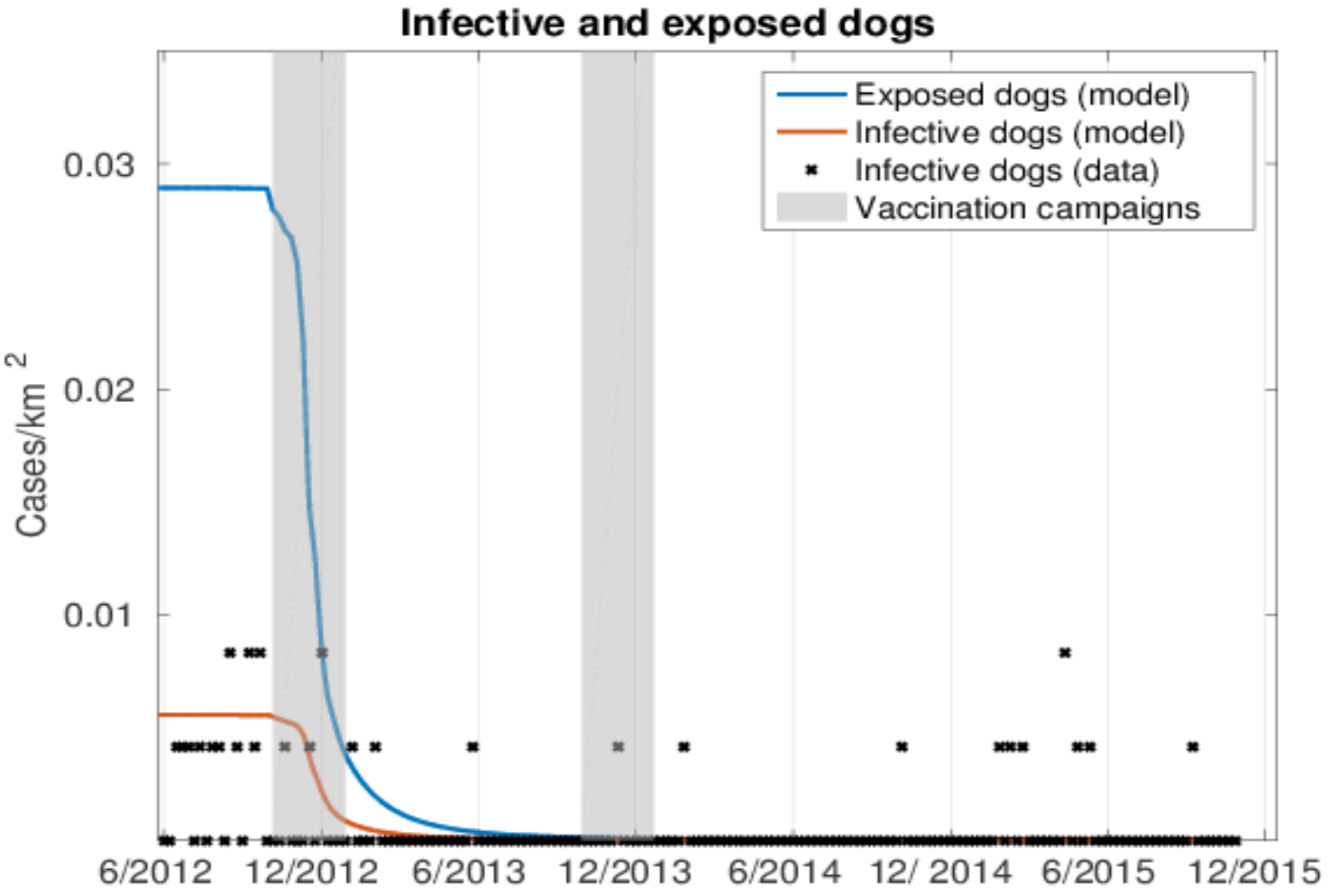
SCIENCE TRANSLATIONAL MEDICINE | REPORT

PUBLIC HEALTH

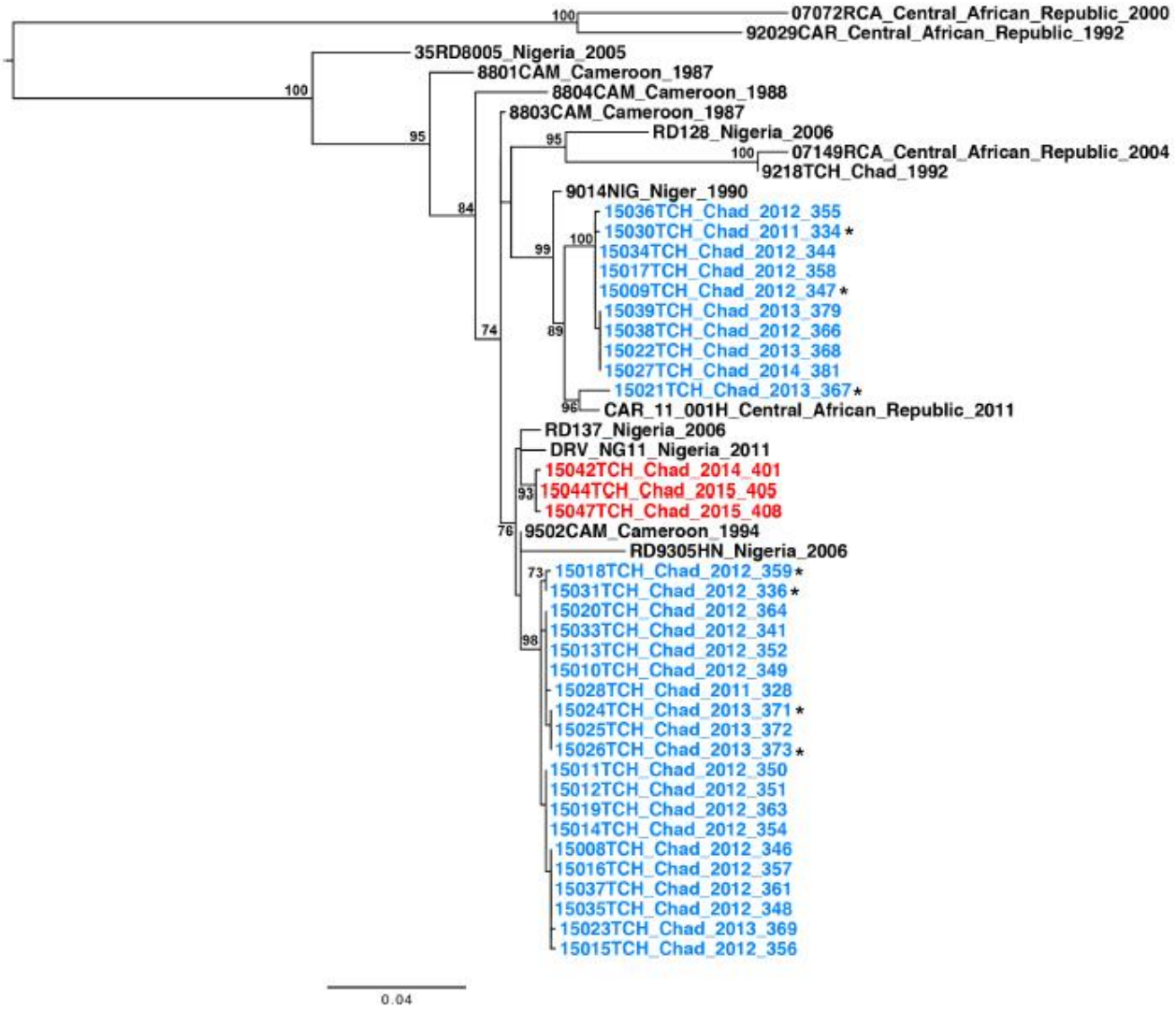
Vaccination of dogs in an African city interrupts rabies transmission and reduces human exposure

Jakob Zinsstag,[1,2]* Monique Lechenne,[1,2] Mirjam Laager,[1,2] Rolande Mindekem,[3] Service Naïssengar,[4] Assandi Oussiguéré,[4] Kebkiba Bidjeh,[4] Germain Rives,[1,2] Julie Tessier,[1,2] Seraphin Madjaninan,[3] Mahamat Ouagal,[4] Daugla D. Moto,[3] Idriss O. Alfaroukh,[4] Yvonne Muthiani,[1,2] Abdallah Traoré,[5] Jan Hattendorf,[1,2] Anthony Lepelletier,[6] Lauriane Kergoat,[6] Hervé Bourhy,[6] Laurent Dacheux,[6] Tanja Stadler,[7,8] Nakul Chitnis[1,2]

