INSTITUT Pasteur

Health clinic, Central African Republic



18 JULY 2025 HKU CROUCHER COURSE

Anthropology of Disease Emergence (including mpox)

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Anthropology & Ecology of Disease Emergence Unit

1. WHY DO ZOONOTIC SPILLOVERS AND EPIDEMICS OCCUR? HOW DO BROAD CLIMATIC/ECOLOGICAL CHANGES INTERACT WITH LOCALIZED SOCIO-ECOLOGICAL, POLITICAL ECONOMIC CHANGES TO PRODUCE EMERGENCES?



Jules Villa



Léa Delmaire



Clément Tarantini



Marius Salgado

nature communications

Article

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Higher convergence of human-great ape enteric eukaryotic viromes in central African forest than in a European zoo: a One Health analysis

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Victor Narat[1,10], Maud Salmona[2,3,10], Mamadou Kampo[4], Thibaut Heyer[5], Abdeljalil Senhaji Rachik[2], Severine Mercier-Delarue[2], Noémie Ranger[6], Stephanie Rupp[7], Philippe Ambata[8], Richard Njouom[9], François Simon[2,3], Jérôme Le Goff[2,3,11] & Tamara Giles-Vernick[4,11]



Leonardo Heyerdahl



Ana Lucia Estrada-Jaramillo



Paul Guille-Escuiret

PLOS GLOBAL PUBLIC HEALTH

RESEARCH ARTICLE

A time of decline: An eco-anthropological and ethnohistorical investigation of mpox in the Central African Republic

Romain Duda[1], José Martial Betoulet[2,3], Camille Besombes[4], Festus Mbrenga[5], Yanina Borzykh[1], Emmanuel Nakouné[5], Tamara Giles-Vernick[1]*

scientific reports

OPEN

A multi-disciplinary comparison of great ape gut microbiota in a central African forest and European zoo

Victor Narat[1,2,10], Katherine R. Amato[3,4,10], Noémie Ranger[5], Maud Salmona[5,6], Séverine Mercier-Delarue[2], Stephanie Rupp[7], Philippe Ambata[8], Richard Njouom[9], François Simon[5], Tamara Giles-Vernick[2,4,10] & Jérôme LeGoff[5,6,10]



Eleana Dongas



Benedetta Lana



Nastassia Tvardik

Contents lists available at ScienceDirect

Social Science & Medicine

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ELSEVIER

The puzzle of Buruli ulcer transmission, ethno-ecological history and the end of "love" in the Akonolinga district, Cameroon

Tamara Giles-Vernick[a,*], Joseph Owona-Ntsama[b], Jordi Landier[a,c], Sara Eyangoh[c]

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Anthropology & Ecology of Disease Emergence Unit

2. AND WHAT ARE THE HEALTH AND SOCIAL CONSEQUENCES OF EPIDEMICS FOR LAY POPULATIONS? HOW DO WE DEVELOP MORE ADAPTED INTERVENTIONS TO ADDRESS EPIDEMICS AND THEIR CONSEQUENCES?



Jules Villa



Léa Delmaire



Clément Tarantini



Marius Salgado

BMJ Public Health

Outsciencing the scientists: a cross-sectional mixed-methods investigation of public trust in scientists in seven European countries

Leonardo W Heyerdahl,[1] Yanina Borzykh,[1] Benedetta Lana,[1] Anna-Maria Volkmann,[2] Lars Crusefalk,[3] Elien Colman,[4] Nastassia Tvardik ,[1] Sibyl Anthierens,[4] Muriel Vray,[1] Tamara Giles-Vernick [1]



Leonardo Heyerdahl



Ana Lucia Estrada-Jaramillo



Paul Guille-Escuiret

Heyerdahl *et al. BMC Public Health* (2025) 25:1305
https://doi.org/10.1186/s12889-025-22406-y

BMC Public Healt

RESEARCH Open Acces

Motivation to continue and the value of care work among French Red Cross volunteers and workers during the COVID-19 pandemic: a mixed methods study

Leonardo W. Heyerdahl[1*], Vincent Guillemot[2], Benedetta Lana[1], Gaston Bizel-Bizellot[3] and Tamara Giles-Vernick[1*]

Contents lists available at ScienceDirect

Vaccine

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

Short communication

Conditionality of COVID-19 vaccine acceptance in European countries

Leonardo W. Heyerdahl [a,1], Muriel Vray [b,1], Benedetta Lana [a], Nastassia Tvardik [a], Nina Gobat [c], Marta Wanat [c], Sarah Tonkin-Crine [c], Sibyl Anthierens [d], Herman Goossens [c], Tamara Giles-Vernick [a,*]



Eleana Dongas



Benedetta Lana



Nastassia Tvardik

JMIR INFODEMIOLOGY Heyerdahl et al

Original Paper

The Impact of the Online COVID-19 Infodemic on French Red Cross Actors' Field Engagement and Protective Behaviors: Mixed Methods Study

