Léa Fourchault (RBINS): github: tropileaf – Abdallah & Dimitri, add me for the analysis

Abdallah Lamane (Harvard Medical School/Centrale Paris)

Dimitri Mbakop (UNIFI/ZHAW)

Ganiyat Saliu (RBINS/VUB)

Prof. Sophie Gryseels (UA/RBINS)

Dr. Erik Verheyen (RBINS)

Prof. Katharina Kreppel (ITM)

**Zootherapeutic practices across Africa: public health risks and impacts on biodiversity**

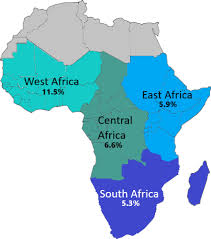
Supervision: Katharina + Sophie + Erik

Dataset: Léa + Ganiyat

Analysis & Figures: Abdallah + Dimitri + Léa 🡪 use R! rnaturalearth + rnaturalearthdata packages for spatial data & maps

Writing: Léa

Editing: all



*Analysis could be done ‘per region’ rather than ‘per country’ - then use the regions above + Maghreb.*

**Theme A: ‘understanding the data’**

*Context*

* Number of studies & number of countries & number of studies per country (mean/distribution?)
* Overall study size & study size per country (study size = number of people interviewed)
* Frequency of target population (more traders? More villagers? More traditional health practitioners?) – is there a significant difference between countries?
* Number of studies published in or after 2020
* Number of practices per country
* Any other statistics we feel inspired about (does one country cluster all data?)

*Content*

* Number of ailments treated
* Most common ailments treated (rank top 10 from ‘WHO Category’)
* Number of unknown ailments
* Number of species used
* Top 10 most commonly + top 10 least commonly used species
* Number of body parts used & rank most to least commonly used
* Number of ‘unknown’ diseases treated (NA in WHO Category)
* Number of distinct practices
* **Number of similar/identical practices across studies + their frequency + their geographic distribution. MAKE GRAPH OR TABLE that shows the animal, the organ, the treatment, and the ailment and the country/region for each practice that is found in multiple studies. Similar = same species (use phylogenetic category if nothing found with species) used for same disease category. Identical = same species, same organ category, same disease category, same treatment category.**

Other ideas?

**Theme B: ‘biodiversity’**

* Most frequently cited phylogenetic category? Top 5 species within each phylogenetic category
* Number of endangered species (IUCN: **VU, CR, EN, DD)** – significantly more or less than non-endangered (LC, DOM) species? Top 10 most frequent endangered species? MAKE GRAPH/TABLE
* Among endangered + among non-endangered species, are there significantly more practices that require a live (dung, faeces, feathers, secretions) or dead (bones, flesh, blood, internal organs…) animal? MAKE GRAPH, test significance using GLMs
* Top 10 practices that are most harmful to endangered species + their frequency & geographic location. Make a graph with frequency of use on the y-axis and level of endangerment on the x-axis.

Other ideas?

**Theme C: ‘risk of zoonotic pathogen transmission’**

I like the way of thinking, but here a few concerns:

Not so sure about scoring the number of known zoonotic pathogens – what about pathogen X? Better to assume potential zoonotic pathogens are present. The known presence of vectors and the social behaviour of the animal (living in groups or solitary). The characteristic of being lethal does not affect the transmission risk. R0 is also a measure to consider. Human R0 cannot be used for animal to animal transmission per se, but can give information.

I don’t understand your treatment scoring. I would give a score for combinations. I.e.

