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forward together · saam vorentoe · masiye phambili

CLIMADE Africa: Review progress update

28 March 2023

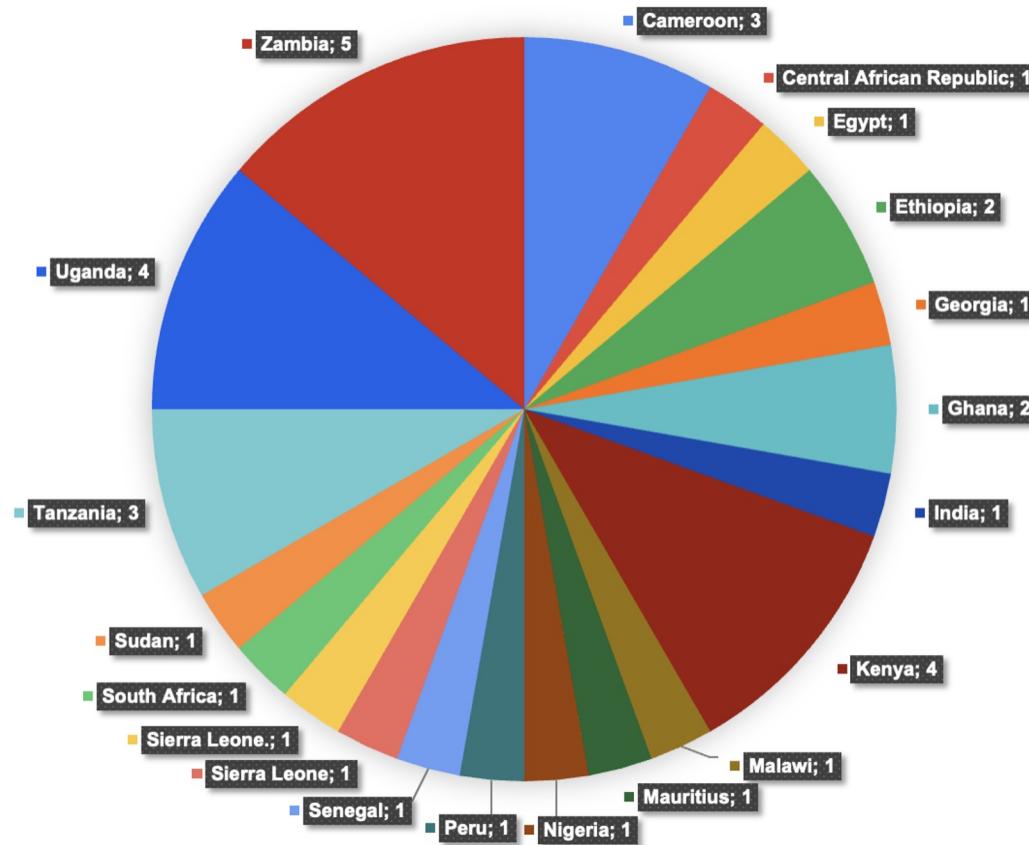
Dr. Monika Moir and Dr. Houriiyah Tegally

Centre for Epidemic Response and Innovation (CERI), Stellenbosch University
<https://ceri.org.za> | <https://climade.health> | Twitter: @tuliodna

April 2023 Genomics and Bioinformatics Training

11 - 21 April 2023

CERI lab, Tygerberg, Stellenbosch University, Cape Town, South Africa



April 2023 Genomics and Bioinformatics Training

11 - 21 April 2023

CERI lab, Tygerberg, Stellenbosch University, Cape Town, South Africa

Topics covered in this training opportunity

- COVID-19 sequencing protocol on ONT
- How to adapt the protocol to other pathogens
- Introduction to Unix and R
- Basecalling and assembly
- QC
- Submitting to SRA and GISAID
- Intro to phylogenetics
- Visualizing lineage plots and trees
- Writing a report

Viral Evolution and Molecular Epidemiology (VEME) Workshop



Apply now!

Deadline: 1st of April

<https://veme.climade.health/application/>



VEME

Virus Evolution and Molecular Epidemiology

20-25 August 2023 - Stellenbosch, South Africa

27th VEME WORKSHOP 2023

27th International Bioinformatics & Virus Evolution & Molecular Epidemiology (VEME)

Centre for Epidemic Response & Innovation (CERI), Stellenbosch University.

DETAILS

REGISTER NOW

Programme consists of four separate modules that will provide an overview of the current methods used to analyze the vast data generated by modern DNA sequencing technologies, including:

- 1-Phylogeny inference;
- 2-Evolutionary Hypothesis Testing;
- 3-Next Generation Sequencing;
- 4-From Trees to Public Health Policy.



Understanding the prevalence and surveillance of climate sensitive vector-borne diseases in Africa

- Understand disease prevalence and occurrence of seven key arboviruses across the African continent
 - Review of seroprevalence studies in humans, vectors, and animals
 - WHO Afro case reports
 - Questionnaires completed by Climade Africa Working Group
- Map the extent of surveillance efforts for these diseases
 - Review of seroprevalence studies
 - Review of genomic studies
 - Questionnaires completed by Climade Africa Working Group
- Identify areas in which disease prevalence is known or likely but genomic surveillance is lacking
- Identify the challenges of genomic sequencing across the continent and where access to the technology and skills is required
- Sequence stored samples for further analysis to better understand these diseases in Africa

Review of arboviruses in Africa: Seroprevalence and Genomics

Possible Duplicates +

Inclusion decisions	
Undecided	0
Maybe	70
Included	741
Excluded	1469
Conflict	135

Decision by -

- [monikam@sun.ac.za](#)
- [James](#)
- [Miss Yajna Ramphal](#)

Minimum collaborator decisions -

At least 1	2409
At least 2	1629
At least 3	104

2023-01-31: Seroprevalence of arboviruses in Africa Blind OFF

Showing 1 to 10 of 2,409 unique entries

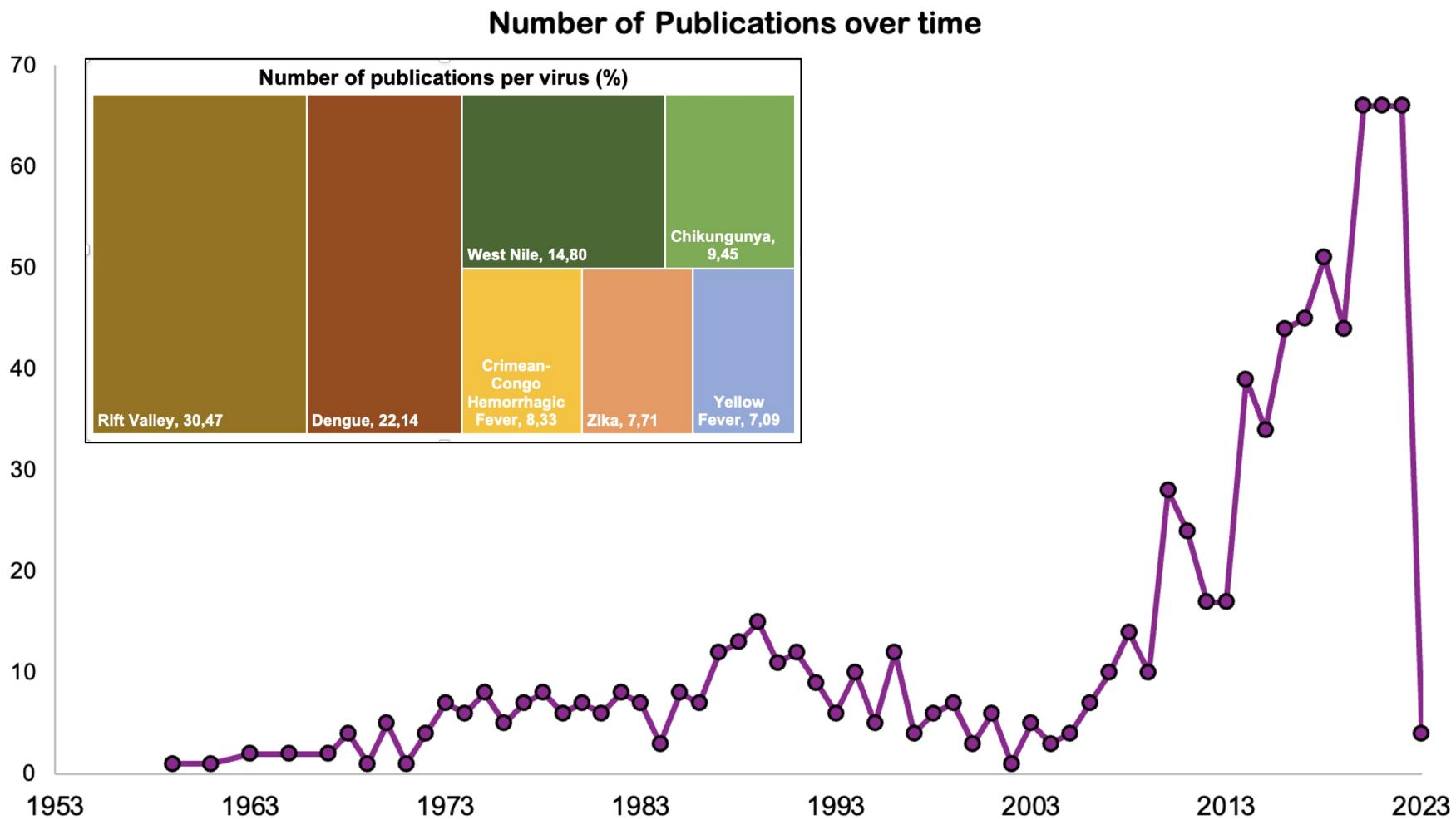
Date	Title	Authors	Rating
2016-07-01	monikam James Yajna Zika Virus.	Musso D; Gubler DJ	
2018-10-01	monikam James Yellow Fever Virus: Diagnostics for a Persistent Arboviral Th...	Waggoner JJ; Rojas A; Pinsk...	
2021-12-02	monikam James Chikungunya virus infection: molecular biology, clinical char...	Khongwichit S; Chansaenroj...	
2021-04-26	monikam James Epidemiology of Crimean-Congo Hemorrhagic Fever (CCHF) i...	Temur AI; Kuhn JH; Pecor D...	
2020-04-01	monikam James Crimean-Congo Hemorrhagic Fever, Mauritania.	Boushab BM; Kelly M; Kébé ...	
2018-01-01	monikam James Seroepidemiological Studies of Arboviruses in Africa.	Gudo ES; Ali S; António VS; ...	