Elimination of dog rabies in N'Djaména, Chad



SCIENCE TRANSLATIONAL MEDICINE | REPORT



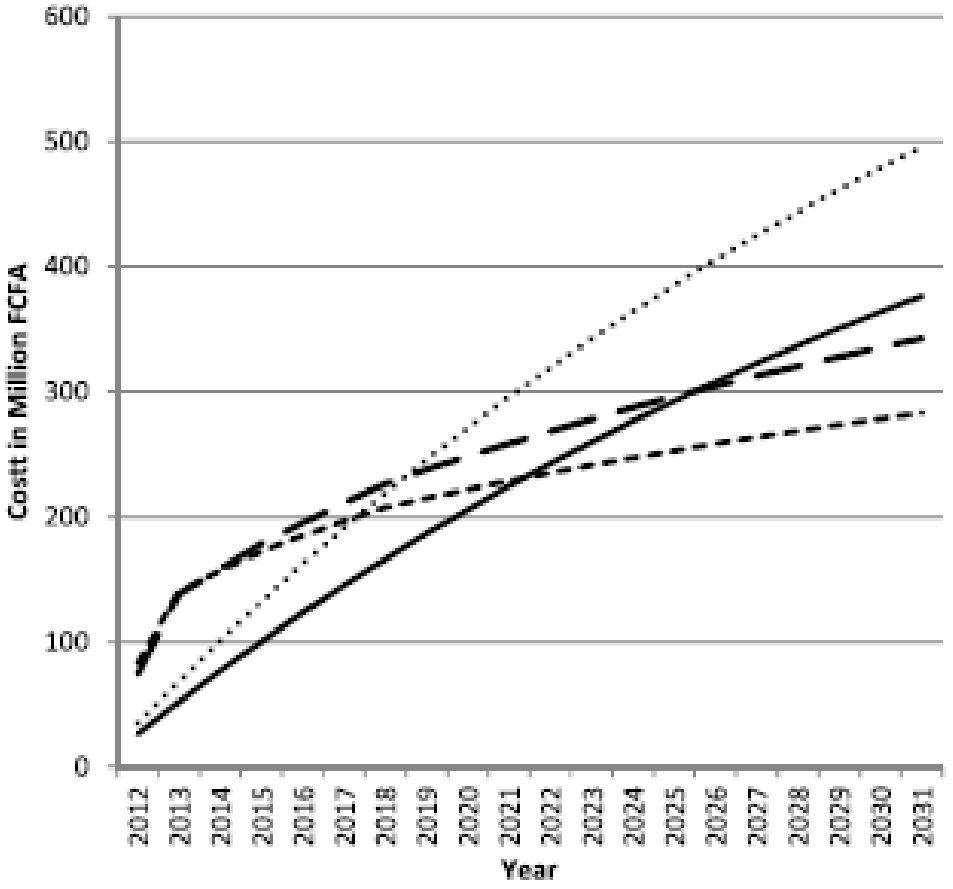


FIGURE 4 | Display of the cost trend of the three different rabies control scenarios.

Technical and social conditions

Surveillance laboratories in all areas (rural)

- DFA, dRIT, RIDT, …..

Information, Education, Communication: Medias, Schools → Social mobilisation

Understanding the social dynamics of rabies control

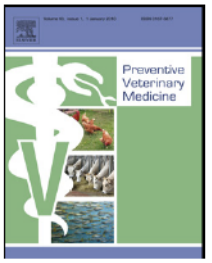
G Model
PREVET-3791; No. of Pages 7
ARTICLE IN PRESS

Preventive Veterinary Medicine xxx (2015) xxx–xxx

Contents lists available at ScienceDirect

Preventive Veterinary Medicine

journal homepage: www.elsevier.com/locate/prevetmed



Low coverage of central point vaccination against dog rabies in Bamako, Mali

Yvonne Muthiani[a,b], Abdallah Traoré[c], Stephanie Mauti[a,b], Jakob Zinsstag[a,b], Jan Hattendorf[a,b,*]