Leonardo W Heyerdahl, PhD; Benedetta Lana, MA; Tamara Giles-Vernick, PhD

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Course objectives & outline

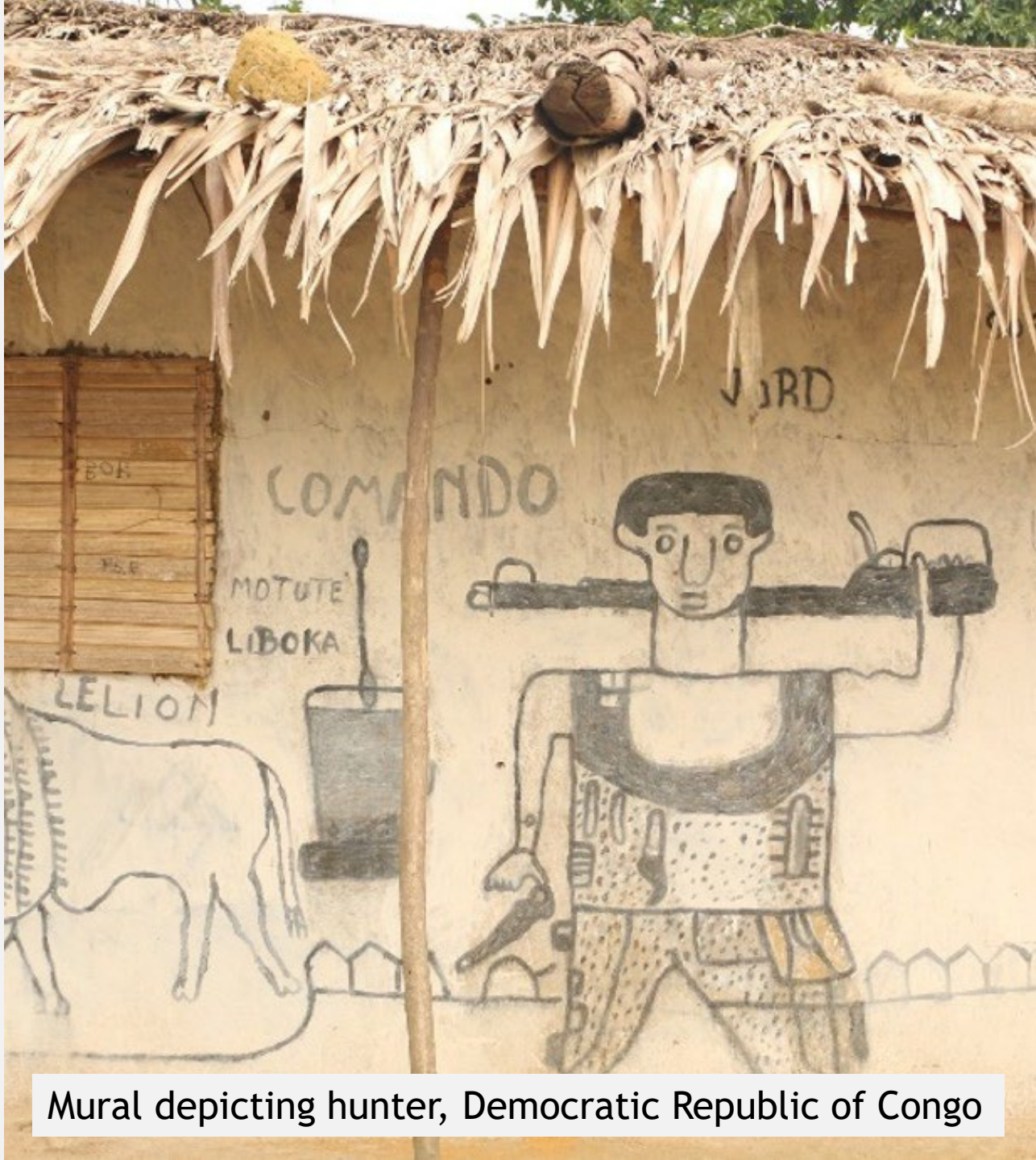
Objectives:

- Show how anthropological inquiry can be integrated into studies of disease emergence/epidemics
- Demonstrate anthropological contributions to our understanding of mpox epidemics in Central Africa

Outline:

1. Some key definitions & intro to medical anthropology
2. Anthropological contributions to understanding mpox epidemics in central Africa
   a. Example 1: Comparative local understandings and practices in Central African Republic forest
   a. Example 2: Urban transmission in Pakadjuma (Kinshasa, Democratic Republic of Congo)
3. Conclusions, including One Health

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Mural depicting hunter, Democratic Republic of Congo

How do we know what we know?

- **Our ways of knowing differ from those of biomedical sciences**

- Biomedical sciences (including public health) focus on specific interactions to identify mechanisms, develop cause-and-effect models (reductionist)

- Qualitative social sciences: may begin with health problem, but situate that problem within a "total environment" of a person, group or population (comprehensive)

→ Diverse dimensions of life are complex, interactive, capable of producing certain consequences related to health

→ Quantitative measures relating to health or sickness = indicators of more complex processes, involving multiple domains of life

Some key definitions

- **Anthropology:**
  the study of « what it means to be human »

- **Medical anthropology** (2 readings):
  - Highly varied theoretical orientations
  - Contributions throughout epidemic processes (from spillover & emergence)
  - « Molecular epidemiology maps social infrastructure » (Nguyen)



"anthropological study of health and healing…[which] takes the tools of anthropology and applies them to human illness, suffering, disease and well-being" (Brown & Closser, 2016)

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ETHNOGRAPHY AS FOUNDATIONAL METHODOLOGY OF MEDICAL ANTHROPOLOGY

→Immersion into a social group to understand everyday lives from an *interior* perspective