Screened ~5000 papers

~840 are relevant for seroprevalence data

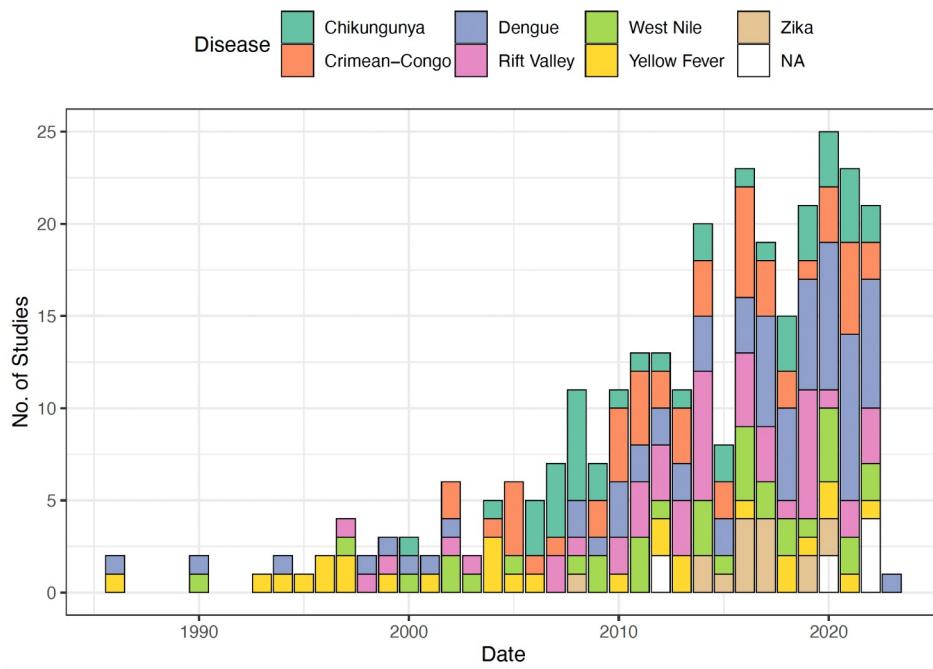
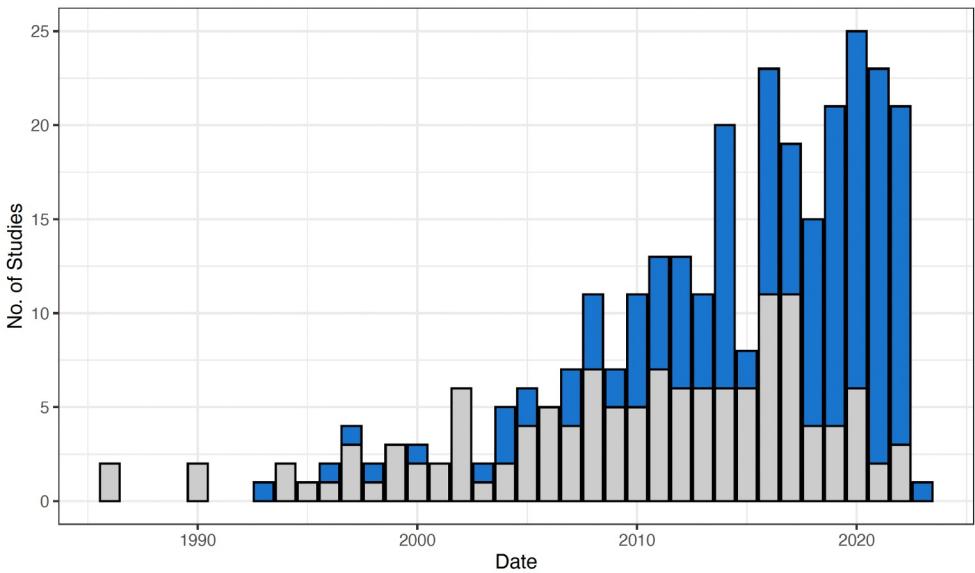
~300 papers present genomes sampled from Africa

