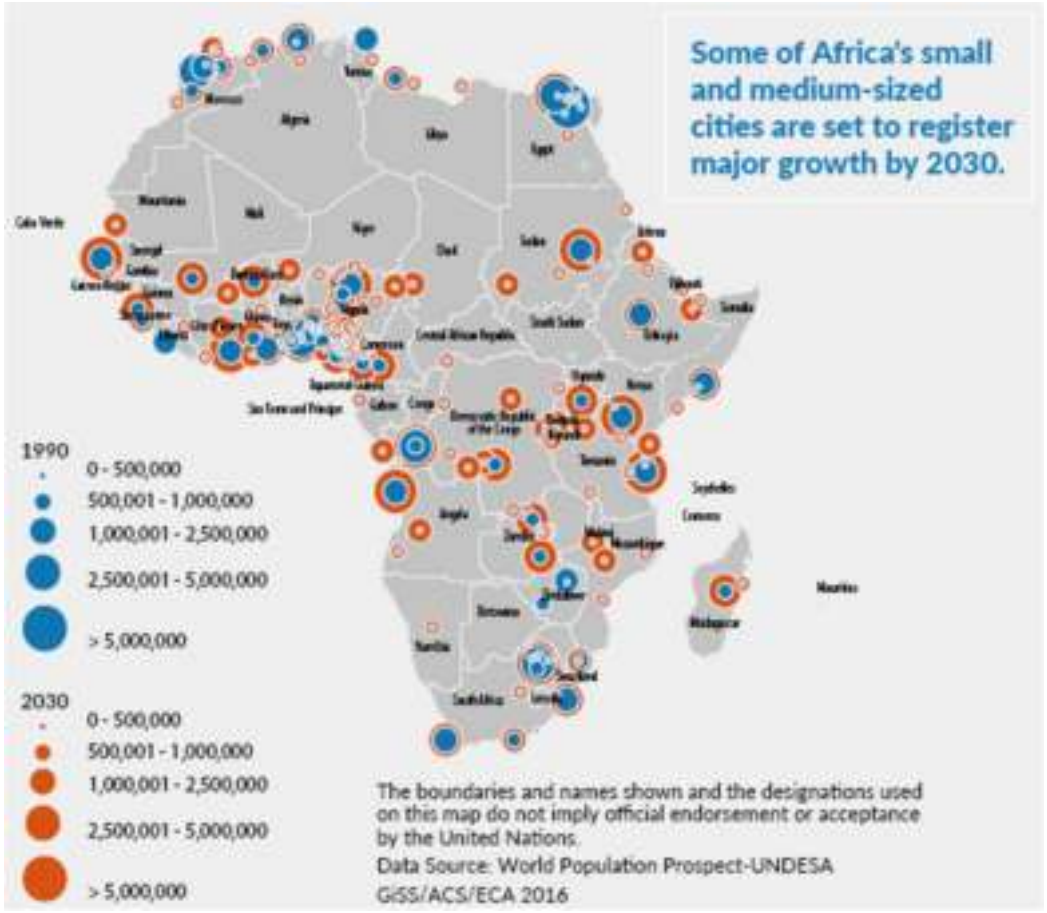
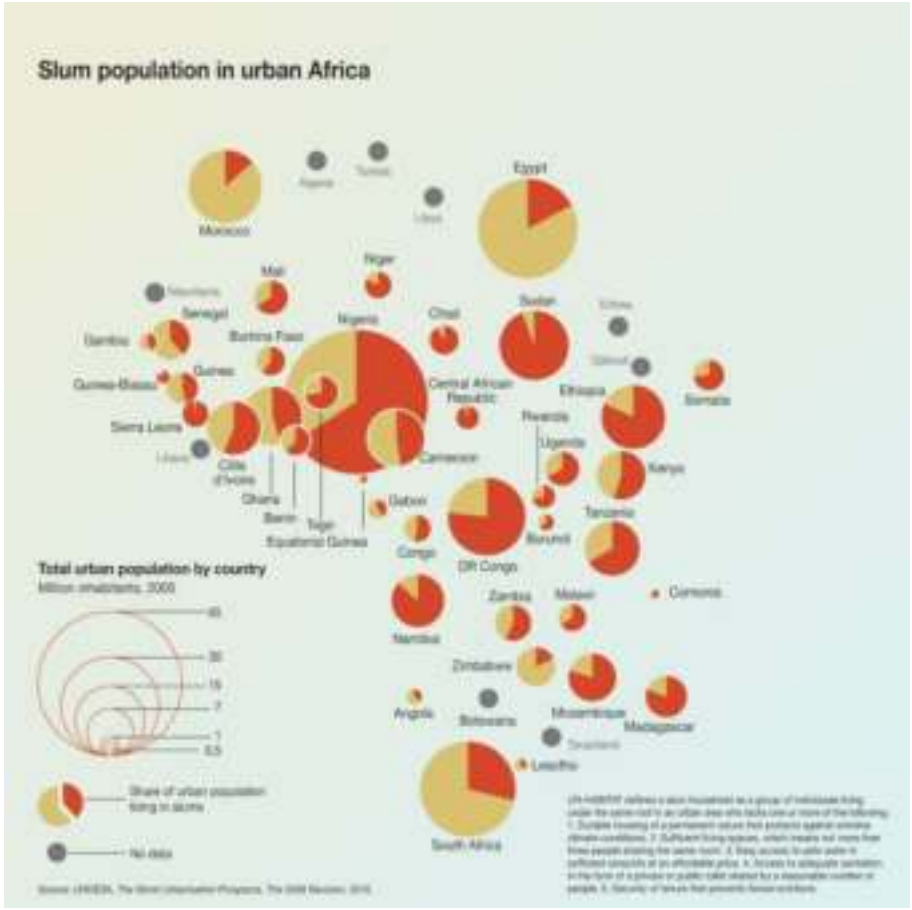
Rodents and related public health issues within urban settings





