

Spatial epidemiological approaches to inform rabies surveillance and control

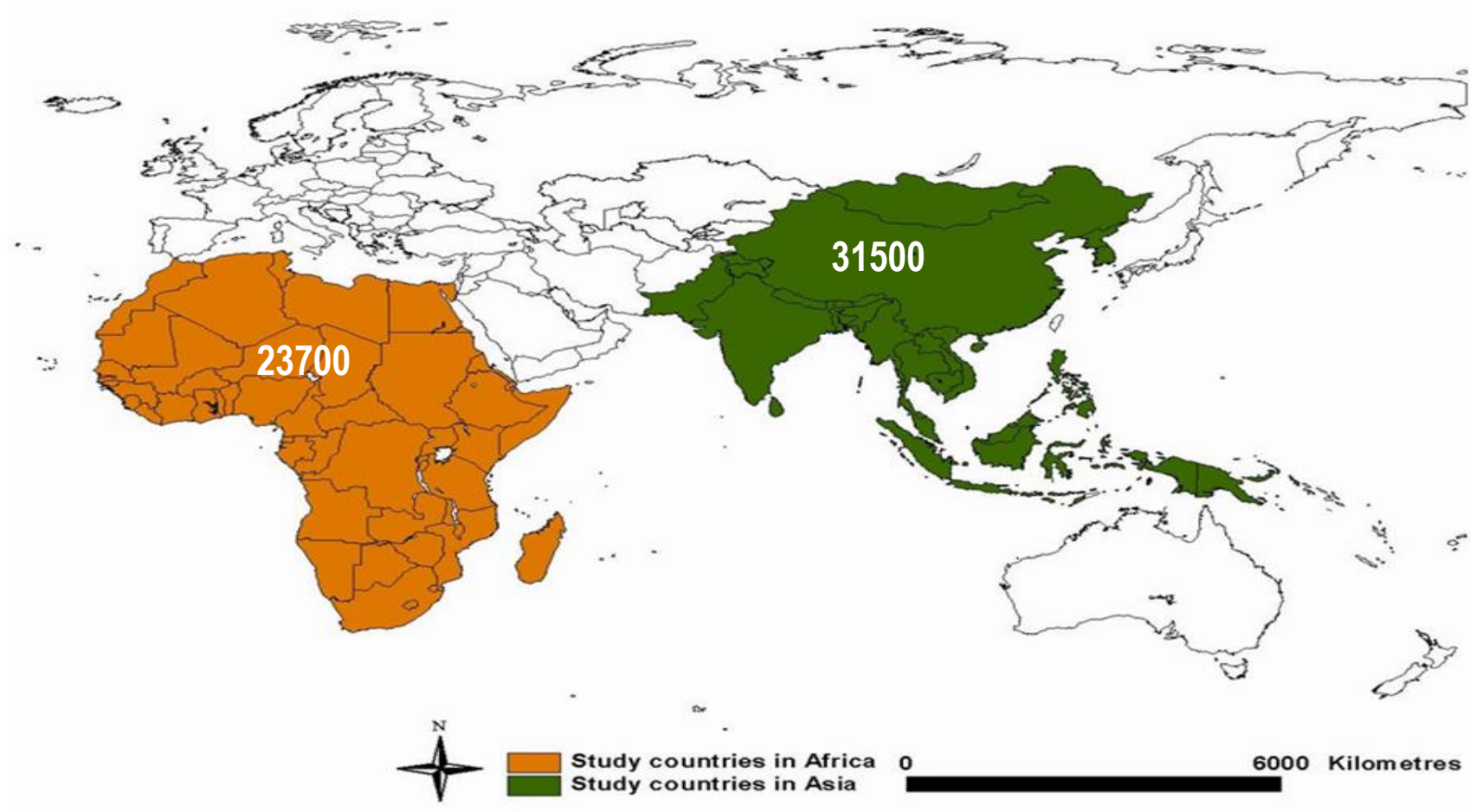
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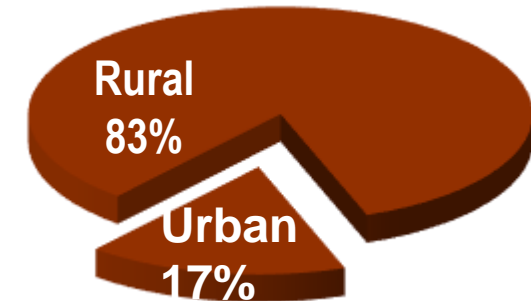
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Global burden