Review of arboviruses in Africa: Seroprevalence

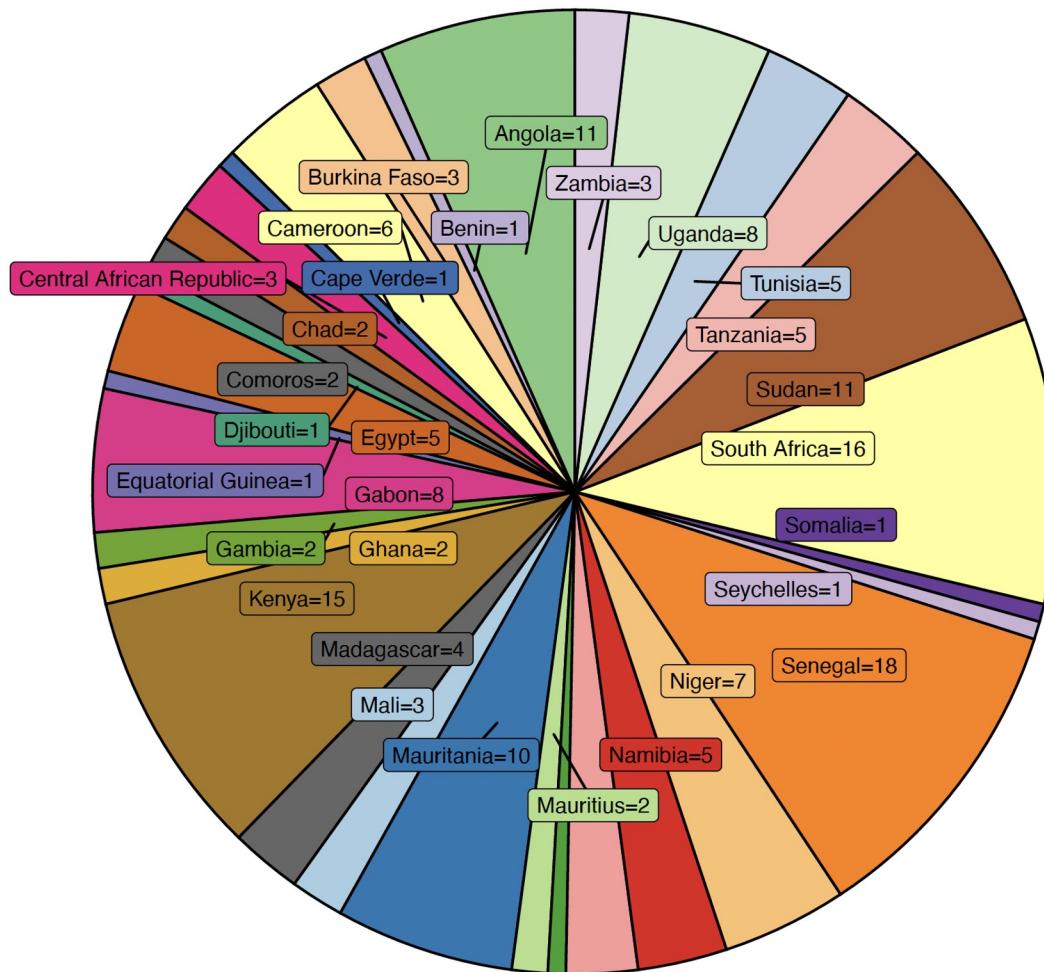


Review of arboviruses in Africa: Genomics

Focus █ Genomic Study Focused on Specific African Country Contains Analysis of African Sequence

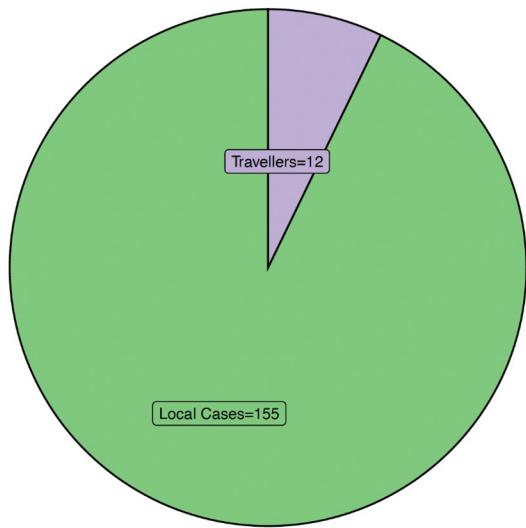


Review of arboviruses in Africa: Genomics

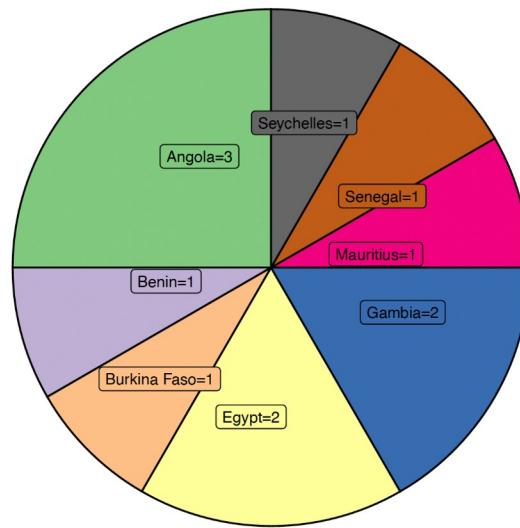


Review of arboviruses in Africa: Genomics

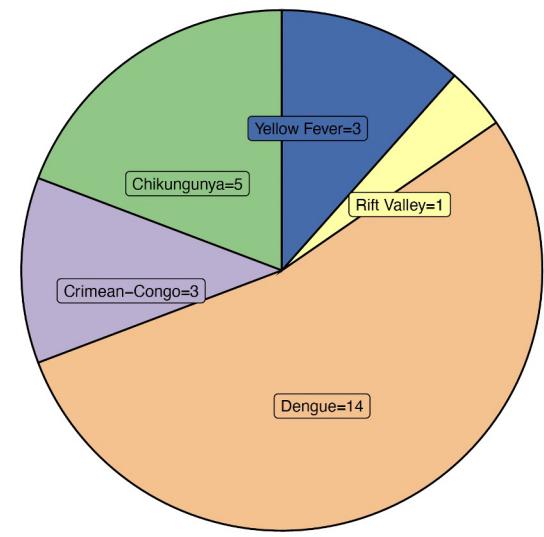
No. Studies with Sequences Generated from African Cases



No. Studies with Travel Cases from Africa



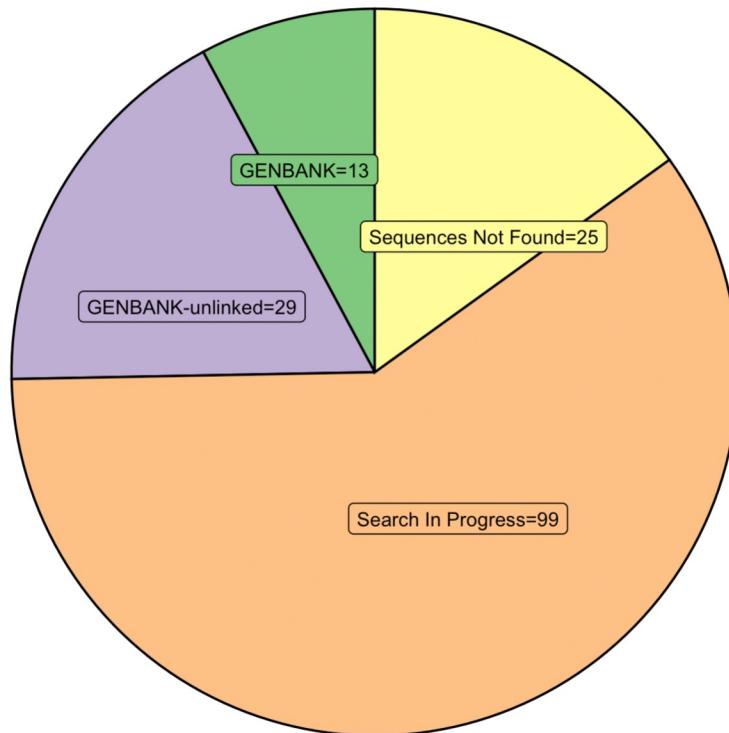
No. Studies with Travel Cases from Africa



Review of arboviruses in Africa: Genomics

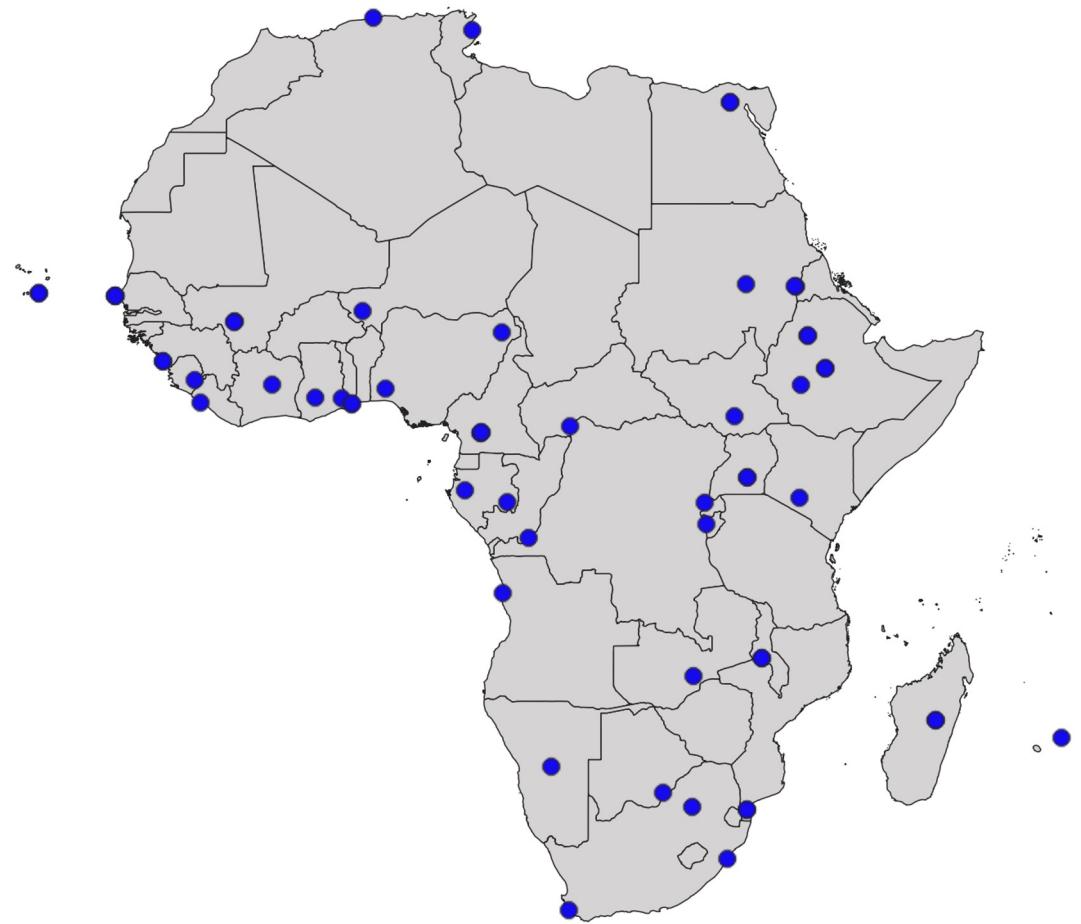
Preliminary

No. Studies with Sequences Generated in Africa
(Sequence Availability)