2010-2050 : African urban population will grow from 400 millions to 1.2 billion
Around 500 millions African city dwellers will live in slums in the 2020s

- ✓ **Poor/no sanitation**
- ✓ **Poor/no waste management**
- ✓ **Very high human density, hence food**

⇩

Board and lodging for rodents

Urban assemblages of rodents are simplified …

… but usually made of highly adaptive and prolific species …

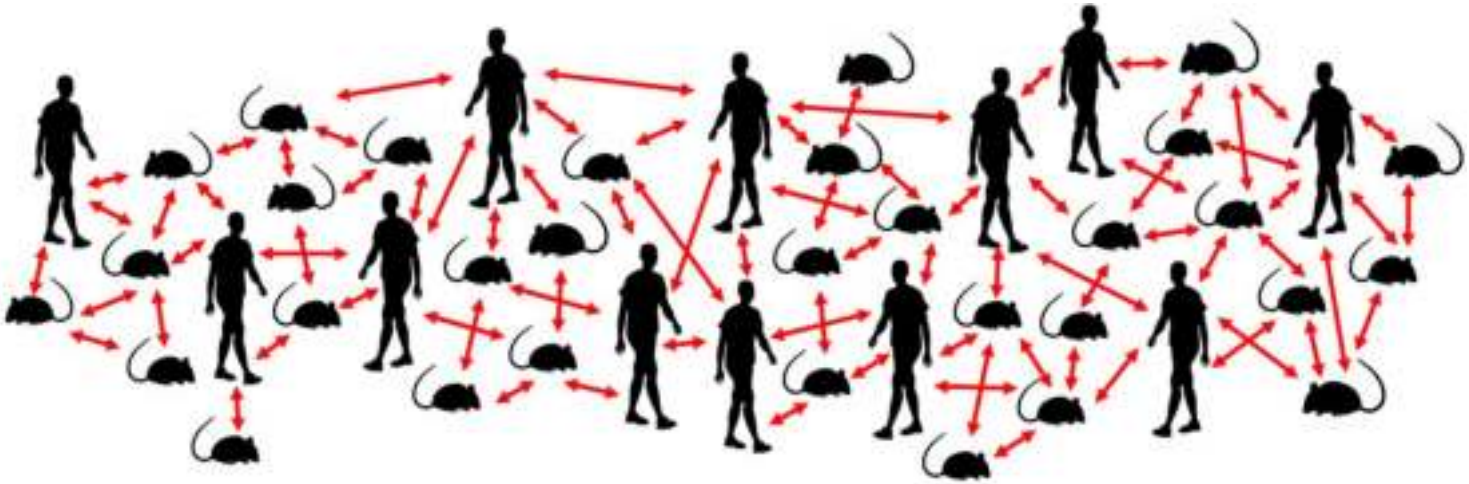
… which are also highly pathogen-competent species.

