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A review of the epidemiology of leptospirosis in Africa

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What do we know about leptospirosis in Africa?

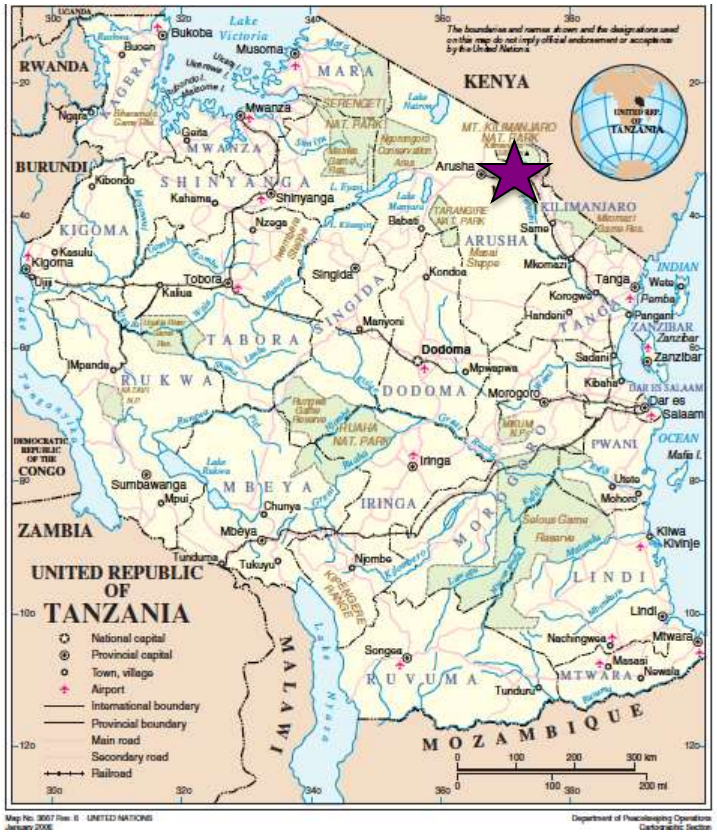
Source: http://www.bbc.com/news/world-africa-34316354, 15th September 2015

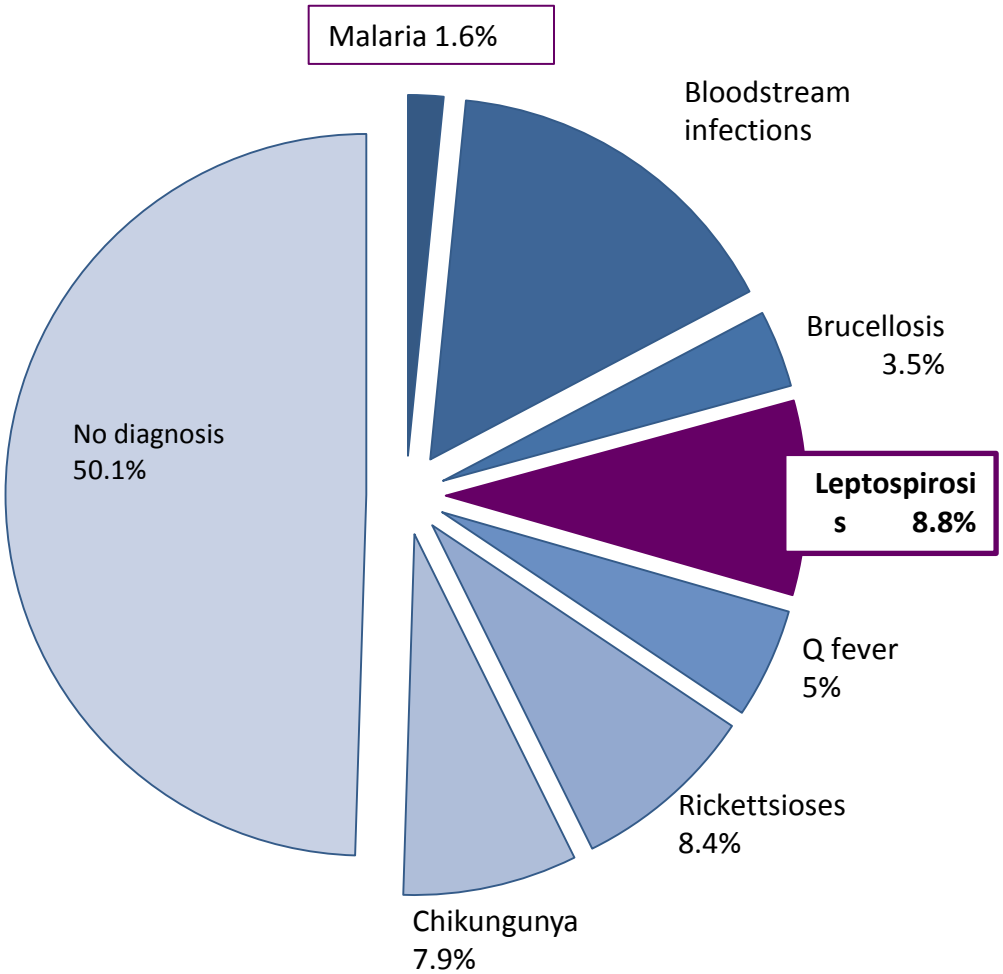
Regional estimates for leptospirosis incidence in Africa