→Can be done *anywhere*



Pakadjuma, Kinshasa

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Methods we employ

PARTICIPANT-OBSERVATION

INTERVIEWS (semi-directed)

FOCUS GROUP DISCUSSIONS

VISUAL methods (video/photography, or participatory methods such as body mapping, photovoice, etc…)

QUALITATIVE METHODS:

- Provide rich, detailed explanations
- Reveal underlying logics guiding practice
- Uncover hidden, stigmatized, or criminalized practices & dynamics
- NOT representative, but can uncover a range of possibilities

INTEGRATION of mixed methods into our research

- QUESTIONNAIRES (drawing from prior qualitative investigation)
- PARTICIPATORY CONTACT SURVEYS (see Narat et al. PLOS NTD 2018; Narat et al. Nat Comm 2023; Narat & Duda et al. in process)

What can medical anthropology contribute to understandings of disease emergences?

#1 QUESTION

…assumptions, terms, categories

#2 SITUATE

…'factors' in broader processes and investigate on a granular scale human-animal-environment-pathogen relations and practices

#3 COUNTERPOSE

…biomedical and public health knowledge with « nonscientific » knowledge of people living on the frontlines of these emergences

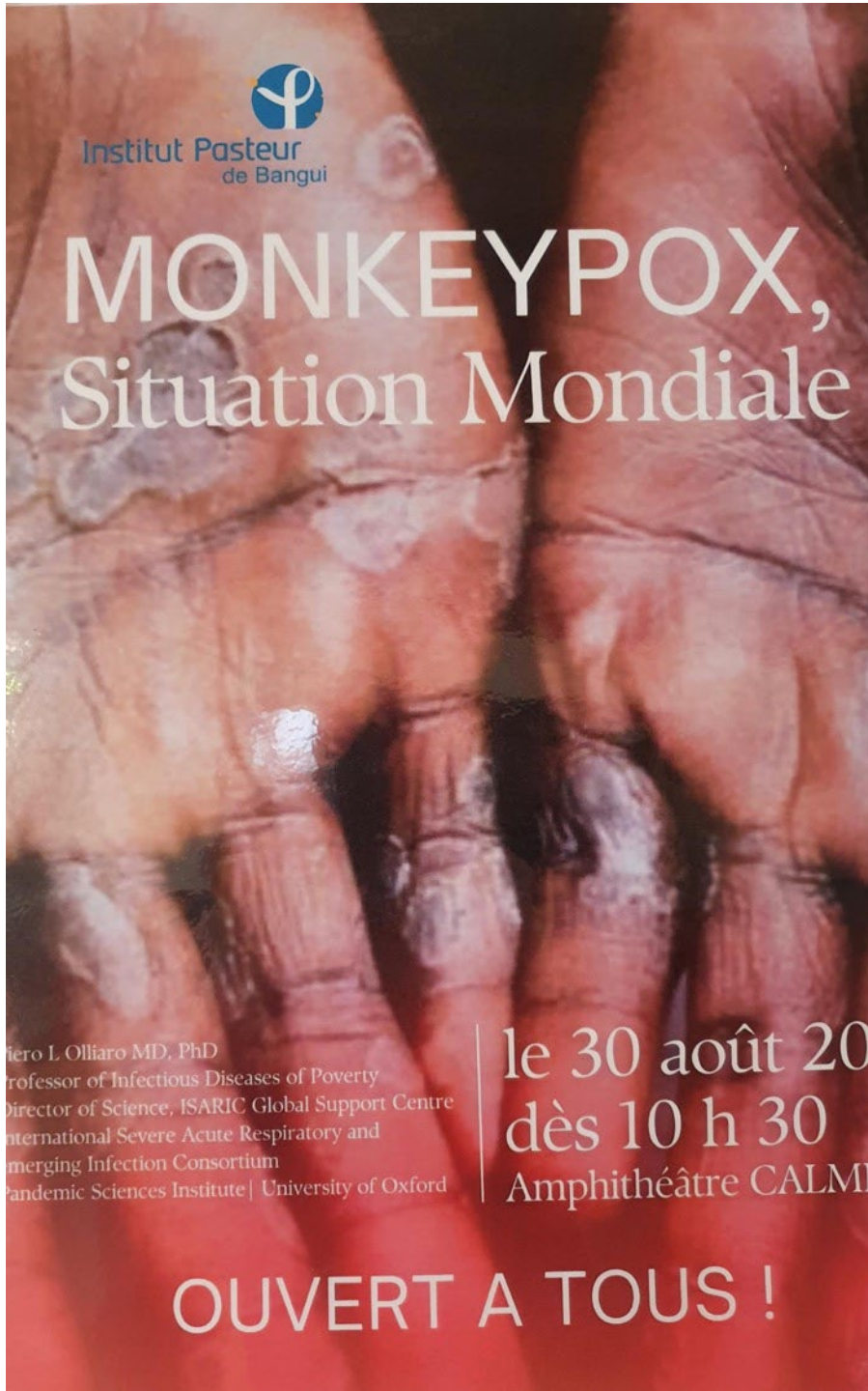
Anthropological contributions to understanding mpox epidemics

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Example 1: AFRIPOX: a multidisciplinary investigation of mpox in the Central African Republic

- Epidemiology of past and current outbreaks
- Ecological changes and identification of reservoir
- Diagnosis and treatment

➡ ***Local understandings of illness, changing practices and processes altering human engagements with forest and fauna***



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anr agence nationale de la recherche

What do we know about mpox in CAR?