Mus musculus

Rattus norvegicus

Rattus rattus
(R. tanezumi)

Cosmopolitan rats and mice



High densities of both human and rodents

⇩

Enhanced risk of rodent-to-rodent and rodent-to-human transmission

⇩

Increased risk of epizootic episodes and zoonotic cases

✓Bushmeat trade, wet markets and rodent consumption



✓Everyday interactions with domestic rodents



400 millions human infections by pathogens whose ecology may involve rodents

Covid19 ?

- ✓ Plague (NB: antibioresistant strains!)
- ✓ Hemorragic fevers (Lassa, SEOV, LCMV, etc)
- ✓ Leptospirosis
- ✓ « Typhus »

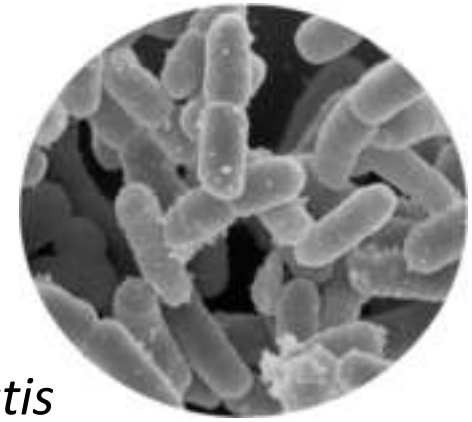
A wide panel of infectious diseases (with huge associated mortality and morbidity, though sometimes poorly documented) …

… many of which assez tightly linked to poverty all over the world!

From a rodent-to-human to a human-to-human transmission

High human densities
Low education level
Poor access to diagnostics and medical care
In many instances, quite high connectivity

Very high risk of epidemics onset and growth
Opportunities for spatial expansion and exportation



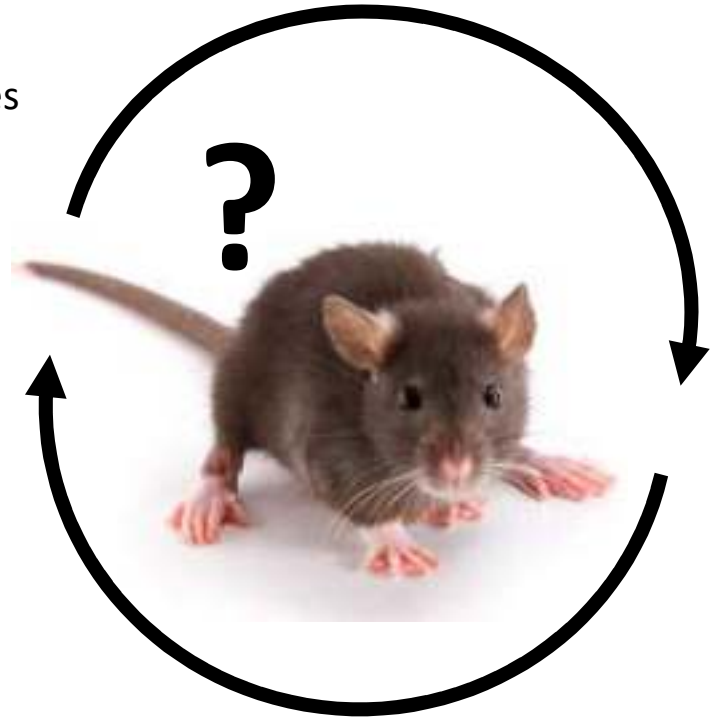
Yersinia pestis

Lassa Fever
Mammarenavirus

City-driven increase in antibio-multiresistance (?)

Domestic wastes
Poor sanitation

Biomedical wastes



Unexplained fevers
Misdiagnostics as malaria

Unregulated market of drugs

Cities are transport hubs …

… thus hotspots for invasive species introduction and further dissemination

→ Pandemics

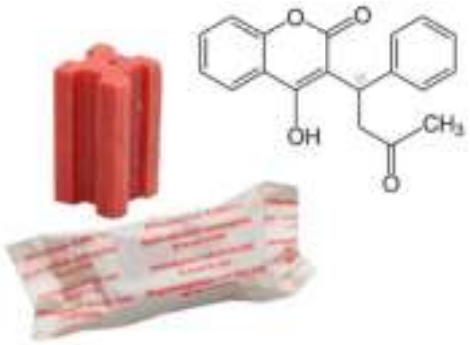
Pathogen strains admixture (e.g., viral reassortment, bacterial plasmid exchanges)