> 59 000 deaths / year

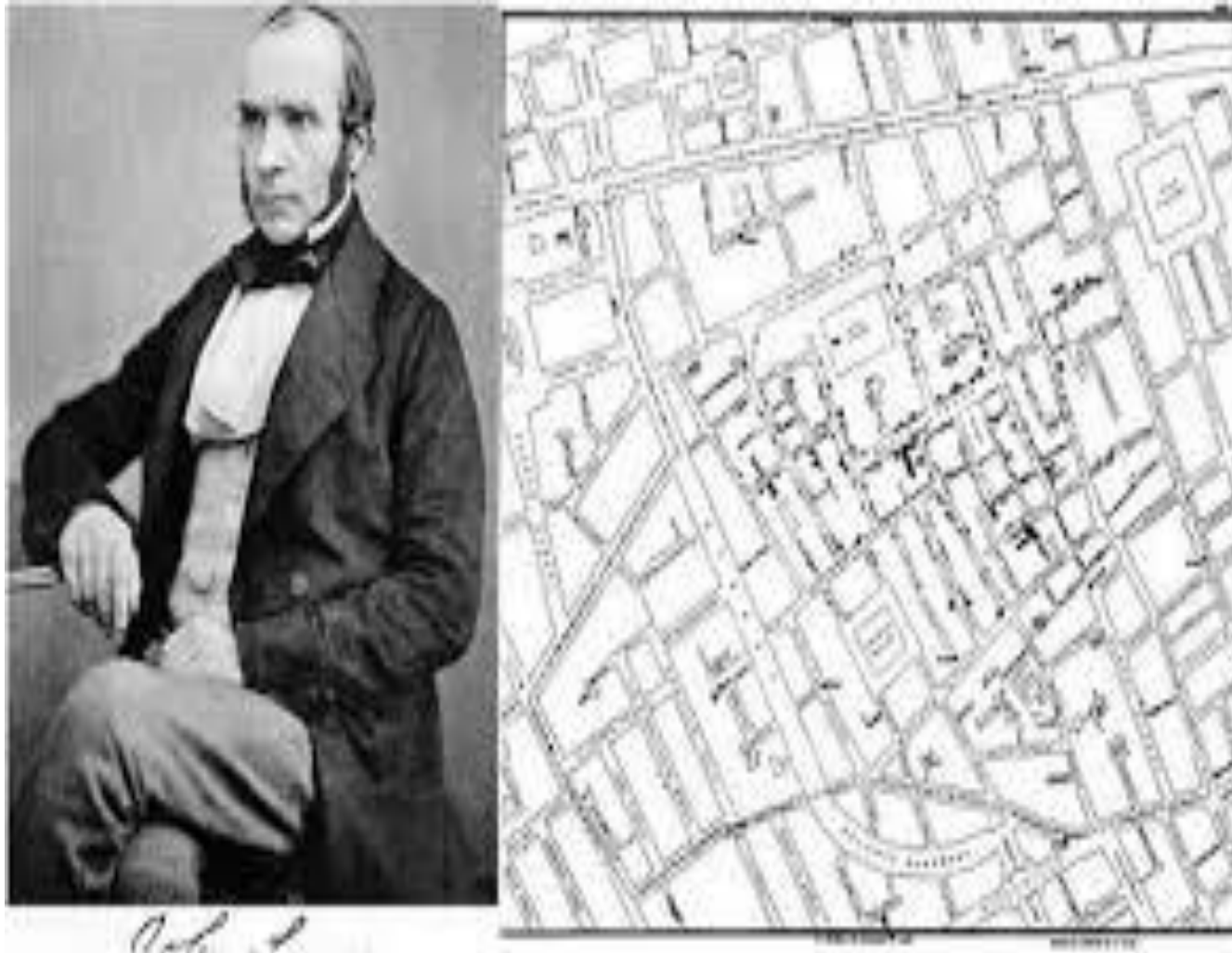


<15 year most at risk

Hampson et al.,2015



Zero dog mediated rabies deaths by 2030

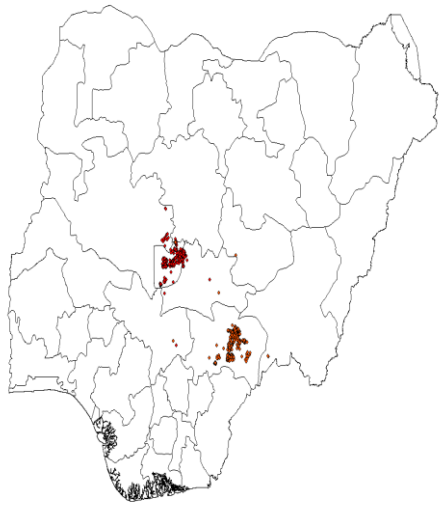


- Understand geographical and temporal patterns
- Identify potential risk factors
- Highlight high risk areas
- Measure inequalities
- Result guide decision making process for better allocation of scarce resources and designing an effective control strategies

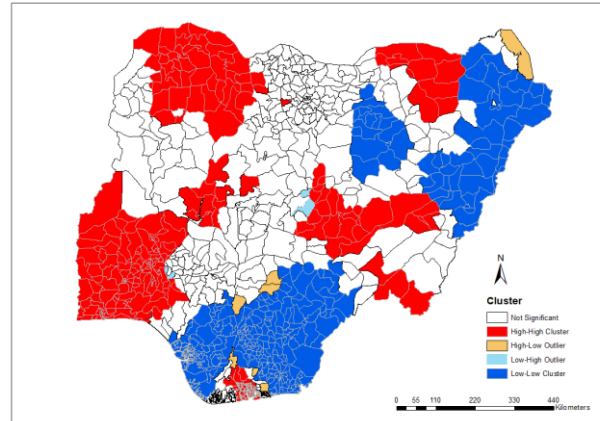
John Snow's map of Cholera, London, 1854