- *Clade 1a*
- *1984 outbreak in Lindjombo SW CAR*
- *2001-2021:* 99 confirmed & 61 suspected cases (Besombes et al. EID 2022)

→*More outbreaks since 2018*

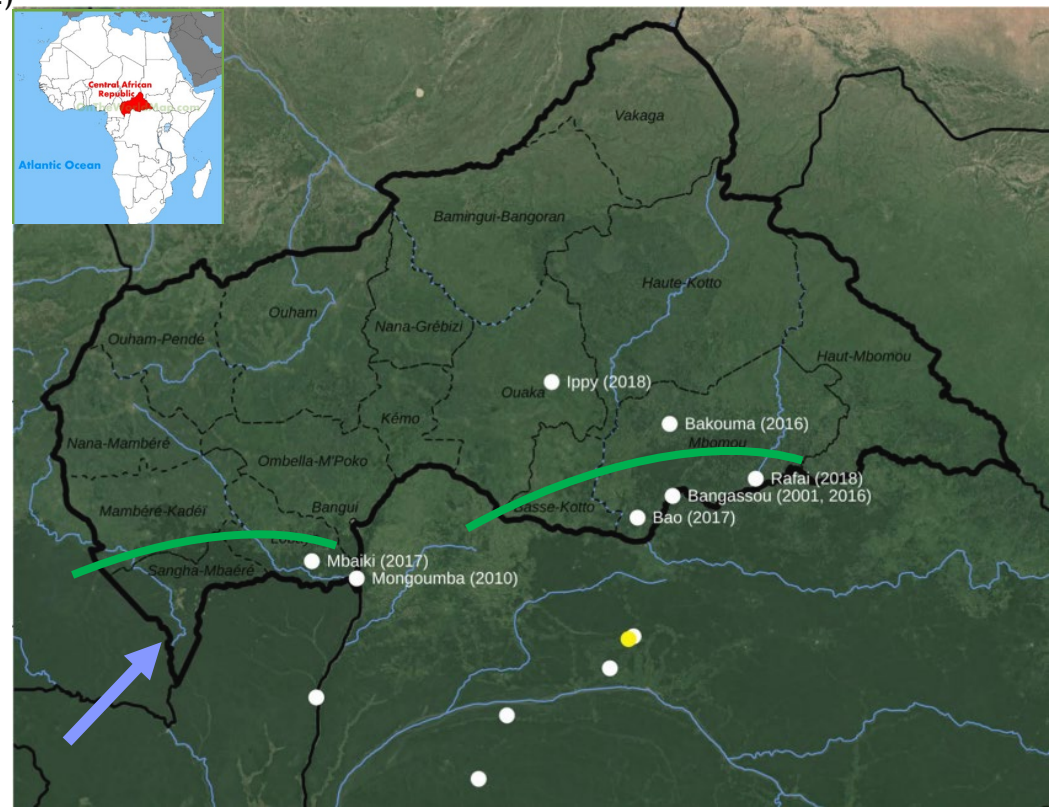
- ***Animal reservoir unknown* but certain rodents suspected** (e.g. squirrel spp.) *(*Curaudeau et al. Viruses 2023)

Transmission

- Contact w/small wild fauna (rodents, monkeys, duikers) (Besombes et al. One Health 2023)
- 2ndary transmission: close family contact; health facilities (Besombes et al. EID 2019)

Explanations for recurrent outbreaks:

- Socio-economic decline, ++ poverty
- ++ Hunting & contact with wild animals
- Armed conflicts
- Ecological disturbances/deforestation
- Sexual networks



Central African Republic map

Besombes et al. EID 2022 ; Garba-Ouangole et al, EID 2023; Besombes et al. EID 2019

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Anthropological investigation of mpox in CAR



Romain Duda

- Investigate past, changing social ecologies of forest resource use
  - new evidence & analyses to illuminate changes facilitating increased exposures
  - guide future ecological, virological, epidemiological research)

- Analyze how local people perceive changing lives and engagements with socioecological, political economic dynamics
  - show *how THEY understand recurrent mpox outbreaks*



Ubangi river

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RESEARCH ARTICLE

A time of decline: An eco-anthropological and ethnohistorical investigation of mpox in the Central African Republic

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Anthropological investigation

Sites:

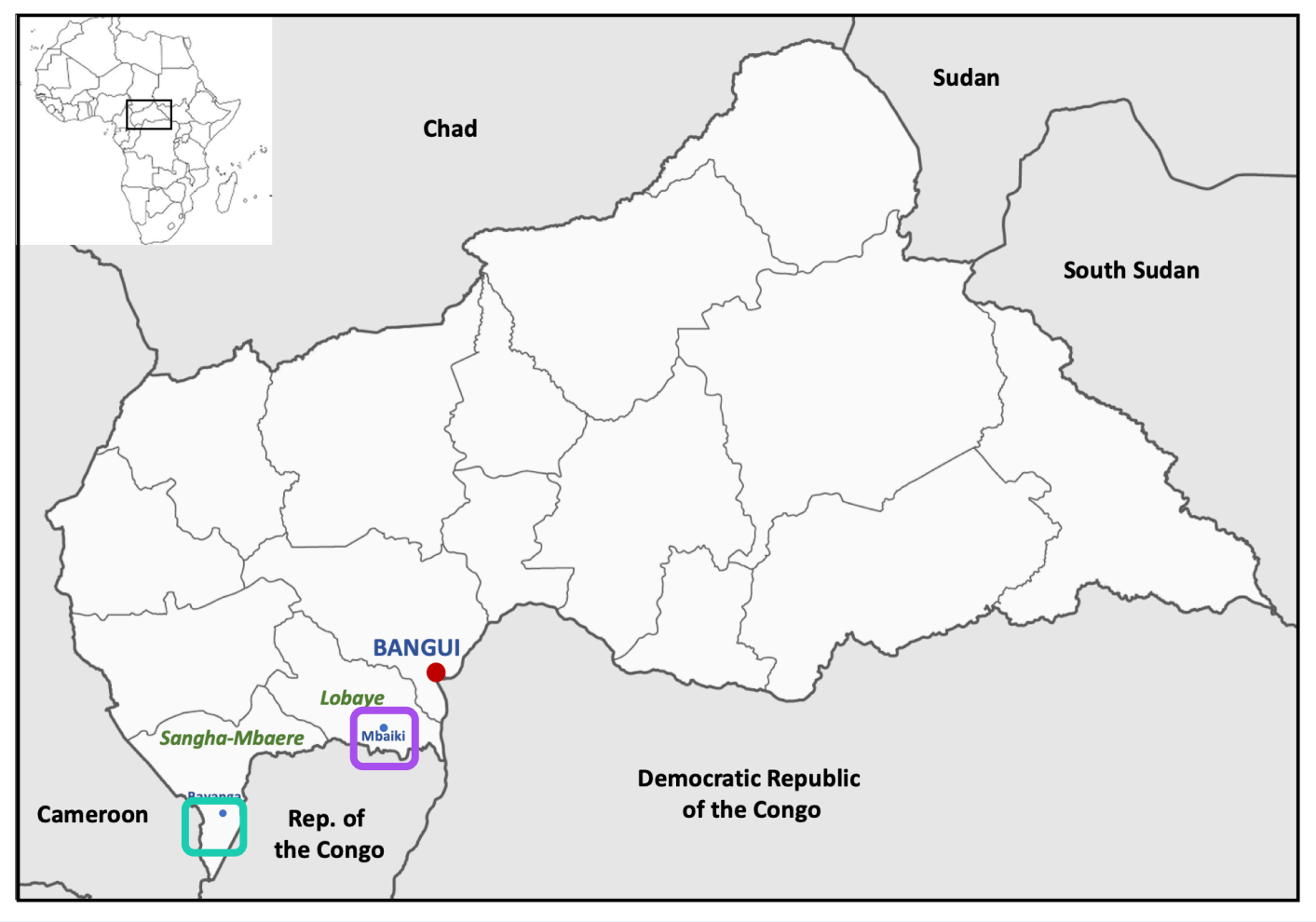
- **Lobaye (Zomea + surrounding villages):**
  - Proximity to Bangui
  - ++ outbreaks
- **Sangha-Mbaere (Bayanga, Lindjombo, other villages) :**
  - more isolated; WWF forest protection; outsider commercial activities;
  - - outbreaks

Timing:

- ***Autumn 2022***
- Long-term research in SW CAR (1991, 1993, multiple research missions thereafter)

Methods:

- Interviews (40), ++ informal & group discussions, participant-observation of forest activities
- 6 months of wild meat market & 48h dietary recall, Lindjombo (1993)



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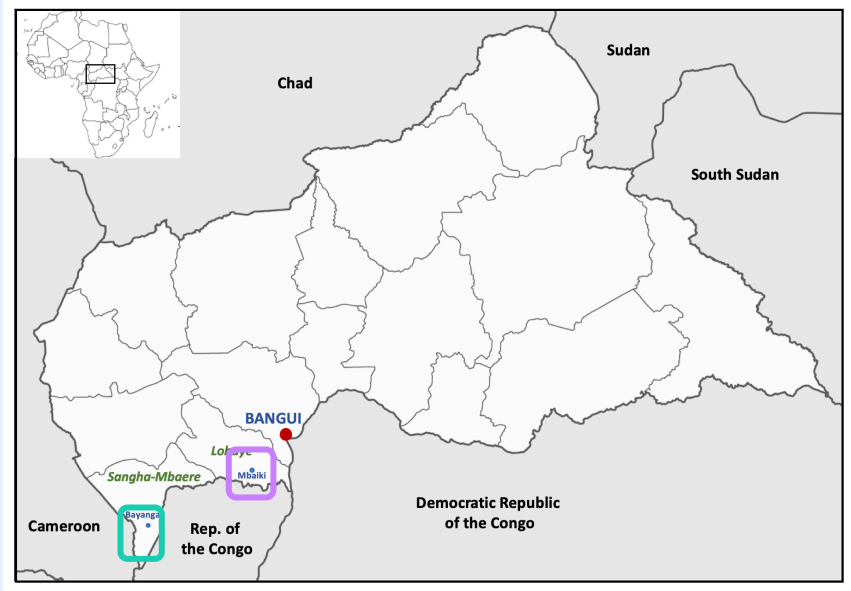
Central African Republic: a historical crossroads