Dissemination of resistances to rodenticides and antibiotics

Rodent control in (African) cities

Acute poisons and gas
Carbonic gas

Traps, glues, …



Anticoagulant rodenticides

Anti-reproductive molecules

Pet or wild predators

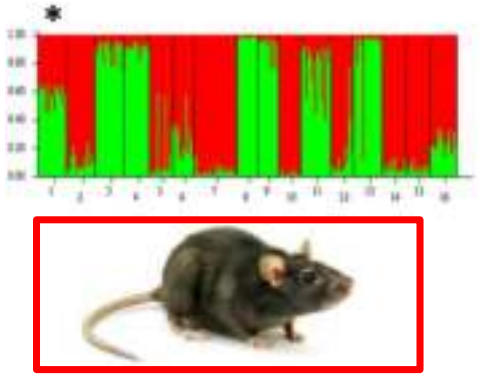
Community-based deratisation: which issues in African cities?

Community-based EBRM approaches intuitively appear as a good mean to upscale human resources and to optimize expenses in a sustainable and eco-friendly way.

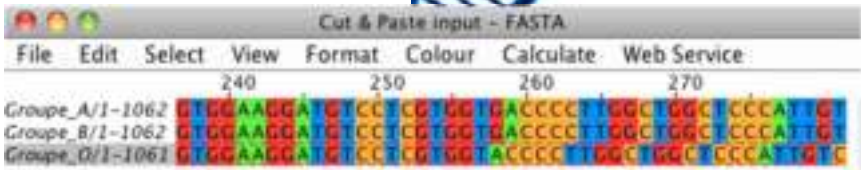
- Efficiency, feasibility in urban dwellings?
- Spatial scale of deratization?
- Enrollment of local urban communities?
- Associated sanitary risk

Very large eradication spatial units

Cotonou, Benin

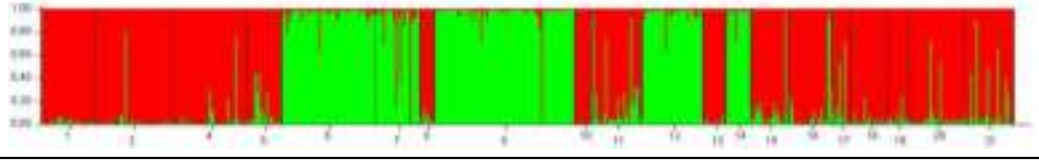


Rattus rattus



Mastomys natalensis

Niamey, Niger



Mus musculus

Dakar, Senegal

Enrollment of succiently numerous inhabitants

Reach and inform all inhabitants

Gain their confidence

⇩

Mixture of various socio-cultural entities

Erosion and compartmentalisation of social solidarity mechanisms

Difficult identification of resource/focal persons

Many languages

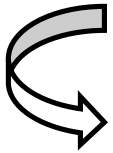
How to convince people to be enrolled?

Poor awareness of rodent-associated health issues

Ex. Niamey, Niger – 170 interviews
→ 96.5% of complaints about rodent problems but no mention of health risks.

Ex. Cotonou, Benin – 141 interviews
→ 72% of complaints about food stock destruction but no mention of health risks

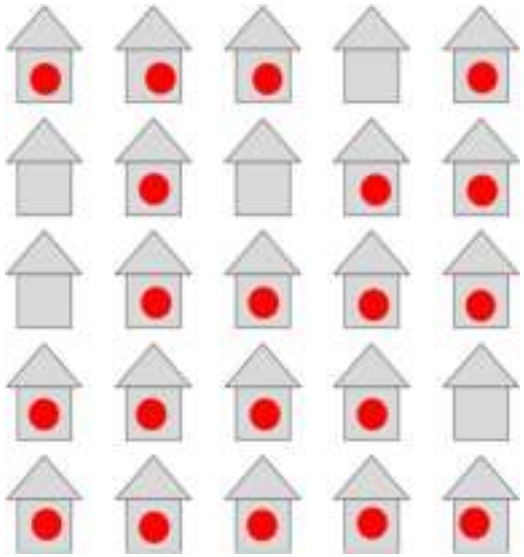
Ex. Osogbo slum, Nigeria – 500 interviews in LFV endemic area
→ only 51.2% view rodents as disease transmitters (Olalekan, 2015)