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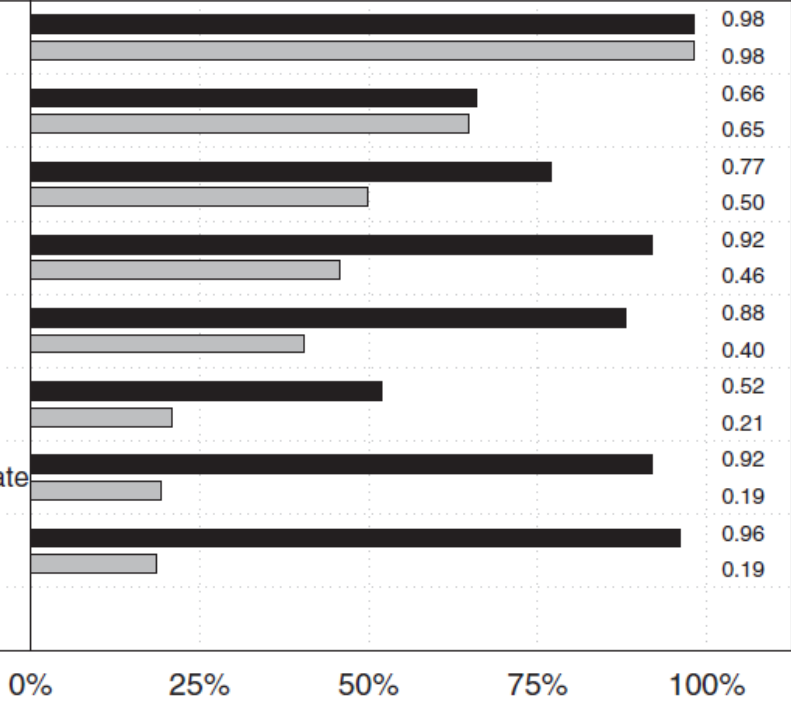
[c] Laboratoire Central Veterinaire (LCV), Km 8, Route de Koulikoro, BP 2295 Bamako, Mali

$$\text{Effectiveness} = \alpha \prod_{i=1}^{n} \beta_{(i)}$$

Y. Muthiani et al. / Preventive Veterinary Medicine xxx (2015) xxx–xxx

Parameter	Assessment	Data source	Effectivness (single parameter, cumulative)	Sensitivity Δ %-points
Efficacy	Vaccination efficacy	Literature	0.98 / 0.98	0.4%
Availability	Information available	Questionnaire	0.66 / 0.65	1.4%
Accessibility	Dog handling & barriers	Questionnaire	0.77 / 0.50	1.2%
Affordability	Perceived (in)direct costs	Questionnaire	0.92 / 0.46	1.0%
Adequacy	Duration, presence of owner	Questionnaire	0.88 / 0.40	1.0%
Acceptability	Various & other	Questionnaire	0.52 / 0.21	1.8%
Targeting	Proportion owned dogs	Bayesian estimate	0.92 / 0.19	1.0%
Provider compliance	Team present at point	Questionnaire	0.96 / 0.19	0.8%
Consumer adherence	NA	NA		



Acta Tropica 165 (2017) 203–215

Contents lists available at ScienceDirect

Acta Tropica

journal homepage: www.elsevier.com/locate/actatropica

A mixed methods approach to assess animal vaccination programmes: The case of rabies control in Bamako, Mali

Laura Mosimann[a], Abdallah Traoré[d], Stephanie Mauti[b,c], Monique Léchenne[b,c], Brigit Obrist[b,c], René Véron[a], Jan Hattendorf[b,c], Jakob Zinsstag[b,c,*]

[a] Institute of Geography and Sustainability, University of Lausanne, Géopolis, 1015 Lausanne, Switzerland
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[d] Laboratoire Central Vétérinaire (LCV), Km 8, Route de Koulikoro, Bamako, Mali

Political and legal conditions (example du Chad)

Political will (national level)

- National rabies elimination strategy (will be a condition of GAVI VIS support)
- make dog vaccination compulsory