Adapted from Costa et al. PLoS Negl Trop Dis 2015

Region	Estimated morbidity per 100,000
North Africa/Middle East	**7.3**
Central Africa	**13.5**
East Africa	**25.7**
Southern Africa	**3.4**
West Africa	**9.7**
All GBD regions	**14.8**

Leptospirosis is an important cause of febrile disease in Tanzania





References: Biggs *et al*. AJTMH (2011) Prabhu *et al*. Clin Infect Dis (2011); Bouley *et al*. AJTMH (2012); Crump *et al*. PLoS NTD (2013*);* Biggs et al. PLoS NTD (2013)

Allan et al. PLoS Negl Trop Dis (2015) 9 (9) e0003899

To compile and evaluate current data on leptospirosis in Africa:

1. Acute leptospirosis as a cause of clinical illness in people
2. Direct evidence of *Leptospira* carrier status in animal populations

Case definitions: Human & Animal

Animal case definitions

Clinical signs present or absent

≥ 1 of the following:

- Culture and isolation of pathogenic *Leptospira*
- Pathogenic *Leptospira* spp. DNA detected by nucleic acid amplification methods (PCR, qPCR)
- Detection of *Leptospira* in clinical samples by immunohistochemical techniques

Human case definitions

Clinical signs present plus ≥ 1 of the following:

- ≥ 4 x rise in MAT titre between acute and convalescent samples
- Culture and isolation
- DNA detection (PCR, qPCR)
- Immunohistochemical detection

Probable:

- Single MAT titre ≥ 1:400
- IgM ELISA positive
- ≥ 4 x rise in IFA antibody titre

Methodology

Following PRISMA guidelines (2009):

DATABASE SEARCH

- 8 databases searched
- Leptospirosis AND Africa
- 1930 – October 2014
- UN definition of Africa

Two stage exclusion process

1. **Abstract review**
2. **Full text review**

- 681 unique articles identified
- 330 excluded at abstract review
- 256 excluded at full text review