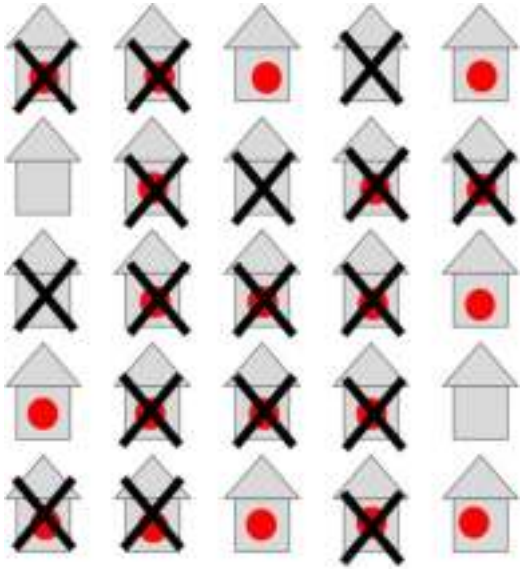
Need for awareness increase
… and/or to rely on other locally identified problems
➔ Importance of socio-anthropologic knowledge

Community-based rat control: a solution in African cities?

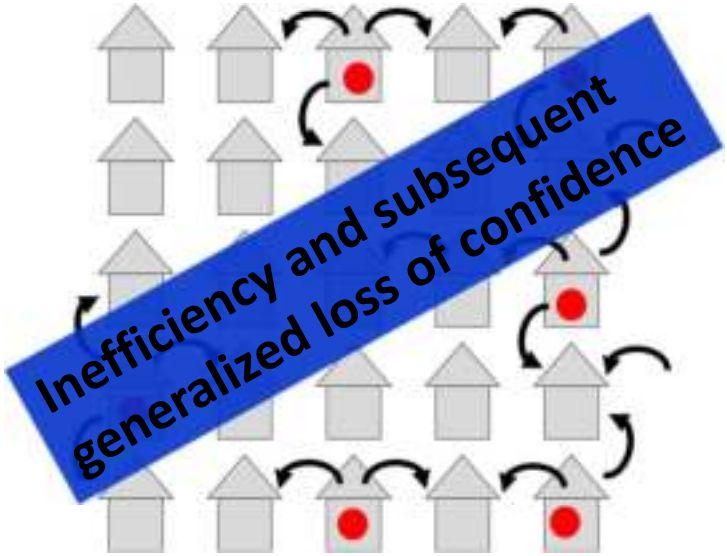
High rodent infestation
in households



Rat control in some
households only



Rapid recolonization
from non-deratted houses



Presence of rodents

Confidence and rat control

Recolonisation

Risks for enrolled but insufficently informed inhabitants

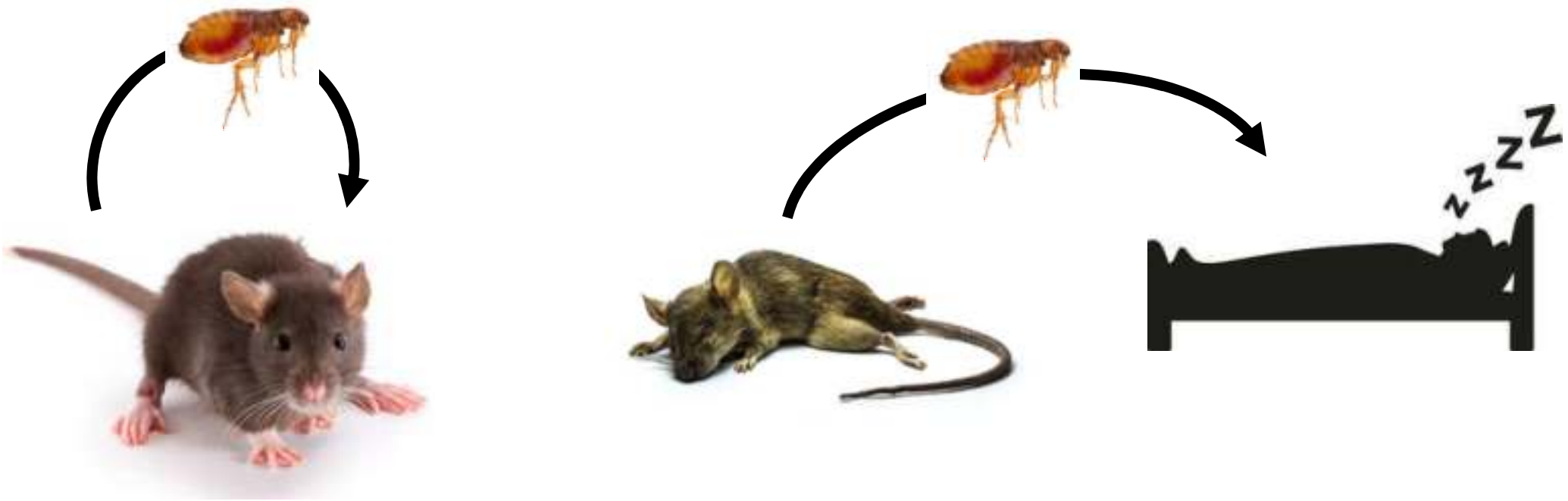
Rodenticides, glues and traps = handling of rodents/poisons by inhabitants