Types of spatial data and objectives of analysis

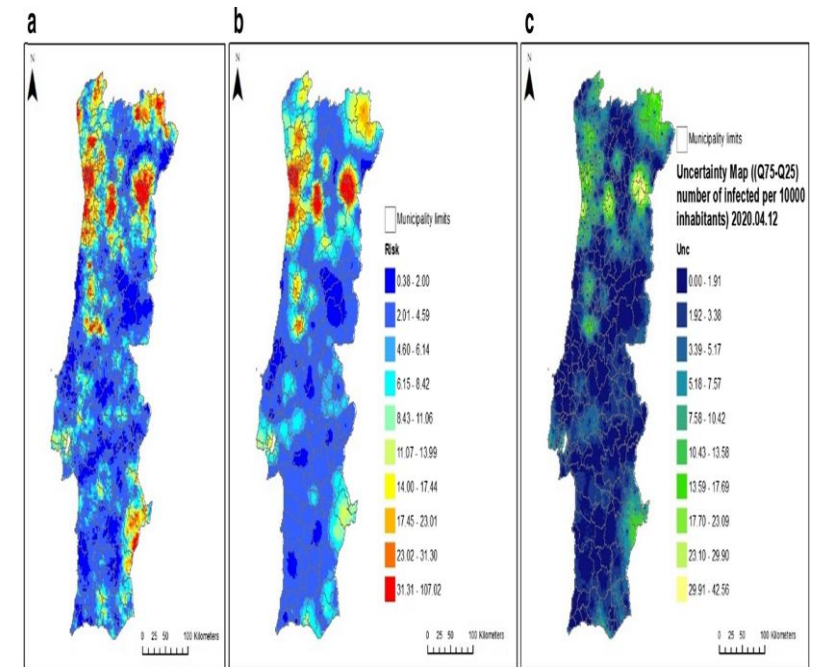
Point patterns



Areal data



Geostatistical data



Azevedo et al., 2020

- Previous studies have used spatial epidemiological approaches to model the risk of rabies transmission risk to humans and animals at different spatial scale
- There has not been any evaluation of the adequacy of the methods used (analysis pipeline)
- Evaluation is critical to inform a framework for best practice when conducting monitoring and evaluating studies