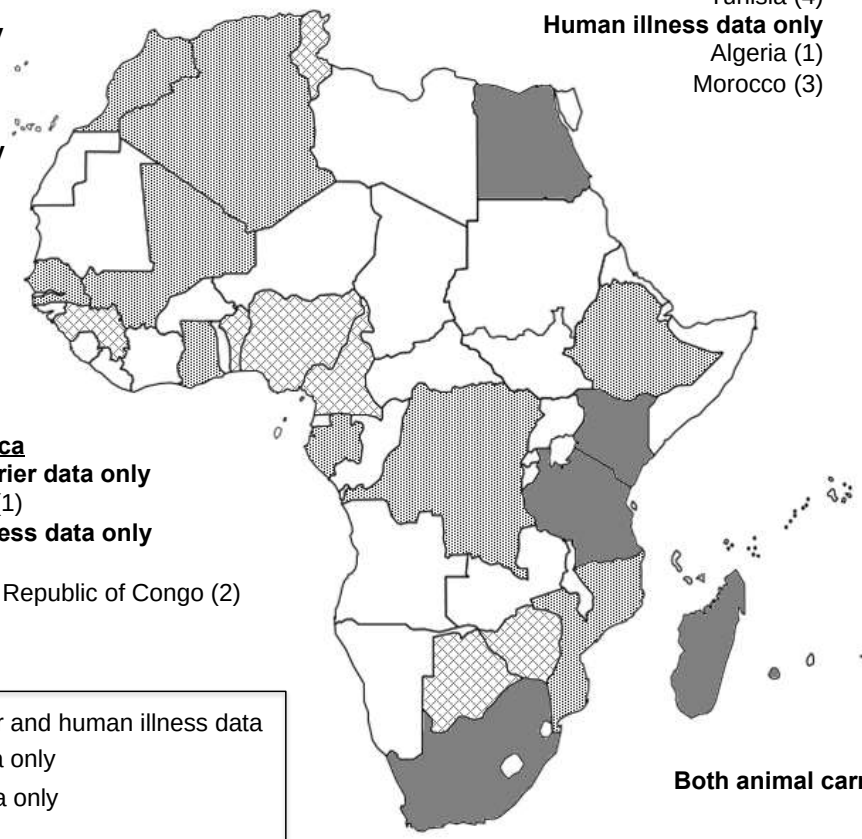
RESULTS: 97 eligible articles

51 animal citations
46 human citations

Geographic distribution of eligible reports of human leptospirosis and animal *Leptospira* infection in Africa

Northern Africa
Both animal carrier and human illness data
Egypt (9)
Animal carrier data only
Tunisia (4)
Human illness data only
Algeria (1)
Morocco (3)

Western Africa
Animal carrier data only
Benin (1)
Guinea (1)
Nigeria (4)
Human illness data only
Ghana (3)
Mali (1)
Senegal (3)



Eastern Africa
Both animal carrier and human illness data
Comoros (2)
Kenya (8)
Madagascar (5)
Mayotte (3)
Réunion (3)
Tanzania (8)
Animal carrier data only
Zimbabwe (8)
Human illness data only
Ethiopia (1)
Seychelles (2)
Mozambique (1)

Middle Africa
Animal carrier data only
Cameroon (1)
Human illness data only
Gabon (2)
Democratic Republic of Congo (2)

- Both animal carrier and human illness data
- Animal carrier data only
- Human illness data only
- No data

Southern Africa
Both animal carrier and human illness data
South Africa (14)
Animal carrier data only
Botswana (2)