Consumption of mechanically captured rodents
(e.g. 20% in Nigerian slums from LFV regions)

Zoonotic risks associated with predators
(e.g. toxoplasmosis and bartonellosis from cats)

Fleas and ticks from dead rodents

Rodents and their ectoparasites (ticks, fleas, etc)



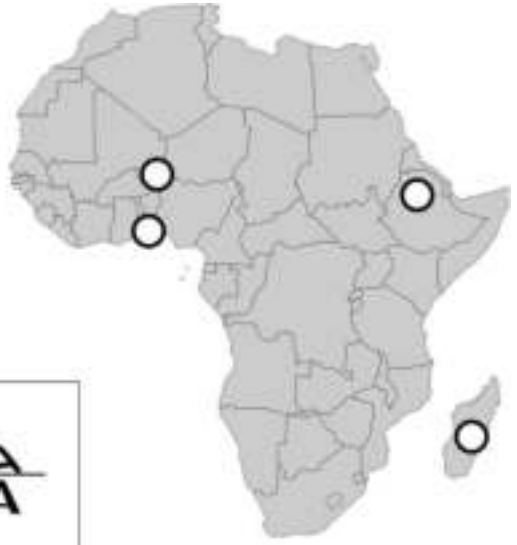
Never kill rats without killing fleas first!!!

Cities are plentiful and all socio-culturally different (and heterogeneous)

A wide spectrum of ideas
hence opportunities to seize

But it is highly probable that each context will require specific locally-driven work habits and implementation measures.

Urban EBRM deserves to be tested in several settings



SCARIA

TOWARDS SUSTAINABLE COMMUNITY-BASED MITIGATION OF RODENTS ASSOCIATED ISSUES

CBGP

META

Institut Pasteur

CERMES

CNHU

Any questions?

Ladji, Cotonou
Benin

Dissemination of antibiotic multi-resistant bacteria in Cotonou rodents

 **x1**

 **x2**

 **x3**

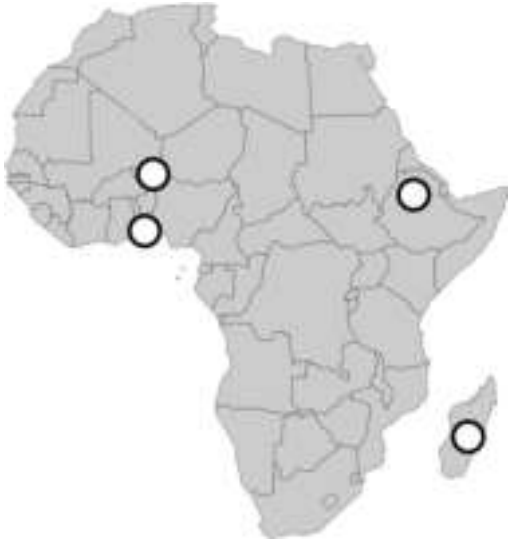
 **x4**

 **x5**

9	8	9	8	7	2

multi-resistant bacterial cultures

Penicilline - Cephalosporine - Sulphamide - Carbepeneme
Aminoside - Quinolone - Monobactame - Fosfomycine - Phenicole



Concrete objectives that could be reached in terms of human health

Madagascar

Institut Pasteur