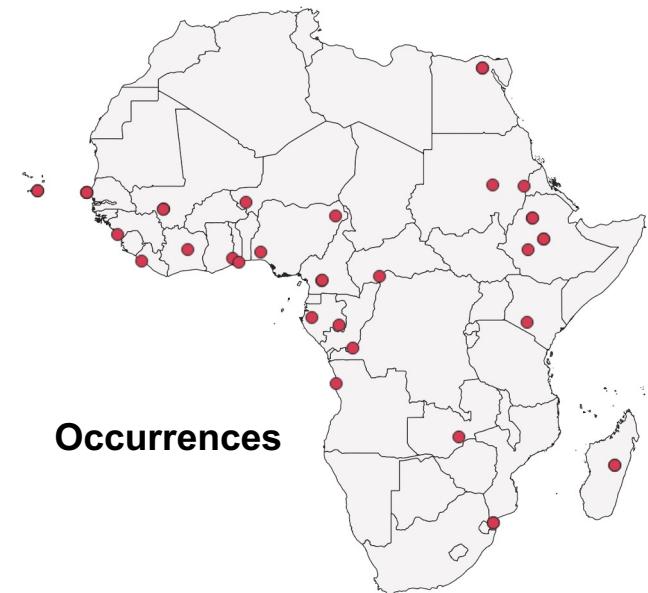
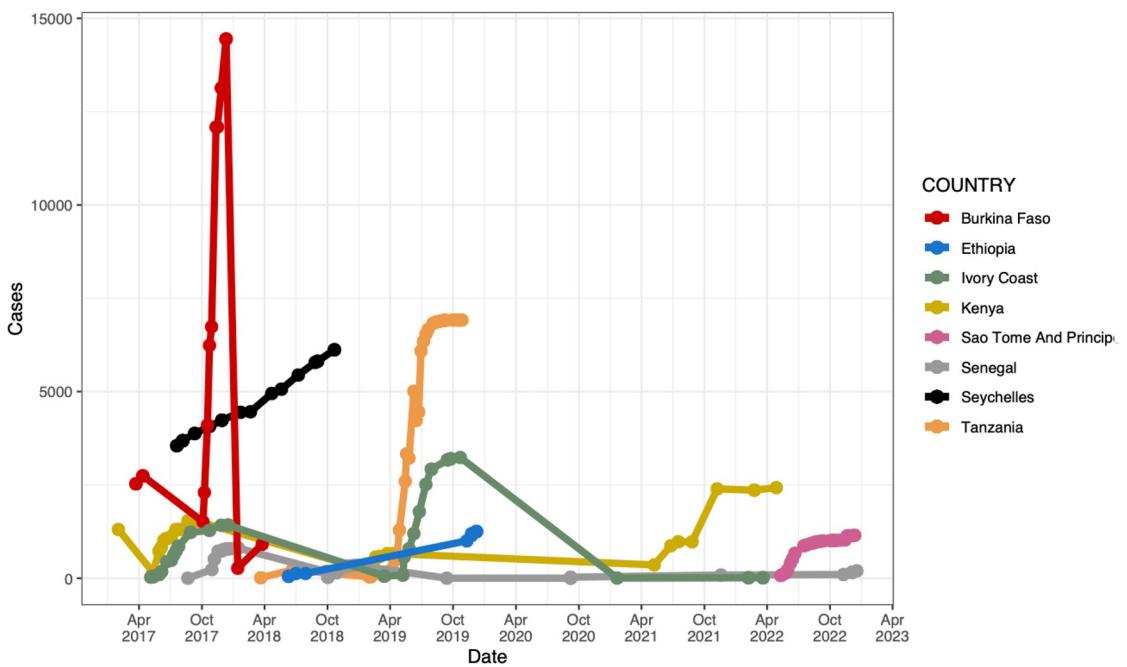
Questionnaire respondents