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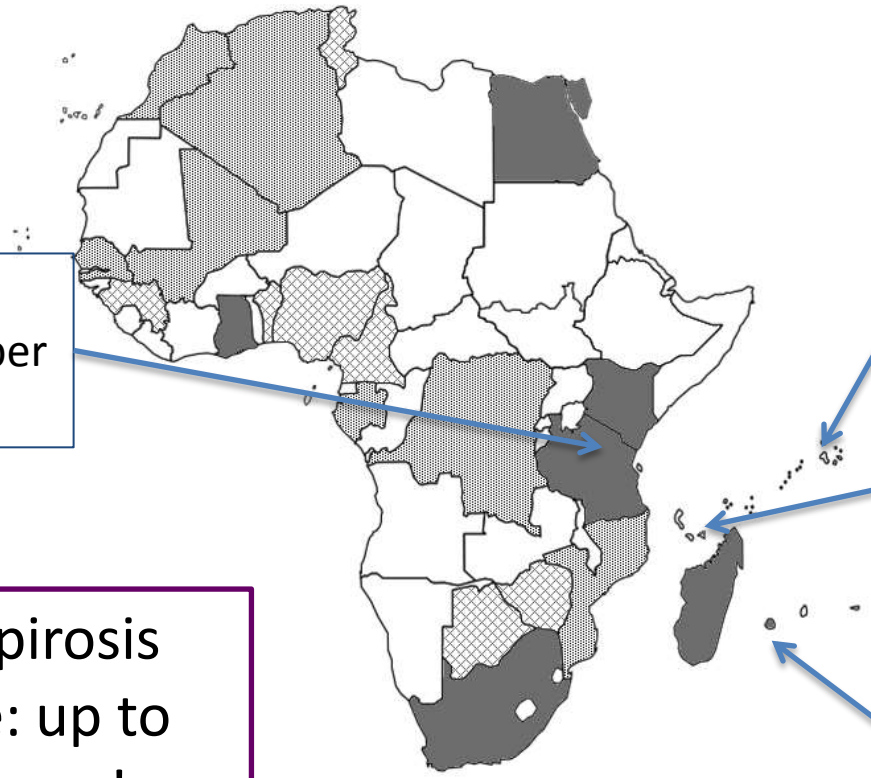
Incidence of acute human leptospirosis in Africa

Estimated global incidence: 14.8 cases per 100,000 (Costa et al. 2015)



Tanzania: 75-102 cases per 100,000 per year

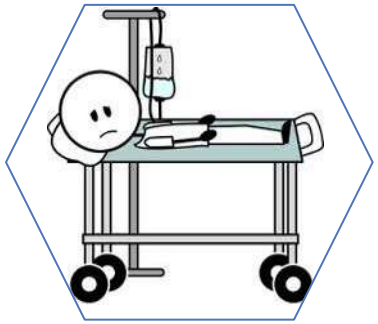
Seychelles: 60-101 cases per 100,000 per year

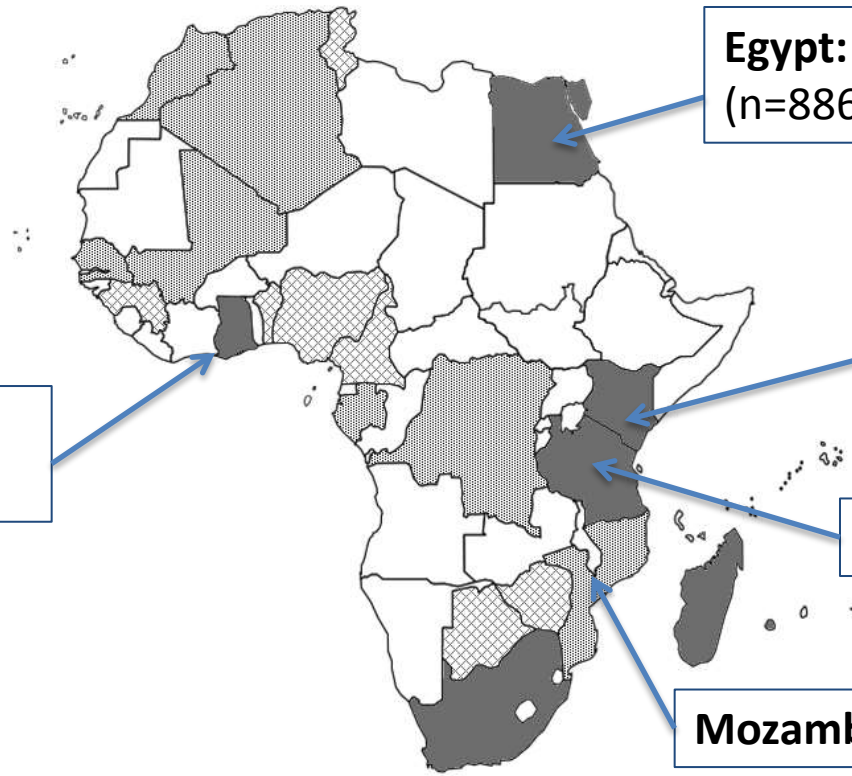
Mayotte: 25 cases per 100,000 per year (mean)

La Réunion: 3.1-12 cases per 100,000 per year

African leptospirosis cases estimate: up to **750,000** per year!