- Previous evidence indicates that reported rabies notifications do not follow a random pattern but exhibit clustered distributions

Objective: Review and critically appraise available literature on spatial epidemiological studies

Method

We used the standard systematic and meta-analysis (PRISMA) guidelines to search and identify relevant articles and grey literatures on rabies spatial epidemiology

Research questions

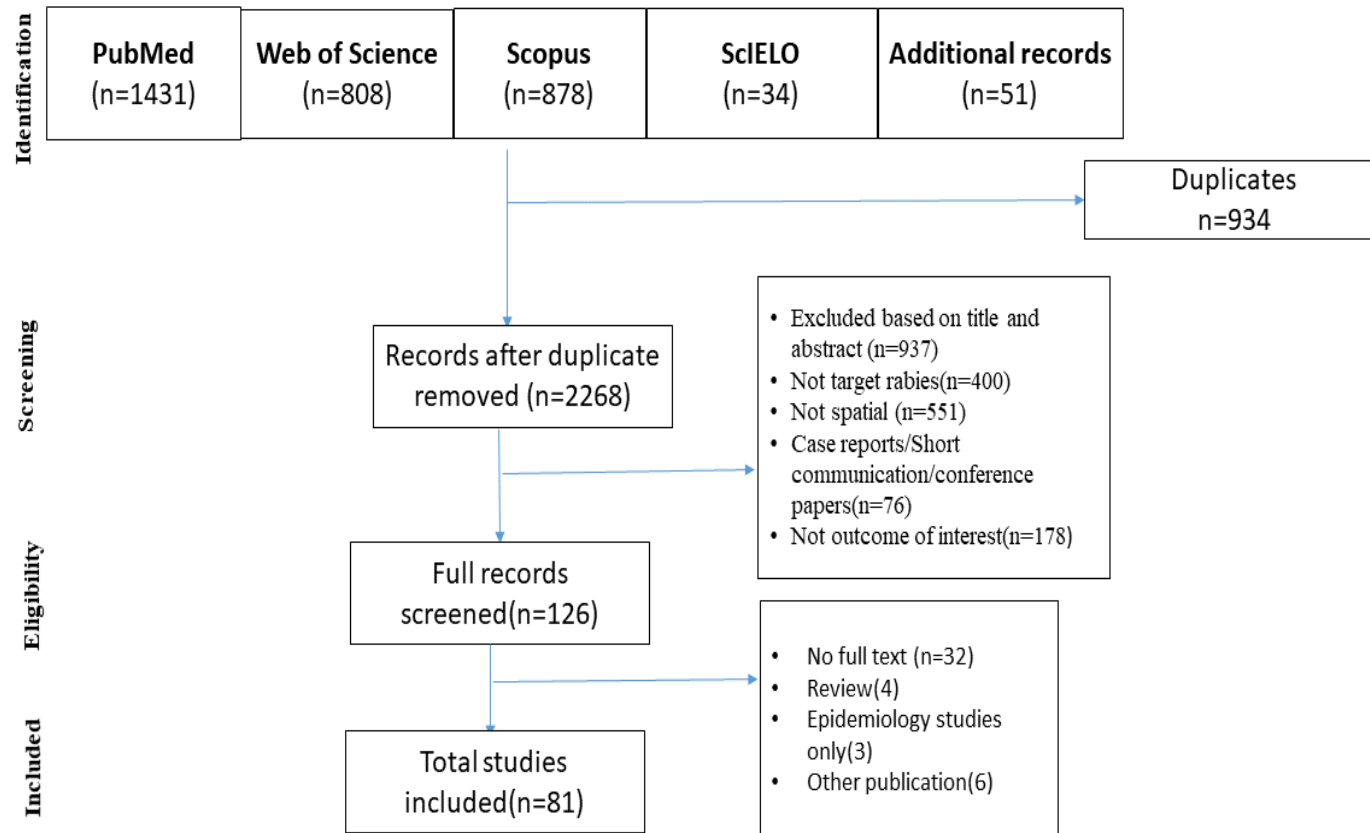
- What are the strengths and limitations of existing spatial epidemiological studies on rabies available in literature?
- What can be suggested as guidance for future studies?