58 completed questionnaires

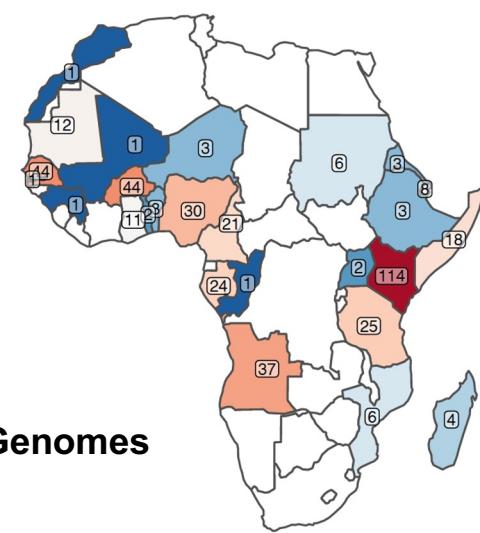


Dengue

WHO Afro reported cases

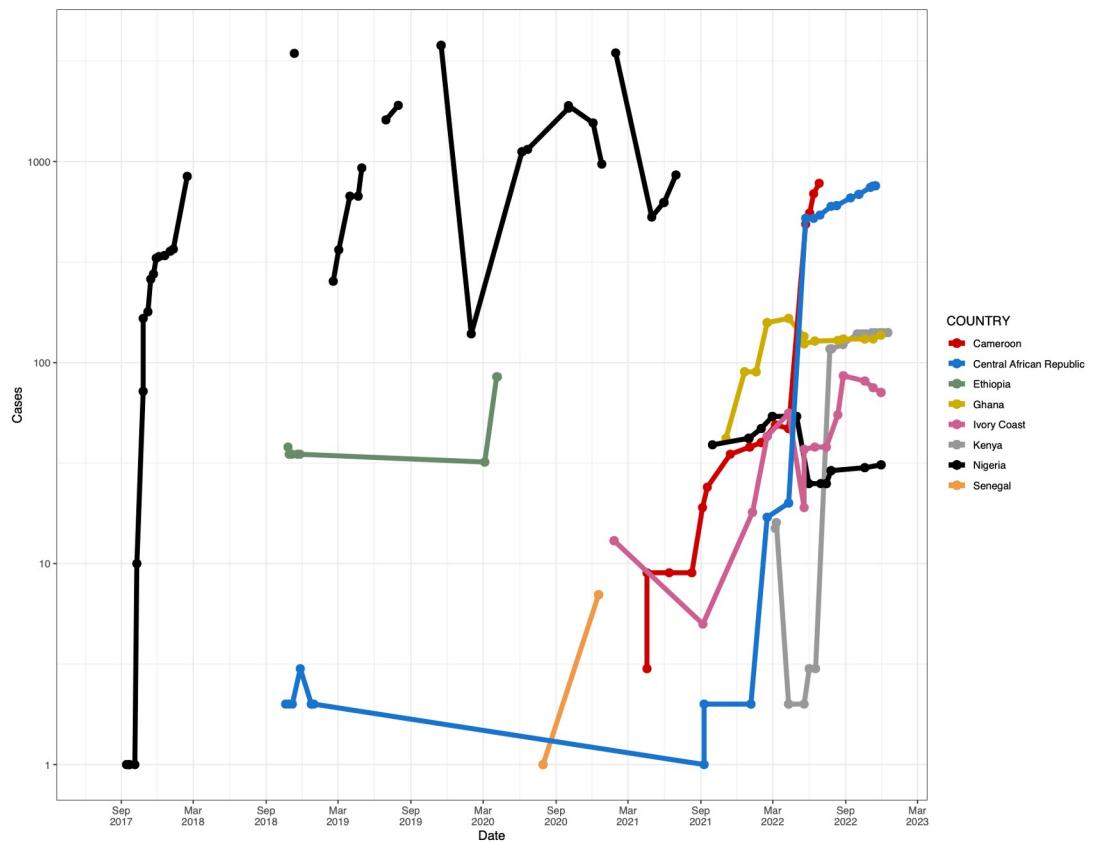


Occurrences

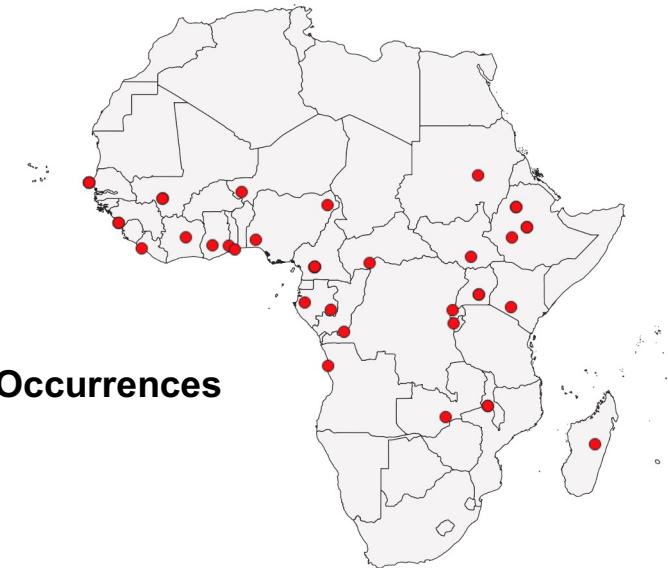


Genomes

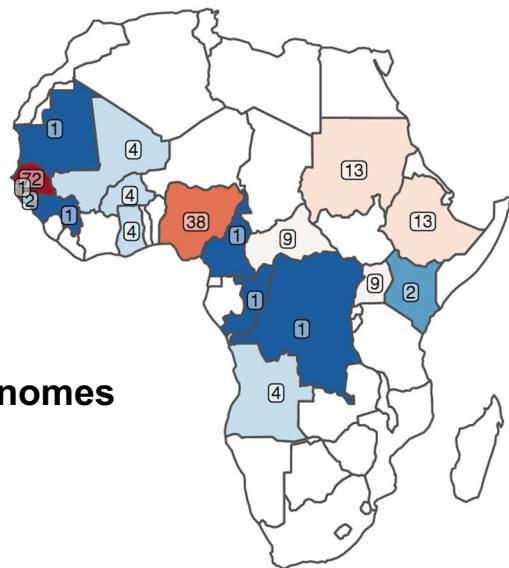
WHO Afro reported cases



Occurrences

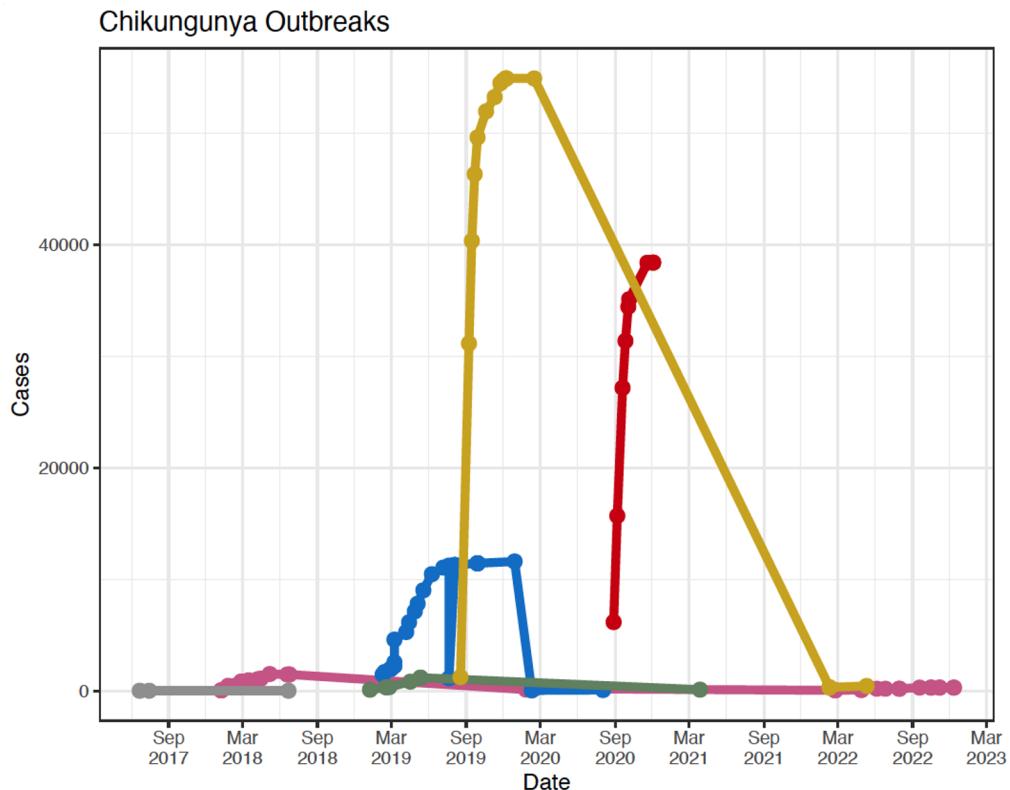


Genomes

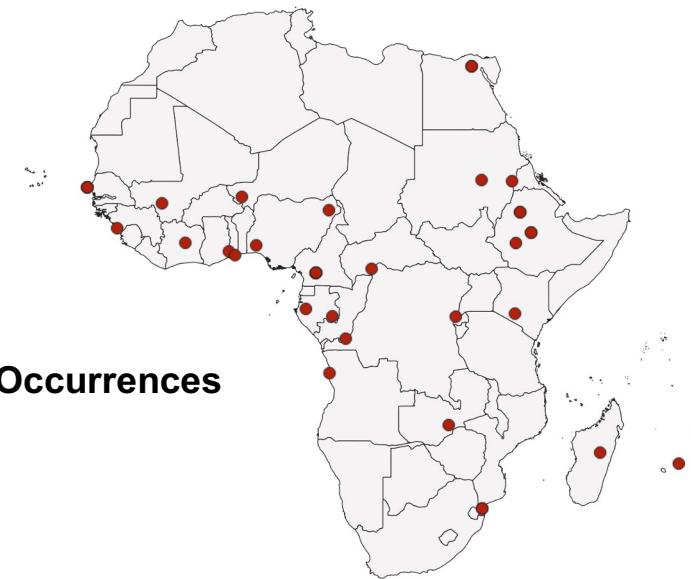


Chikungunya

WHO Afro reported cases



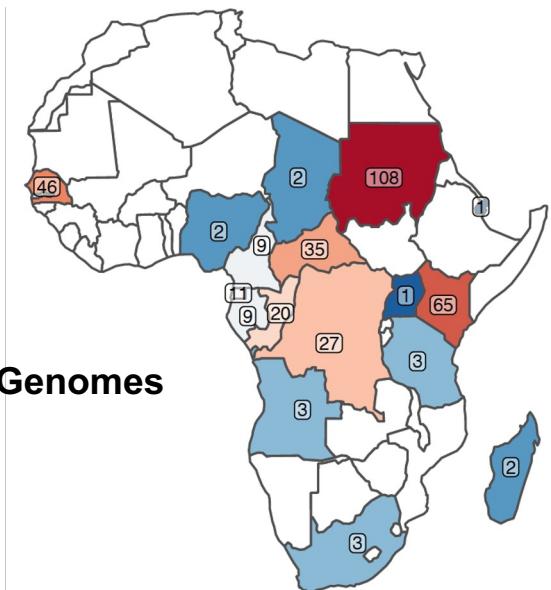
Occurrences