Prevalence of acute human leptospirosis in febrile patients





Egypt: 4.0-19.8%
(n=886-2441)

Kenya: 3.2-17.9%
(n = 39-281)

Ghana: 4.5-7.8%
(n=88-166)

Tanzania: 8.4% (n=831)

Mozambique: 2.3% (n=43)

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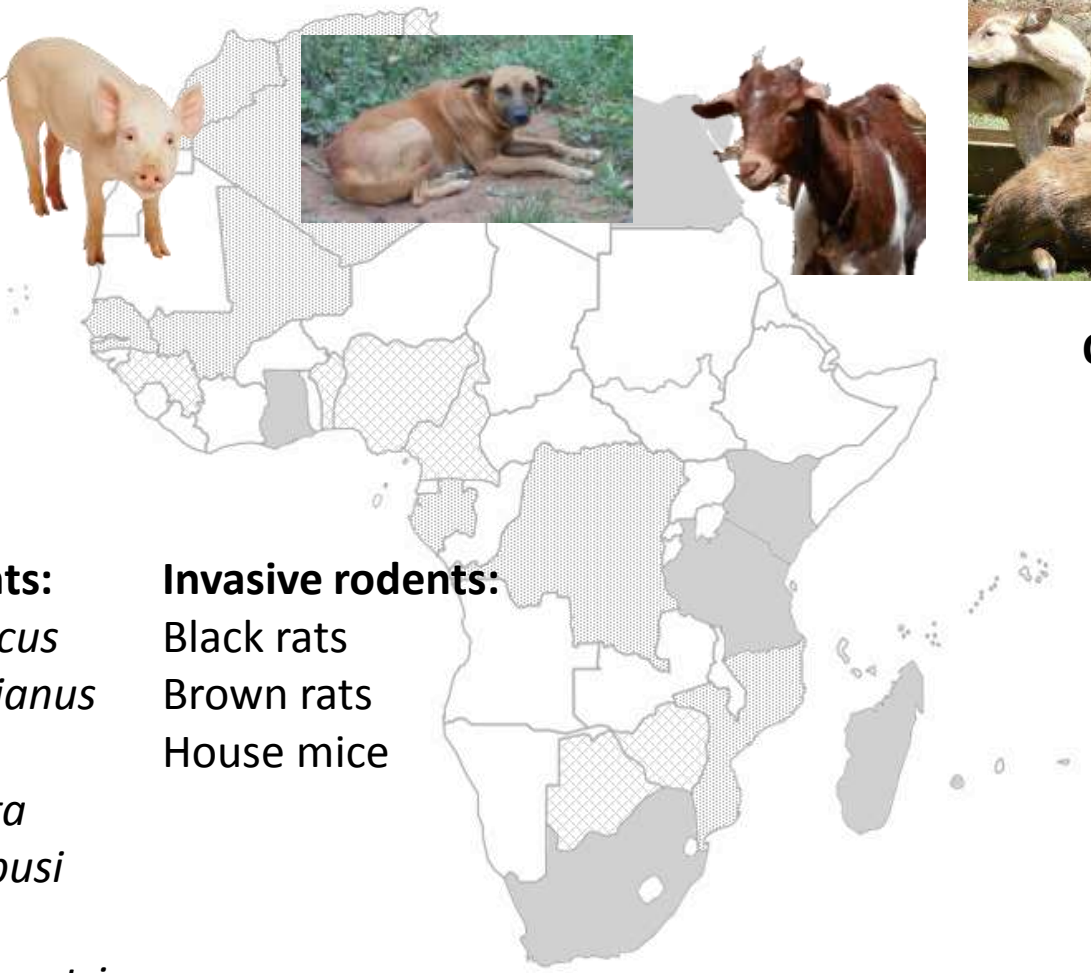
Diversity of animal hosts of *Leptospira* spp. in Africa