Significance

- Suggest guidance for future studies

Outcome

- We proposed a framework for global application



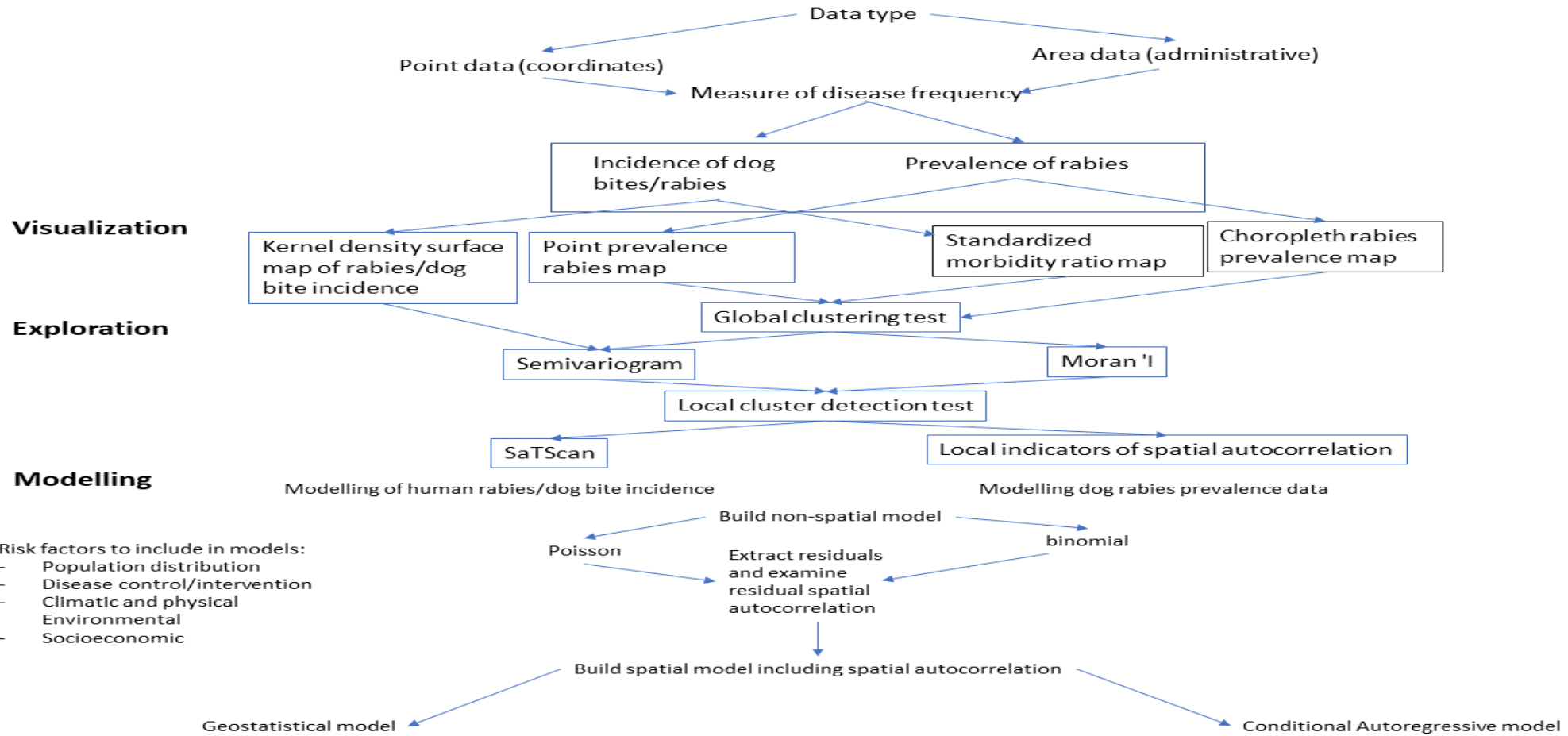
Data extracted

- Type of study,
- publication year,
- study design (e.g., cross-sectional, case-control, cohort),
- Country, rabies epidemiological data (e.g., species),
- Measure of disease frequency (eg. incidence and/or prevalence),
- Diagnostic methods used
- study objectives/aim and key findings
- scale of the study (national or subnational)
- Detail of the spatial techniques used for each of the three spatial epidemiology steps (visualization, exploration and modelling).

Key findings

- Most studies used passive surveillance data
- Most studies were carried out at subnational level and mostly in city centres