COUNTRY

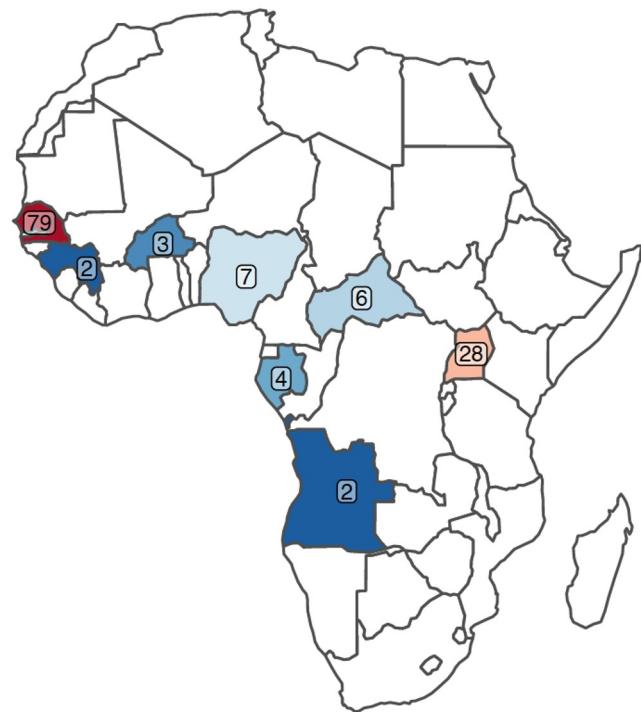
- Chad
- Congo
- DRC
- Ethiopia
- Kenya
- Tanzania

Genomes



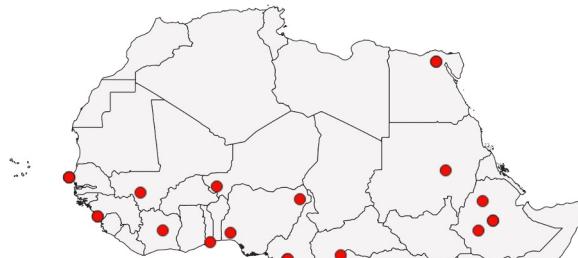
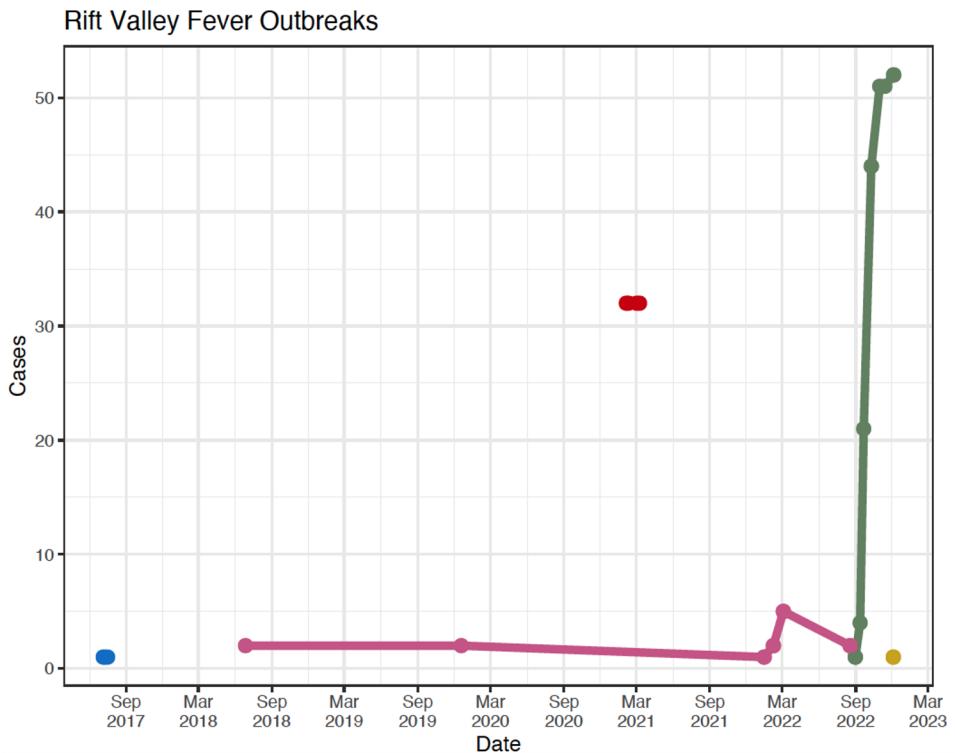
WHO Afro reported cases

3 Cases in Angola in 2017

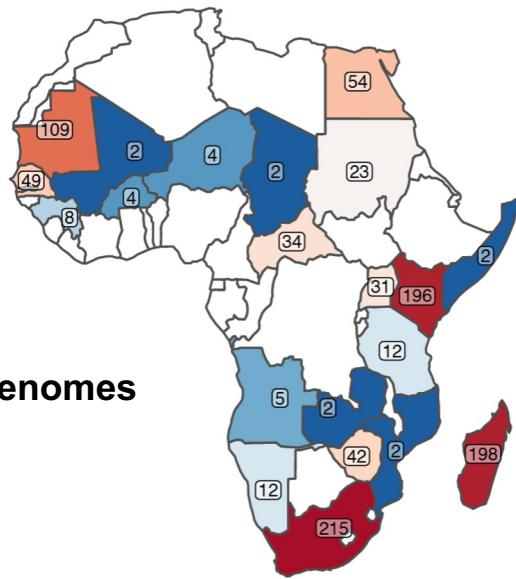
Occurrences**Genomes**

Rift Valley

WHO Afro reported cases

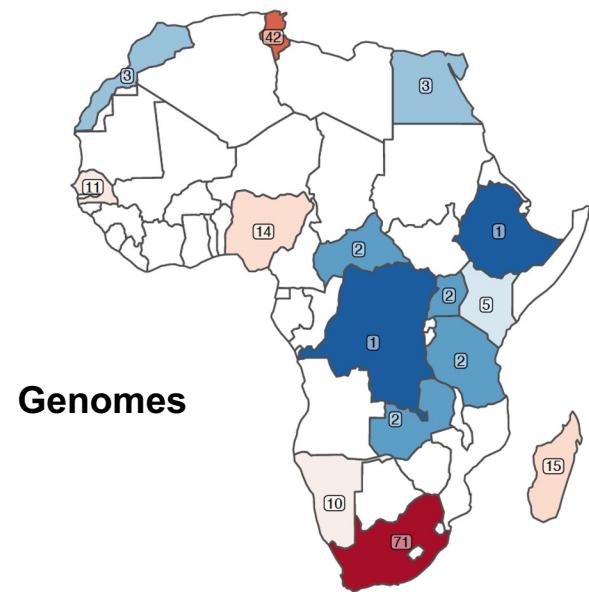
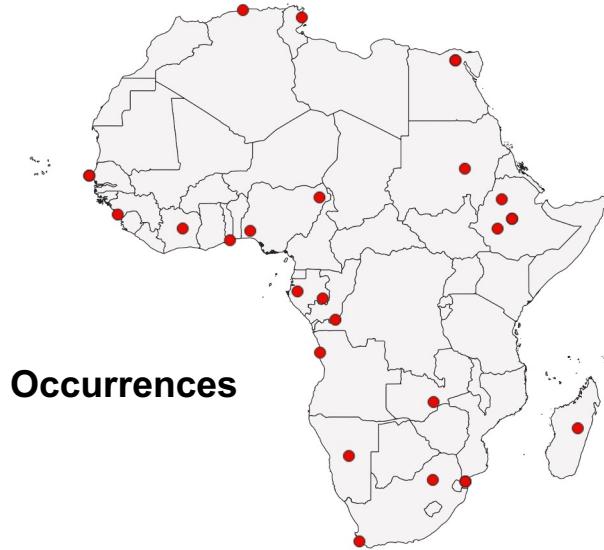
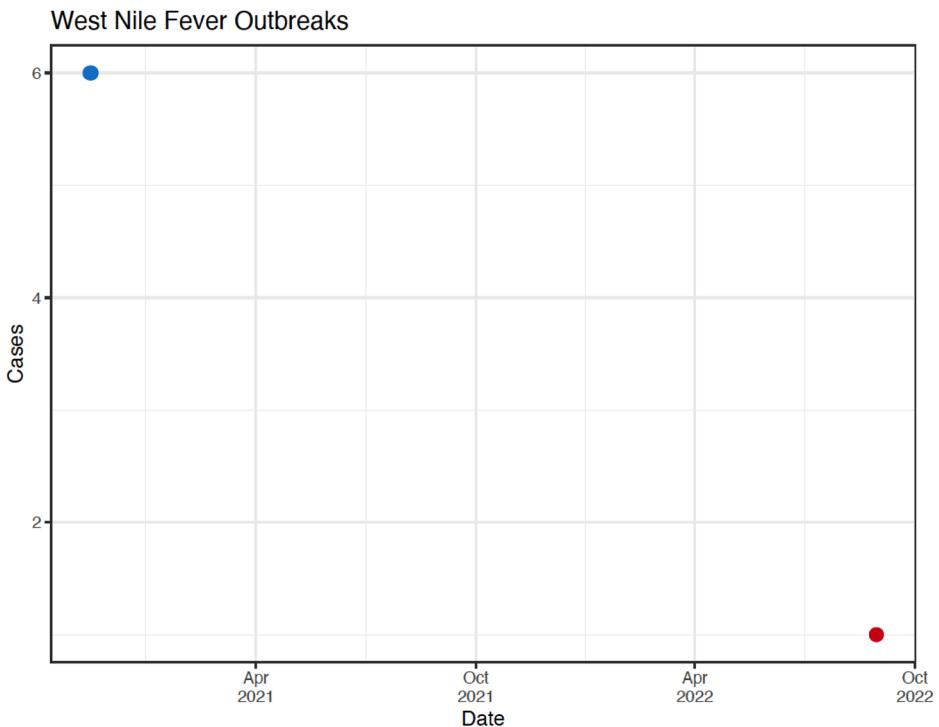