Indigenous rodents:
Arvicanthus niloticus
Cricetomys gambianus
Eliurus minor
Gerbiliscus robusta
Lophuromus sikapusi
Mastomys spp.
Saccostomys campestris

Invasive rodents:
Black rats
Brown rats
House mice

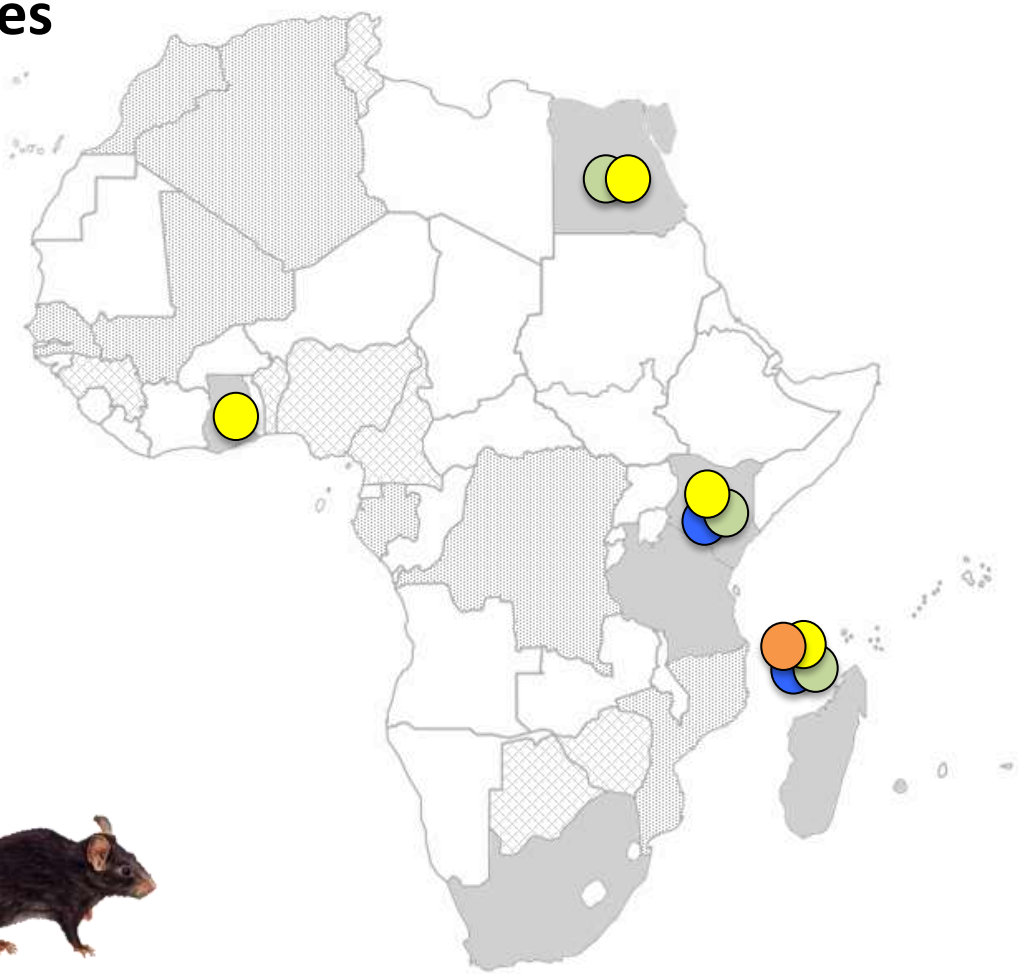
Other wildlife
Bats
Egyptian Fox
Mongoose
Shrews
Tenrecs