- Most studies used maps to depict the incidence and prevalence of rabies
- Disparity in approaches to the clustering and cluster detection methods
- Variable selection was not comprehensive

Framework



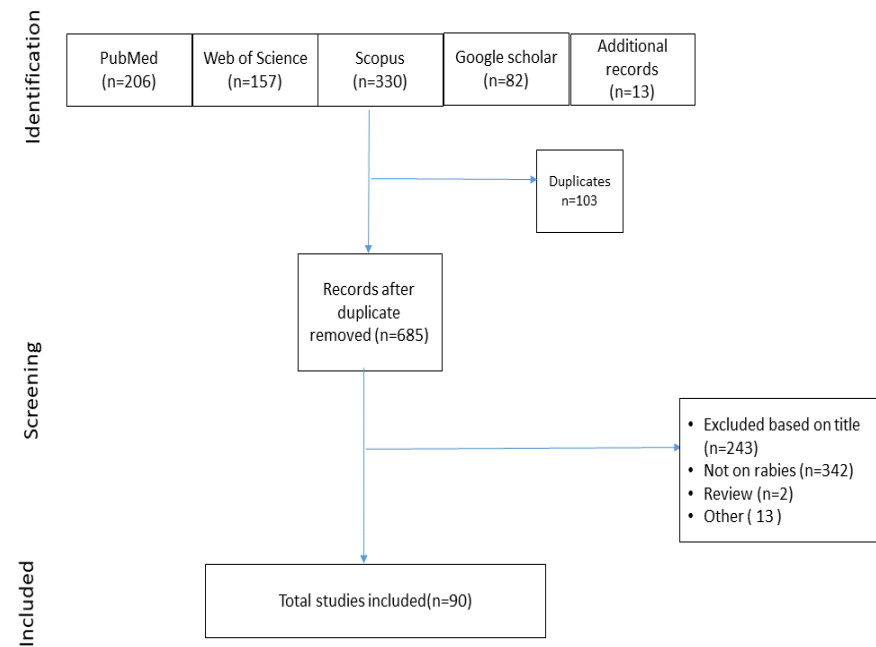
- Despite reports of continuing rabies virus transmission and deaths, a rabies elimination strategy has not been implemented to date in Nigeria
- There is a lack of consolidated information on the extent of rabies distribution and risk factors
- Effective planning of rabies vaccination programs using baseline epidemiological data is crucial to attaining the 2030 goal of zero dog-mediated human rabies deaths in Nigeria

Objective

- To summarise existing data to help support the design of a national rabies action plan towards attaining the target of zero human deaths from dog rabies by 2030