Occurrences



Genomes

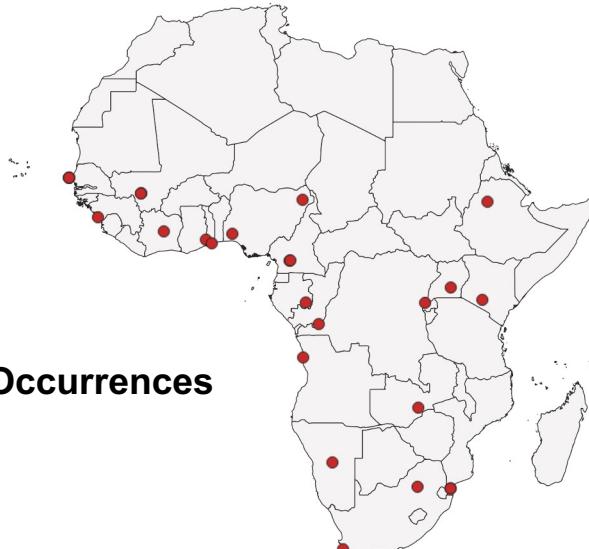
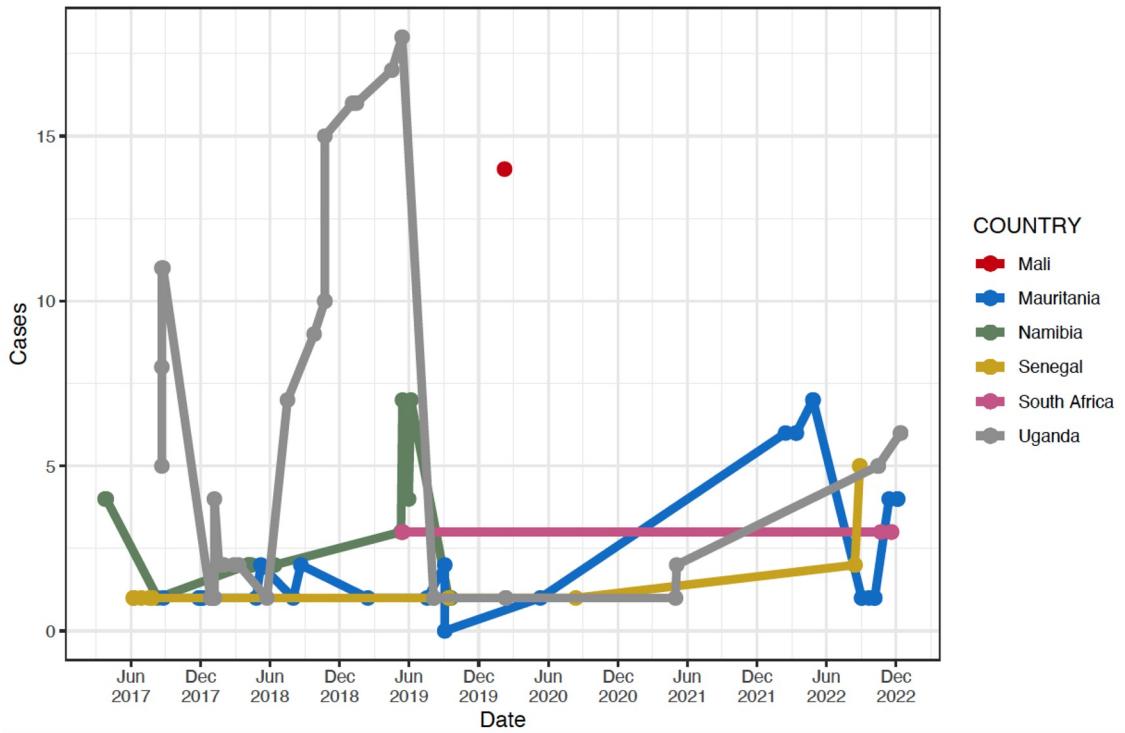
WHO Afro reported cases