19th century slave raiding, slavery, and integration into global economy

- ++ mobility, interactions between language/ethnic groups, violence
- Sangha Mbaere & Lobaye regions implicated in different regional dynamics

French and German colonial rule (late 19th c. to late 1950s)

- extractive, violent colonial rule through concessionary companies, commercial enterprise
- little investment in population or infrastructures
- Different regional dynamics



Independence 1959: major political instability (5 coup d'états)

- High dependence on external political and economic support (France; Russia)

2003-2024

- *Major instability, with warfare among multiple armed groups*
- *Central government: little control beyond Bangui (capital) and parts of the south*
- *Economic stagnation & crisis, further decline of health system*

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1. What *is* « mpox » for local populations? Shared notions but site divergences

Yangba: category of cutaneous illnesses (symptomatic definition)

- *yangba : smallpox*
- *kota yangba : chicken pox*
- *kete yangba : measles*
- ***yangba ti makako*** : « monkey pox » → Term introduced by Institut Pasteur de Bangui



Photos of mpox patients, health centre, Lobaye

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Emmanuel Nakouné, IP-Bangui

What is mpox?
Site divergences
Lobaye

Yangba ti makako: diagnostic category well known among health workers & local populations

→ ***IP-Bangui influence:**

frequent visits

diagnosis, treatment of patients

sample collection (collaborations w/inhabitants)

training of health personnel

→ But proliferation of *yangba* terms, linked to other skin afflictions: unstable knowledge for local populations

What is mpox?
Site divergences
Sangha-Mbaere region

Any serious illness that eventually provokes medical evacuation by people dressed in PPE (exceptional isolation measures) = "Ebola"

"A few days before the ambulance came, people wouldn't go near me, even when I spoke to them. People would flee from me because they were thinking as they saw as my condition worsened that it wasn't measles, it was more likely Ebola. Even the doctor who came to see me was afraid and wouldn't approach me.(Man, 45 y.o., Bayanga)



Health centre notices, Bayanga

- World-Wide Fund for Nature (WWF) awareness campaigns for Ebola
- Health care workers knew little about mpox
- "Ebola" → Fears of illness, stigmatization, blood collection, medical staff wearing PPE, dying alone in hospital
- Confusion & flight of mpox patients during Oct. 2022 outbreak

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2. Situating « contact » in livelihoods, hunting, & exposures : Zomea/Lobaye and Sangha comparisons

- *Similar lack of meat in diets (« meat hunger ») in both sites*
- *Both sites experience changes in hunting & gathering (-30 years) that have shaped contact with rodents*

BUT

- *Zomea (Lobaye): long-term problem, consequence of overhunting*

  →Recollections of past consumption of large mammals;

  →1980s-90s : « Strangers » (Bangui, Mbaiki) hunt, fish, gather

  →++ low cost rifles in 1990s

  Current conditions

  → Reported meat consumption 1x/week

  →++ **rodent *capture & consumption*** (squirrels, porcupines, Gambian rats)

  ****Classic « empty forest »: no large game, ++ rodents**

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Captured rodents


Adolescent rodent trappers

Situating « contact in livelihoods, hunting, & exposures: Zomea/Lobaye and Sangha comparisons

Sangha region: a protected area (national park) where WWF and ecoguard patrols regulate hunting (& human-animal contacts)

- Hunting pressures:
  - Community hunting zone: ++ licensed shotgun hunters (Bayanga)
    - ***8 legal, 37 illegal (1994) (Noss, 1995)***
    - ***30 (2008) (Hodgkinson, 2009)***
    - **60 (field research 2022)**
    - + Covert hunting & trapping (cable snares, guns, net hunting)
- High cost of hunting inputs and meat (unaffordable)



"today, we don't eat meat every day, where are we going to find the money to eat? They sell a *ngendi* haunch [Cephalophus callipygus] for 4000-4500 cfa [(6-7 €]! Where can you find this money?" (OA.10, man, 56 Bayanga)

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Situating « contact » in livelihoods, hunting, & exposures: Zomea/Lobaye and Sangha comparisons

Changing meat consumption (Lindjombo 1993 and present)

Dietary recall, Lindjombo, 1993

48h dietary recall among 24 adults (10 women/14 men, 20-85 y.o., from ea. major family)

- **357 meal days** recorded
- Participants ate **meat on 172 days**
- **Most common animals consumed**
  - Bay duiker: 46.5%
  - Red river hog/giant forest hog: 34.3%
- ***No consumption of squirrels or other rodents***



Child carrying blue duiker carcass

2022 qualitative research

- Reported substantial reduction of large and medium sized forest mammals (eg bay duiker, bush pig)
- Less consumption of meat
- ++ small mammals consumed, especially blue duiker, giant pouched rats, cane rats

Forest is not as depleted as in Zomea/Lobaye, less reliance on rodents for animal protein

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Situating « contact » in livelihoods, hunting, & exposures: Zomea/Lobaye and Sangha comparisons Non-timber forest products (NTFP) and rodent exposures/contacts


Edible caterpillars


Dried caterpillars for sale

- **Caterpillar: **Lobaye (Jul-Aug)**
  ++ *forest activities, movement between villages & forest camps, ++ rodent capture & consumption*
- Palm wine collection: **Sangha (year-round, ltd participation)
  ++ *tree-dwelling rodents*

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"Squirrels come at night to drink out of the glass collection container, and sometimes they've drunk so much that they fall into it. Their abdomens expand, so they stay there."
(mpox patient from Bayanga)

3. Counterposing local historical explanations for new disease emergence: Lobaye-Sangha comparison

- Local understandings of mpox outbreaks
  - « We don't know »
  - from monkeys? wind? odors?
  - Unknown origins→evocation of worlds outside of daily experience (Congo? Cameroon? Occult worlds?)