Regional coordination

Cost analysis and budgeting

Financing: DIB, Global Environmental Facility (GEF), …

Elimination of human rabies by 2030

Global Alliance for Rabies Control

PARACON

PANAFRICAN RABIES CONTROL NETWORK

JOURNÉE MONDIALE CONTRE LA RAGE 28 SEPTEMBRE

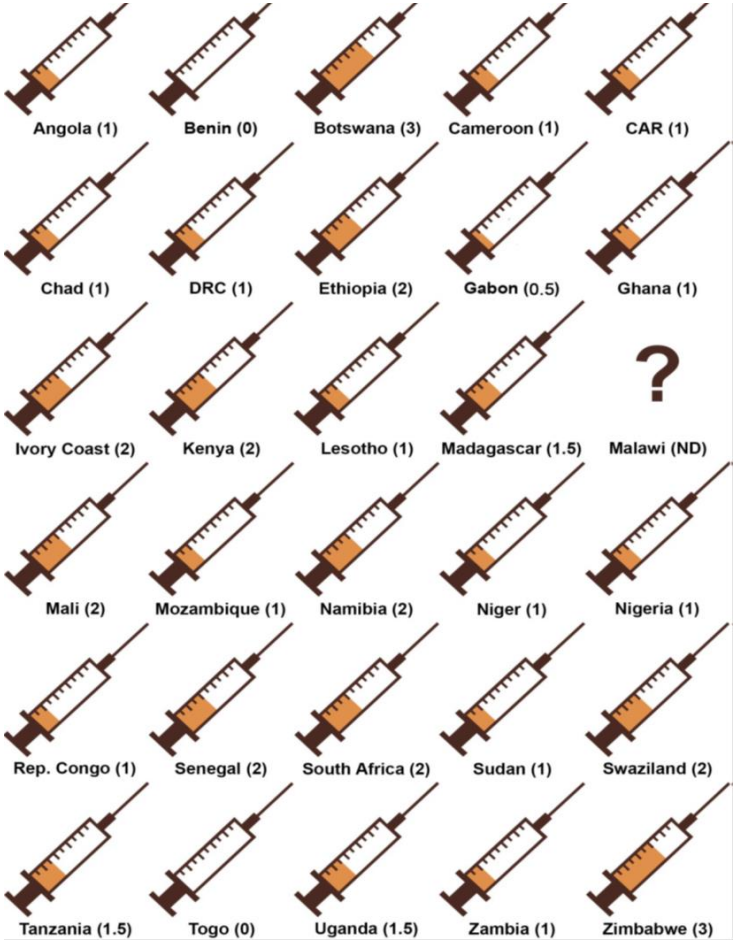
This goal is still far ahead, but in the light of the facts that proceeded, is it not permitted to hope that the efforts of modern science will achieve it one day?

Louis Pasteur, 1882

Examples: Rinderpest (PARC), Latinamerica (PAHO), Europe

SARE- Stepwise Approach to Rabies Elimination

O-GARC SARE-TOOL (version July 2014)



Possible strategy for dog rabies elimination in Africa - best use of geographical barriers

Acta Tropica xxx (2017) xxx–xxx

Contents lists available at ScienceDirect

Acta Tropica

journal homepage: www.elsevier.com/locate/actatropica

Cost-estimate and proposal for a development impact bond for canine rabies elimination by mass vaccination in Chad

Franziska Anyiam[a,b], Monique Lechenne[a,b], Rolande Mindekem[d], Assandi Oussigéré[c], Service Naissengar[c], Idriss Oumar Alfaroukh[c], Celine Mbilo[a,b], Daugla Doumagoum Moto[d], Paul G. Coleman[e], Nicole Probst-Hensch[a,b], Jakob Zinsstag[a,b,*]

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[c] Institut de Recherches en Elevage pour le Developpement, Boîte Postale 473, N'Djaména, Chad
[d] Centre de Support en Santé International, Boîte Postale 972, N'Djaména, Chad
[e] H20 Venture Partners, 33-35 George Street, Oxford OX1 2AY, UK

Principle of a development impact bond (DIB)