Ingestion/inhalation raw bodily fluids/matter – ingestion/inhalation heat treated bodily fluids/matter

topical raw bodily fluids/matter on open wound – topical raw bodily fluids/matter on closed skin

* ***Risk score based on (A) the animal used (phylogeny, social behaviour, pathogen diversity), (B) the organ used, (C) the treatment type, (D) the human recipient.***

***1 lowest risk, 5 highest risk.***

* **phylogenetic relatedness between animal and humans:** primates (5), other mammals including rodents and bats (4), birds and reptiles (3), fish (2), insects and crustaceans (1)
* **social behaviour of the animal:** social – lives in herds, packs, flocks, etc. (4), solitary – no gathering observed in adults (2)
* **body part of the animal that is used**: blood or internal organs (5) secretions such as semen (4) faeces, urine and flesh (3), hairs or fur (2), nails, horns etc (1)
* **treatment type**: injected or topical raw on wound (5), ingested raw or inhaled raw (4), ingested altered or sprayed or topical not on wound (3), inhaled altered (2), ingested cooked or others (1)
* **recipient** **human**: physically sick child or infant (5), seemingly physically healthy child or infant (4), pregnant or lactating adult (3), physically sick adult (2), seemingly physically healthy adult (1)
* **pathogen diversity in animal**: bats, rodents, artiodactyla (5), other mammals and birds (4), arthropoda (3), reptiles and actinopterygii (2), amphibians and molluscs (1).

**Display top 5 high-risk practices and low-risk practices as SPIDER CHART (e.g., below) with each axis being one risk category (phylogen, sociality, body part, treatment…).**

A green hexagon with white text

Description automatically generated

* Mean risk score across practices?
* Distribution of risk score: centred around low-risk (1-2) or high-risk (4-5) or even distribution? GRAPH
* Riskiest practices: geographically clustered?
* **Graph moyenné**

Other ideas?

Ring map transmission risk -> social patterns, e.g., cardiovascular disease

Papers of interest:

1. Carlson CJ, Farrell MJ, Grange Z, Han BA, Mollentze N, Phelan AL, et al.. The future of zoonotic risk prediction. *Philos Trans R Soc Lond B Biol Sci*. 2021. Vol. 376(1837):20200358
2. **Grange ZL, Goldstein T, Johnson CK, Anthony S, Gilardi K, Daszak P, et al.. Ranking the risk of animal-to-human spillover for newly discovered viruses. *Proc Natl Acad Sci U S A*. 2021. Vol. 118(15):e2002324118 🡪 RISK SCORE**

<https://www.nature.com/articles/nature22975>

<https://royalsocietypublishing.org/doi/full/10.1098/rstb.2020.0358>

<https://www.pnas.org/doi/epdf/10.1073/pnas.2002324118>

<https://www.nature.com/articles/s41579-021-00665-x>

<https://journals.asm.org/doi/10.1128/mbio.02985-21>

<https://www.nature.com/articles/s41564-021-00999-5>

<https://www.annualreviews.org/doi/pdf/10.1146/annurev-environ-102016-060827>

example of scoping reviews:

<https://www.nature.com/articles/s41467-023-36267-9>

<https://journals.plos.org/plosntds/article?id=10.1371/journal.pntd.0009691>

<https://www.thelancet.com/cms/10.1016/S2542-5196(23)00107-9/attachment/3bae61fc-dd64-4b8e-8033-63c764502a75/mmc1.pdf>

Table S1. International Classification of Diseases by the World Health Organization (ICD-11 version; OMS 2019). Codes as in Table 1 in the main text.

Codes Diseases

1 Certain infectious or parasitic diseases

2 Neoplasms

3 Diseases of the blood or blood-forming organs

4 Diseases of the immune system

5 Endocrine, nutritional or metabolic diseases

6 Mental, behavioural or neuro-developmental disorders

7 Sleep-wake disorders

8 Diseases of the nervous system

9 Diseases of the visual system

10 Diseases of the ear or mastoid process

11 Diseases of the circulatory system

12 Diseases of the respiratory system

13 Diseases of the digestive system

14 Diseases of the skin

15 Diseases of the musculoskeletal system or connective tissue

16 Diseases of the genitourinary system

17 Conditions related to sexual health

18 Pregnancy, childbirth or the puerperium

19 Certain conditions originating in the perinatal period

20 Developmental anomalies

21 Symptoms, signs or clinical findings, not elsewhere classified

22 Injury, poisoning or certain other consequences of external causes

23 External causes of morbidity or mortality

24 Factors influencing health status or contact with health services

25 Codes for special purposes

26 Traditional Medicine conditions