Search and selection strategies based on PRISMA guidelines



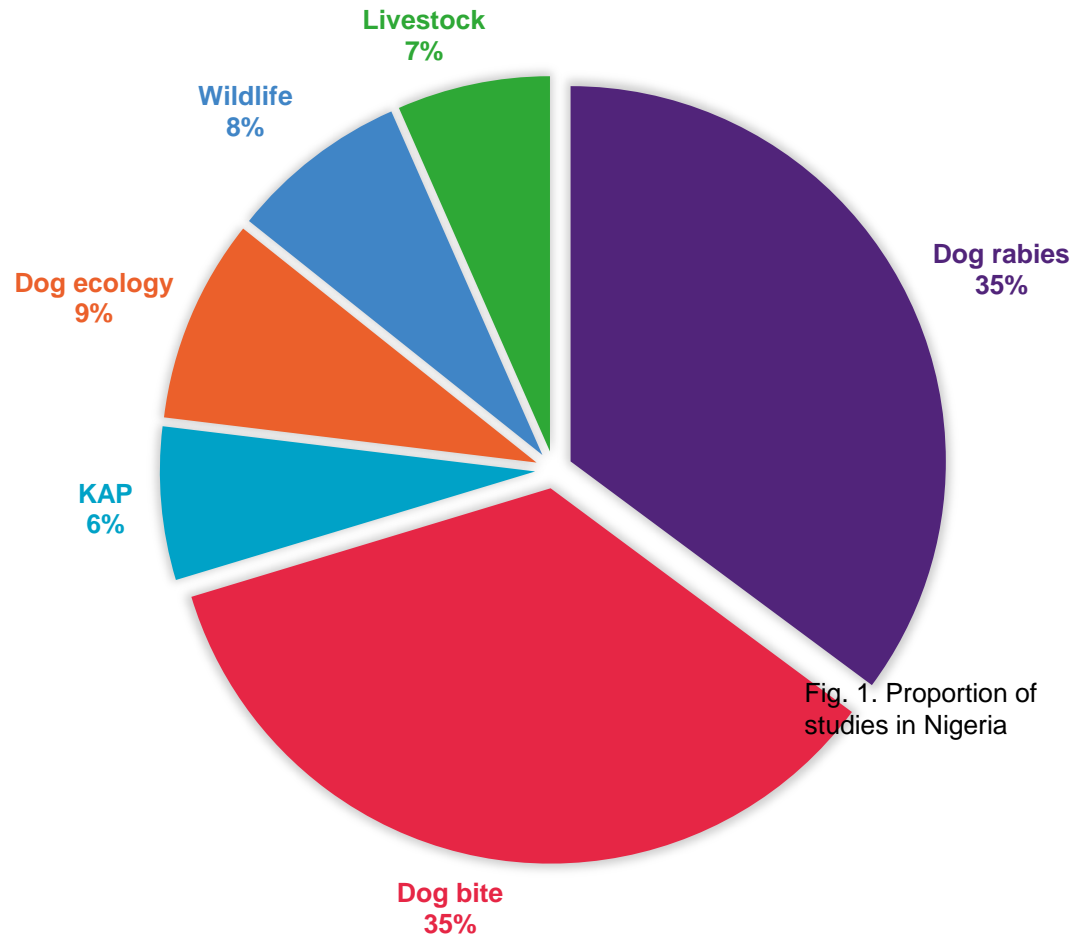


Fig. 1. Proportion of studies in Nigeria

- The prevalence of dog rabies was 6% in the south-south, (5% and 9%) southeast, (2% and 11%) southwest, (4% and 15%) north-west, (5% and 17%), northcentral and 2% and 44% in the northeast
- Regions distant from rabies diagnostic facilities accounted for more human rabies cases and fewer dog rabies cases
- Most bites were unprovoked (36.4%-97%) by owned dogs with low vaccination rates (12%-38%)

Conclusions

- Dog trade for human consumption presents significant public health risks
- Regional transportation of dogs presents a significant concern for national rabies control efforts, mostly when dog movement occurs between relatively porous land borders.
- Dog bites in Nigeria are reported to both human and veterinary hospitals, with disproportionately affected children and males.
- Some victims (dog bite), use traditional medicine in place of PEP
- There was a significant geographical heterogeneity concerning dog rabies, dog bite, and human rabies
- Rabies risk, coupled with welfare concerns identified, demonstrates the need for continued advocacy towards legislation prohibiting dog trade in Nigeria and elsewhere



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