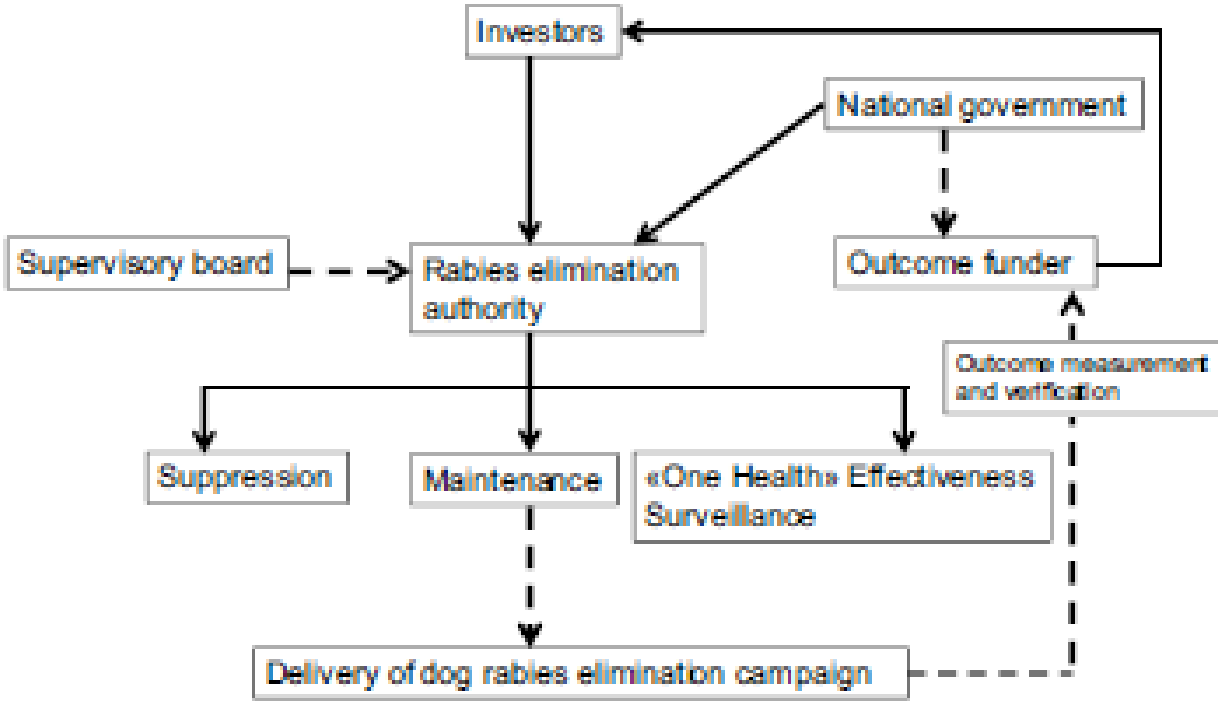
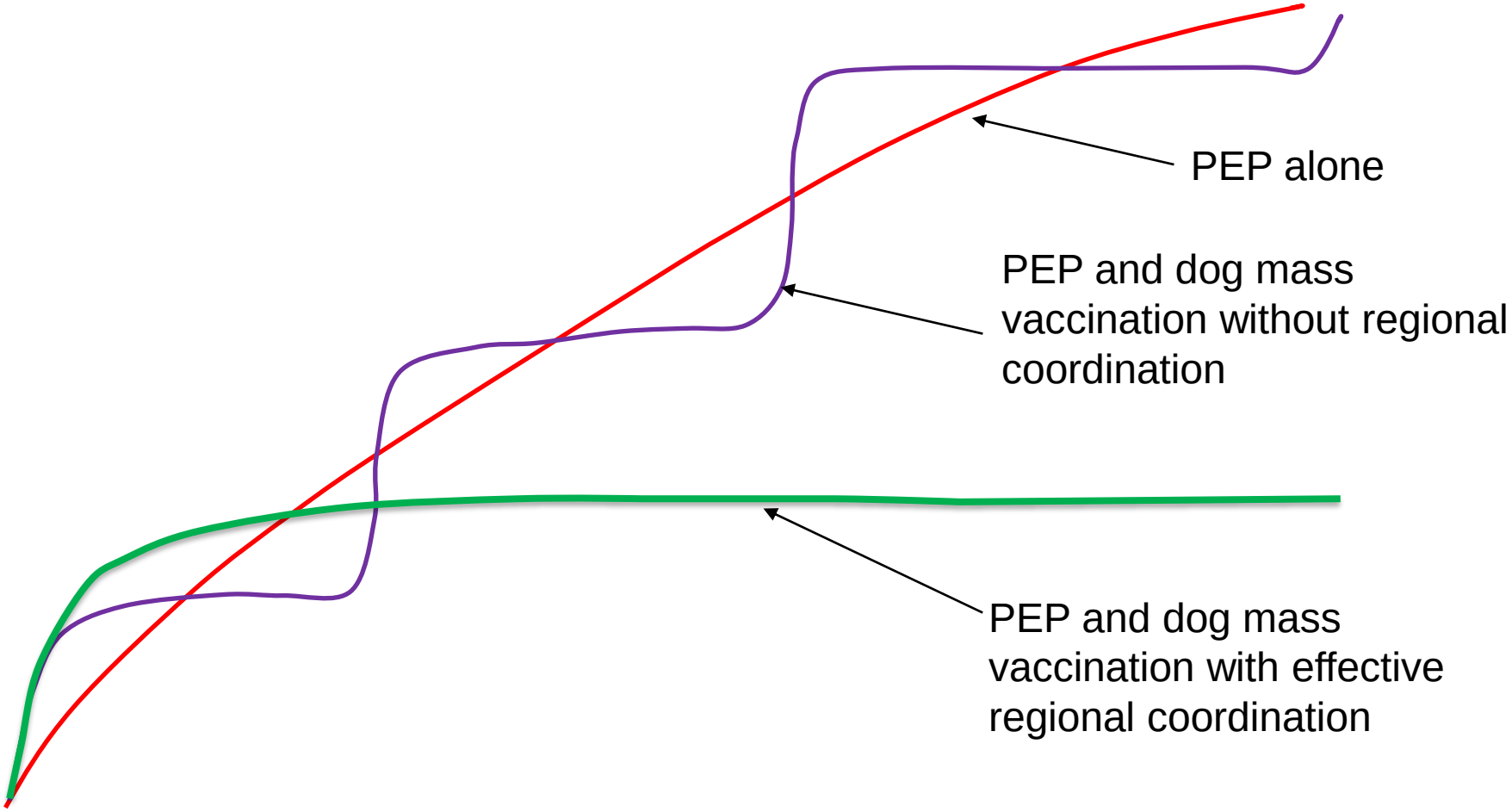