Diversity of *Leptospira* from human cases in Africa

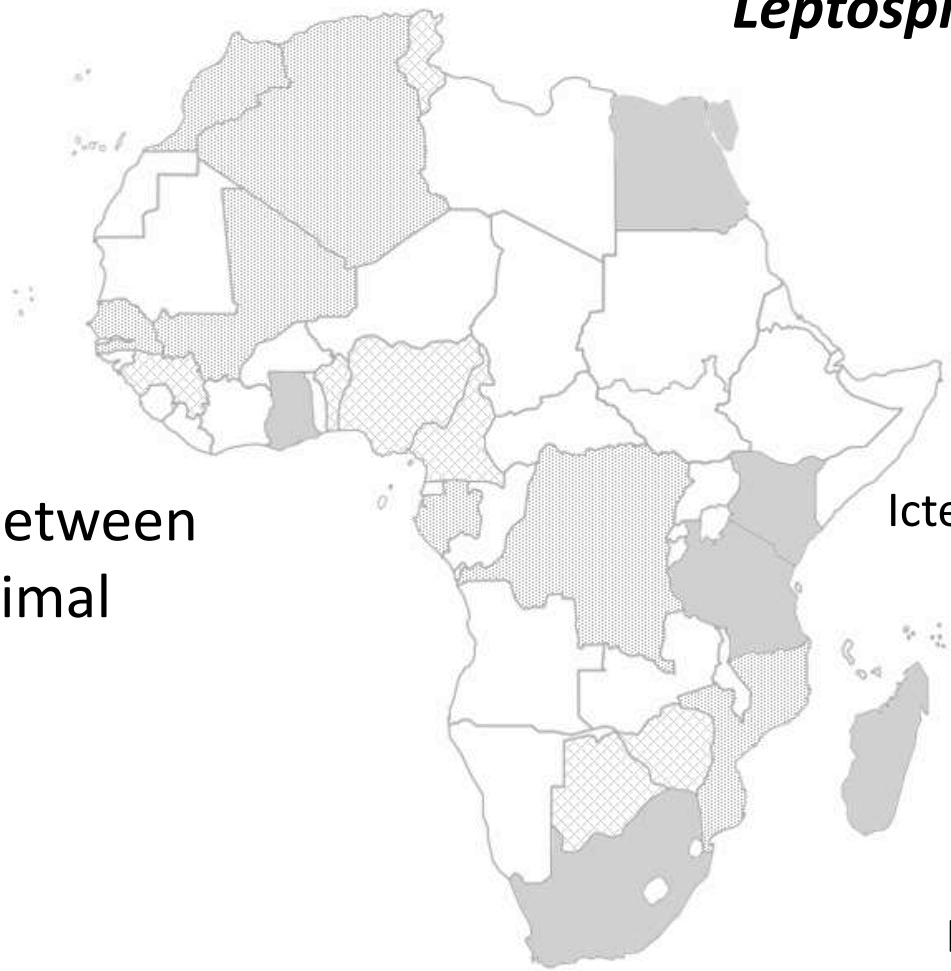
***Leptospira* species**

Predominant species:

- *L. borgpetersenii*
- *L. interrogans*
- *L. kirschneri*
- *L. mayottensis*
- *(L. noguchii)*
- *(L. santarosai)*



Serological diversity of *Leptospira* from human cases in Africa



***Leptospira* serogroups**

Australis
Autumnalis
Bataviae
Canicola
Djasiman
Grippotyphosa
Hebdomadis
Icterohaemorrhagiae
Mini
Pomona
Pyrogenes
Sejroe
Tarassovi
Mini/Hebdomadis
Pyrogenes/Ballum

- Few linkages between human and animal studies

Conclusions

1) Leptospirosis in an important cause of febrile illness in people in Africa.