- Local historical explanations for disease emergences
  - ++ "New" illnesses: express erosion of social relations, economic recession, governance problems

  - Different idioms and explanations in 2 sites

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Dried wild meat for sale

Counterposting local historical explanations for new disease emergence: Lobaye-Sangha comparison

- ***"Blockages" (flows & circulation of people, resources, money essential for life, health, wellbeing)***

Why do blockages exist?

Abandonment

Poor governance since 1980s; catalyzes civil war, which in Lobaye has affected health system, local economy, infrastructures (roads): valued resources "blocked" in forest

++ **Occult forces** & corruption of secret society tasked with ensuring prosperity (flows of money & resources) & blocking bad events

Zomea/Lobaye

Before, we ate meat, fish, palm oil, but there isn't any anymore. Everything has changed…Especially from 2013, everything has gotten difficult, everything is blocked. People live badly: they have health problems, they have problems getting food. Before, there were roads, even paved. Taxis passed by, and even if you had a whole vat of manioc, you could get money for it. Now, the road is totally ruined, and the times have gotten really difficult….Safe drinking water? There isn't any. Same for health, and the hospital: no nurses, no pharmacists, no medicine. (60 y.o. woman)

"The politicians have completely ruined everything. They have caused a lot of damage. This damage is felt in the lives of people here. There have been terrible things done to our lives, huge problems, maledictions to our bodies…We Central Africans, we've encountered some really heavy problems, and we started having those problems when our leaders didn't act well". (40 y.o. man)

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Counterposing local historical explanations for disease emergences: Lobaye-Sangha comparison

Sangha region: inhabitants highlight economic and moral decline: abandonment but with more fragmented explanations)

- Mourn departed companies that went bankrupt (long history outsider-driven economic activity) → lack of paid employment
- Absence of state
- In absence of economic life, an increased pressures on forest resources, including game (contrast to 1990s WWF arguments, when companies seen to ++ demographic & hunting pressures)
- Cross-border mobilities facilitate illness (mpox from Congo or Cameroon)
- Very limited health care

  Bayanga: small public health structure + private hospital:
  Other villages: small health posts with matrons
  WWF: “One Health” approach for animal disease (not human!);

- Moral decline: people disregard ancestral knowledge for preventing illness

Abandonment →Influx of more unknown, untreatable maladies

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Counterposing local historical explanations for new disease emergence: Lobaye-Sangha comparison

SANGHA region

« Before, there weren't as many illnesses as there are now. Now, there are illnesses that we just don't understand. Lots of illnesses…have multipled…and they kill people. (78 y.o. woman)

I think that the illnesses we see are linked to the fact that people just don't eat well. Before, there was enough to eat…People now leave their homes in the morning and they don't eat until the evening, then they eat a little something at 8pm. Your body willl weaken, become more vulnerable to illness.

(45 y.o. man)



Workshop of now-bankrupt Slovenian coffee plantation, Lindjombo

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Counterposing local historical explanations for new disease emergence: Lobaye-Sangha comparison

SANGHA region



Preparation of greater spot-nosed monkey for consumption

*An animal cadaver, found in the forest, before you wouldn't take it…because you'd get « **egbale** »: all the children that you bring into the world will die. Now people have forgotten that, they have started finding dead animals in the forest, they take them, they eat them, maybe some of those animals were sick.*

(45 y.o man, Sangha)

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Discussion and conclusions for example 1

Mpox outbreaks in CAR are processes, not a single event: implicating more than human-rodent contact or human-virus interactions

- What is mpox? Lay populations have limited understanding of mpox & symptoms (multiple, fluid nosological terms)→unstable local knowledge
  Implications for prevention messaging and risk communication

- Situate rodent contact: large game depletion, “meat hunger”
- ++ rodent capture and consumption: but exposures shaped by different economic and ecological dynamics: Lobaye as “empty forest”, Sangha less so

- Counterpose: Increase in illnesses (including mpox) explained as decline and abandonment, but differently in different sites

- Recommendations:
  - More studies integrating anthropological, historical research
  - Better health worker training for mpox management
  - In framing preventive measures, account for local explanations
    - use local terms, don’t criminalize rodent consumption

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Bayaka woman preparing payo (wild mango) seeds

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EXAMPLE 2:

Mpox Transmission in Pakadjuma, Kinshasa



Nurse Nathalie Kayiba looks at mpox posters in Pakadjuma, Kinshasa, May 2025

PAKADJUMA

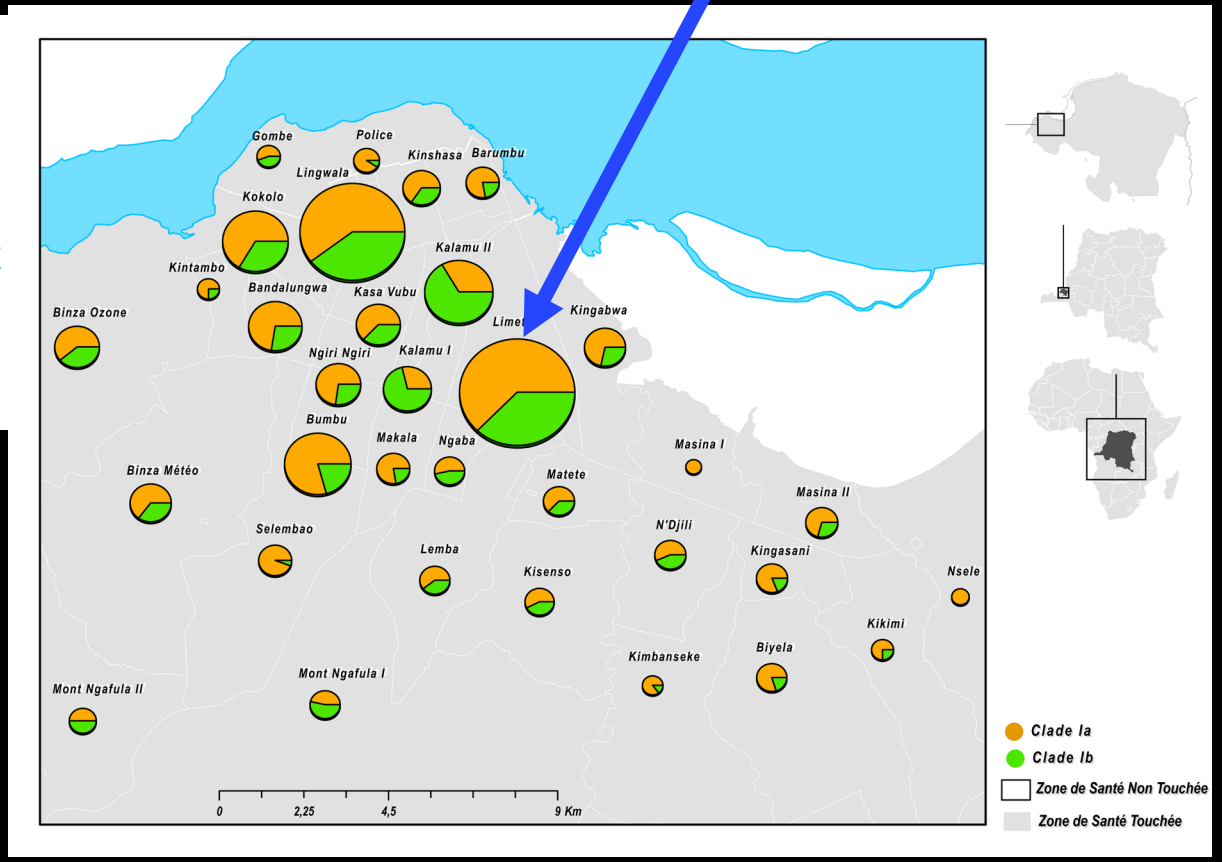


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Africa CDC ✓
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🇨🇩 Good news: The Democratic Republic of the Congo (DRC), through the National Institute of Public Health (@Insprdc), launched its #mpox vaccination campaign in Kinshasa, specifically in Pakadjuma, the epicenter of the outbreak both nationally and globally.



Distribution of mpox cases in Kinshasa by health zone, May 2025

Why has Pakadjuma been so hard hit by the mpox epidemic ?

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r2hc Research for health in humanitarian crises | elrha

PRELIMINARY RESULTS (SITUATE)

→ Population mobility between Pakadjuma and mpox-endemic provinces (Tshuapa)

→ Sexual networks that are invisible to health workers, as well as INRB epidemiologists and virologists

→ Social practices x living conditions: communal use of personal objects, sharing of clothing, and absence of basic infrastructure

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Pakadjuma community health worker

Conclusions: What can medical anthropology contribute to our understanding of mpox (…& other emergences)?

- ***Large scale drivers (e.g. deforestation, poverty, civil unrest) only gets us so far in understanding mpox outbreaks and epidemics.***

- ***Medical anthropologists***

Question **underlying assumptions**, reframe them : for instance “contact”, “poverty”, “hunting”

Situate ***“factors”*** **in their broader historical and contemporary processes**, employing new kinds of evidence and analyses and revealing through granular, grounded investigations the localized logics & practices at play

Counterpose public health explanations with local understandings, in part to assist in preparedness and response efforts

We also propose, (co-)develop, and pilot measures to reinforce/adapt epidemic response and address longer-term consequences of epidemics



Mpox survivors “Ambassadors” association meeting

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‘One Health’ aspirations guiding our research

“One Health is not an absolute state (disease freedom) - it is a process, an approximation, where the optimum may involve several suboptima within the components.” (Hinchliffe, 2023)

“more transparent, plural, and just perception of health that takes seriously the role of more-than-humans and of nonscientific knowledges…” (Braverman 2023)







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Romain Duda
Jules Villa
Yanina Borzyk

Institut Pasteur
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Camille Besombes

The people of the Lobaye and Sangha regions and of Pakadjuma for their friendship, hospitality, and collaboration

Agence Nationale de Recherche, ANRS-MIE, ELRHA

Discussion

- Do you have any questions?
- Can you envision working with anthropologists in your own research? How?



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