Fig. 1. Proposed development impact bond organizational structure.

Cumulative cost of rabies control



Estimated cost for West and Central Africa for 10 years

					Probabilistic			
	Presumptive			**Human / I**	**Human / Do**	**Human**	**Dog**	**Euro**
Country	**SARE status**			**Dog ratio**	**Dog ratio**	**Population**	**Population**	
Chad	2	10 years	DIB	10	10	11'852'462	1'147'012	28'000'000
Niger	1			20	20	18'638'600	931'930	22'749'570
Burkina Faso	1			15	15	19'512'533	1'300'836	31'755'013
Mali (urban)				121				
Mali	1			30	30	17'467'108	582'237	14'213'127
Mauritania	0			30	30	3'677'293	122'576	2'992'243
Senegal	1			20	20	3'677'293	183'865	4'488'365
Gambia	0			20	20	2'009'648	100'482	2'452'900
Guinea Bissau	0			10	10	1'759'159	170'241	4'155'799
Guinea Conakry	0			10	10	12'093'349	1'170'324	28'569'066
Sierra Leone	0			10	10	6'018'888	582'473	14'218'891
Liberia	0			10	10	4'299'944	416'124	10'158'095
Côte d'Ivoire	2			10	10	23'740'424	2'297'460	56'083'864
Ghana	1			10	10	26'908'262	2'604'025	63'567'496
Togo	1			10	10	7'756'937	750'671	18'324'820
Benin	0			10	10	10'741'458	1'039'496	25'375'388
Nigeria (urban)				6				
Nigeria	1			10	10	186'053'386	18'005'166	439'528'497
Cameroon	1			10	10	24'360'803	2'357'497	57'549'434
Total								**824'182'570**

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LCV, Mali: Abdallah Traoré

CSRS, Côte d'Ivoire: Bassirou Bonfoh, Vessaly Kallo, Mathilde Tétchi

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ETH Basel Suisse: Tanja Stadler

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ANSES: Florence Cliquet

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