1) Human disease data is lacking from many countries. Little population-level data is available.

2) Leptospirosis is endemic in wild and domestic animals in Africa.

3) Three main species predominate reports: ***L borgpetersenii, L. interrogans*** **and** ***L. kirschneri***
   - *L. mayottensis* on Indian Ocean Islands

1) Studies linking human acute leptospirosis with animal infections are rare.

Seroprevalence of leptospirosis in sub-Saharan Africa

International Journal of Infectious Diseases 28 (2014) 47–64

Contents lists available at ScienceDirect

International Journal of Infectious Diseases

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

Review

Leptospirosis in Sub-Saharan Africa: a systematic review☆

Sophia G. de Vries [a], Benjamin J. Visser [a], Ingeborg M. Nagel [b], Marga G.A. Goris [c], Rudy A. Hartskeerl [c], Martin P. Grobusch [a,*]

[a] Center of Tropical Medicine and Travel Medicine, Department of Infectious Diseases, Division of Internal Medicine, Academic Medical Centre, University of Amsterdam, Meibergdreef 9, 1100 DE, room F4-220, Amsterdam, Netherlands
[b] Medical Library, Academic Medical Centre, University of Amsterdam, Netherlands
[c] WHO/FAO/OIE and National Leptospirosis Reference Centre, KIT Biomedical Research, Amsterdam, Netherlands

- Leptospirosis is ubiquitous in people and animals in Africa

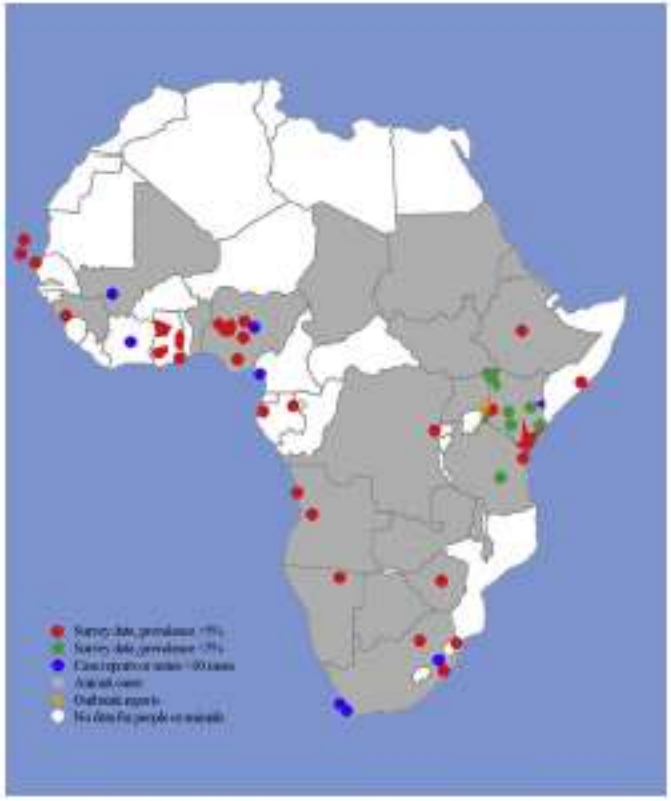


Figure 2. Availability and nature of reported epidemiological data. Prevalences and numbers refer to human cases unless specified otherwise.

Identifying constraints to leptospirosis research on the African continent

1. Leptospirosis is a “hidden disease” - there is little clinician or veterinarian awareness

1. Challenges of clinical diagnosis in the absence of laboratory diagnostics

1. Lack of coordination and sustainability: people working in isolation, historic work forgotten…

1. The ‘One Health’ approach: “Leptospirosis is a zoonosis, and it is important that human health workers, veterinary personnel and scientists work together in exploring ways and means of controlling it”

M.J. Owolo, Opening Address, 1st Conference of leptospirosis in Africa, Zimbabwe 1992

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