Crimean-Congo Hemorrhagic Fever

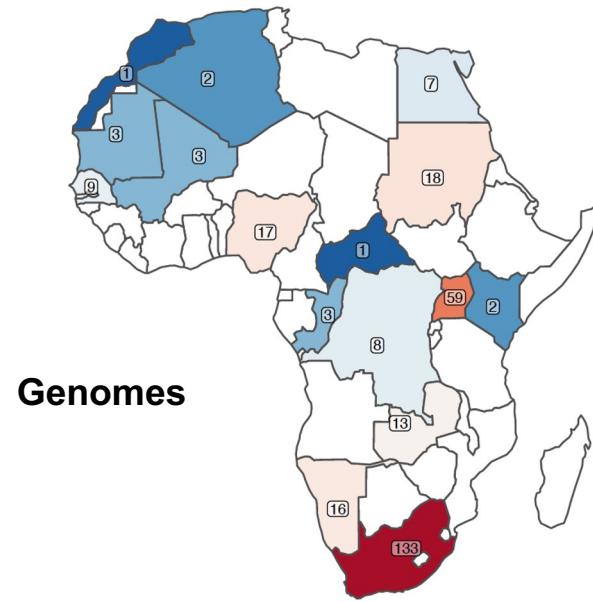
WHO Afro reported cases

Crimean-Congo Hemorrhagic Fever Outbreaks



COUNTRY

- Mali
- Mauritania
- Namibia
- Senegal
- South Africa
- Uganda



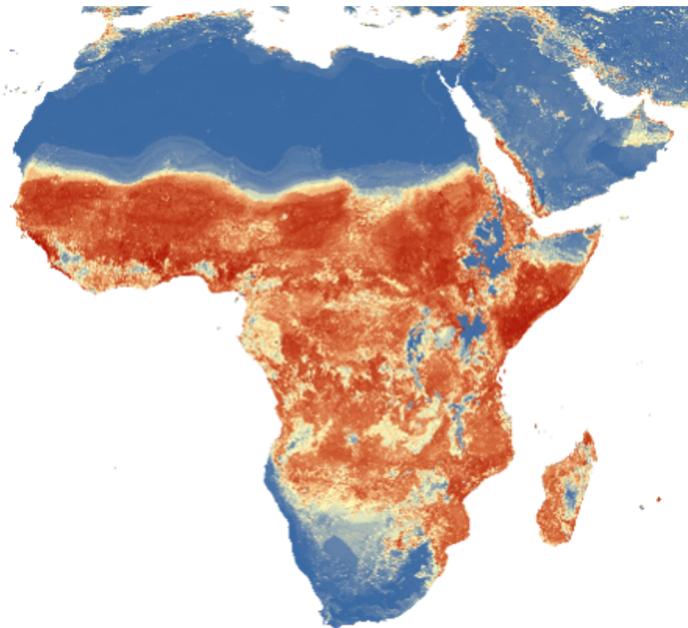
Key Arbovirus vectors

<u>Virus</u>	<u>Vectors</u>
Dengue	Ae. aegypti
West Nile	<i>Cx. modestus</i> , <i>Cx. neavei</i> , <i>Cx. perexiguus</i> , Cx. pipiens , Cx. quinquefasciatus , Cx. univittatus , Cx. theileri
Yellow Fever	Ae. aegypti , Ae. africanus , <i>Ae. albopictus</i> , Ae. furcifer/taylori , <i>Ae. leucocelaenus</i> , Ae. luteocephalus , Ae. metallicus , <i>Ae. opok</i> , Ae. simpsoni complex , <i>Ae. vittatus</i> , <i>Haemagogus capricorni</i> , <i>Haemagogus equines</i> , <i>Haemagogus janthinomys</i> , <i>Haemagogus leucocelanus</i> , <i>Haemagogus mesodentatus</i> , <i>Haemagogus spegazzinii</i> , <i>Sabettus chloropterus</i>
Zika	Ae. aegypti , Ae. africanus , Ae. albopictus , <i>Ae. furcifer</i> , <i>Ae. jamoti</i> , <i>Ae. opok</i> , <i>Ae. flavicollis</i> , <i>Ae. grahami</i> , <i>Ae. taeniorostris</i> , <i>Ae. tarsalis</i> , <i>Ae. vittatus</i> , <i>Ae. dalziella</i> , <i>Ae. fowleri</i> , <i>Ae. luteocephalus</i> , <i>Ae. metallicus</i> , <i>Ae. minimus</i> , <i>Ae. neoafricanus</i> , <i>An. gambiae</i> , <i>Eretmapodites inornatus</i> , <i>Eretmapodites quinquevittatus</i> , <i>Mansonia uniformis</i>
Chikungunya	Ae. aegypti , Ae. africanus , Ae. albopictus , Ae. cordellieri , Ae. furcifer , <i>Ae. fulgens</i> , Ae. luteocephalus , Ae. neoafricanus , Ae. taylori , <i>Ae. vittatus</i>
Rift Valley	<i>Ae. aegypti</i> , <i>Ae. caballus</i> , <i>Ae. cumminsii</i> , Ae. circumluteolus , Ae. dentatus , Ae. juppi , Ae. mcintoshii , Ae. ochraceus , <i>Ae. pombaensis</i> , <i>An. squamosus</i> , <i>Cx. bitaeniorhyncus</i> , <i>Cx. quinquefasciatus</i> , <i>Cx. poicilipes</i> , <i>Cx. theileri</i> , <i>Cx. univittatus</i> , <i>Cx. zombaensis</i> , <i>Eretmapodites quinquevittatus</i> , <i>Mansonia africana</i> , <i>Mansonia uniformis</i>
Crimean-Congo Hemorrhagic Fever	Ticks of the genus <i>Hyalomma</i>

Distribution of arbovirus vectors in Africa

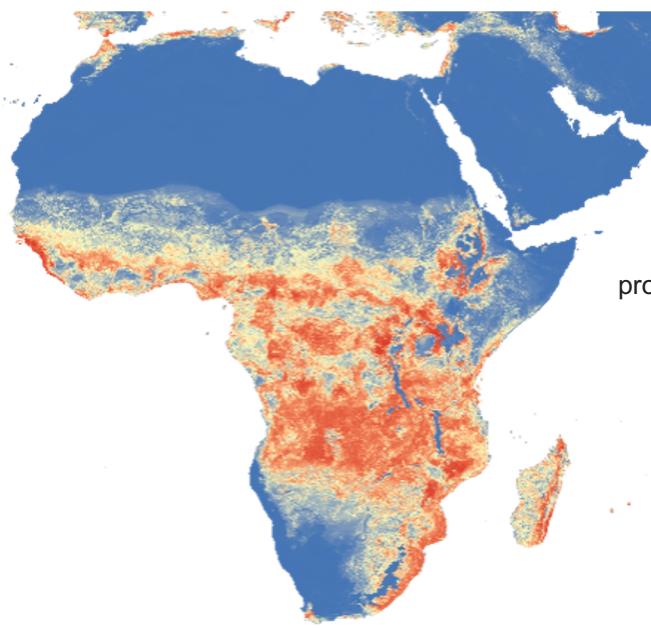
Ae. aegypti Distribution Map

(Transmits: Dengue, Yellow Fever, Zika, Chikungunya)



Ae. albopictus Distribution Map

(Transmits: Zika, Chikungunya)

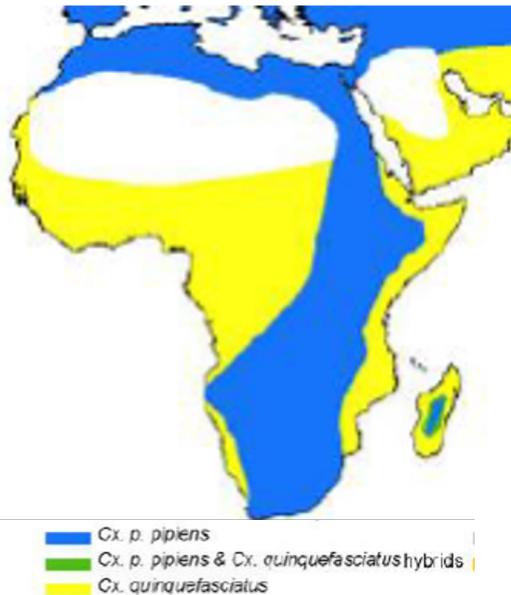


Moritz UG Kraemer, et al. (2015) **The global distribution of the arbovirus vectors *Aedes aegypti* and *Ae. albopictus*** eLife 4:e08347.
<https://doi.org/10.7554/eLife.08347>

Distribution of arbovirus vectors in Africa

***Cx. pipiens* Distribution Map**

(Transmits: West Nile)



Ciota AT, Kramer LD. **Vector-Virus Interactions and Transmission Dynamics of West Nile Virus.** Viruses. 2013; 5(12):3021-3047.

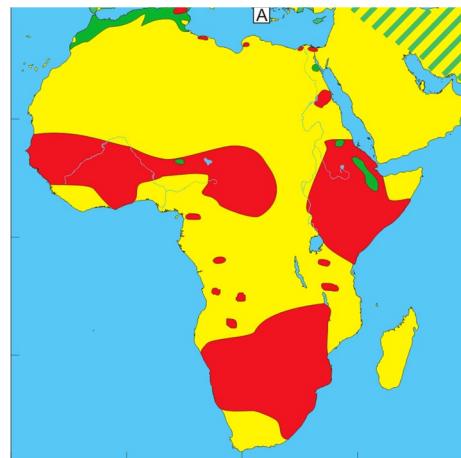
<https://doi.org/10.3390/v5123021>

***Hyalomma* Ticks Distribution Map**

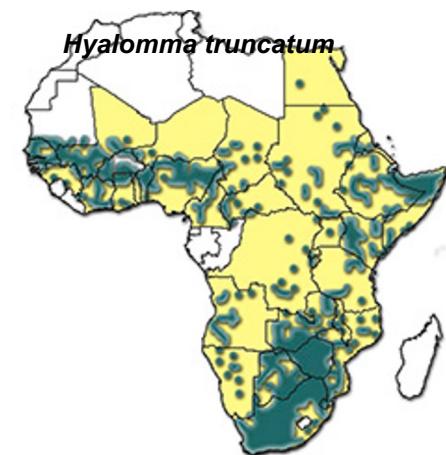
(Transmits: Crimean-Congo Hemorrhagic Fever)

***Hyalomma marginatum* (green)**

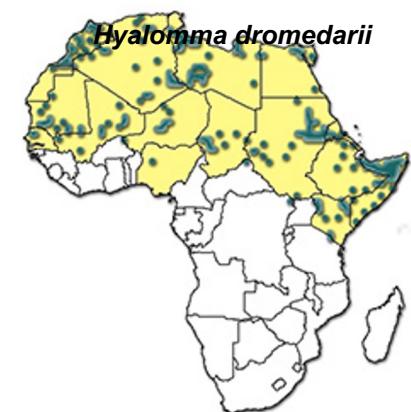
***Hyalomma rufipes* (red)**



Hyalomma truncatum



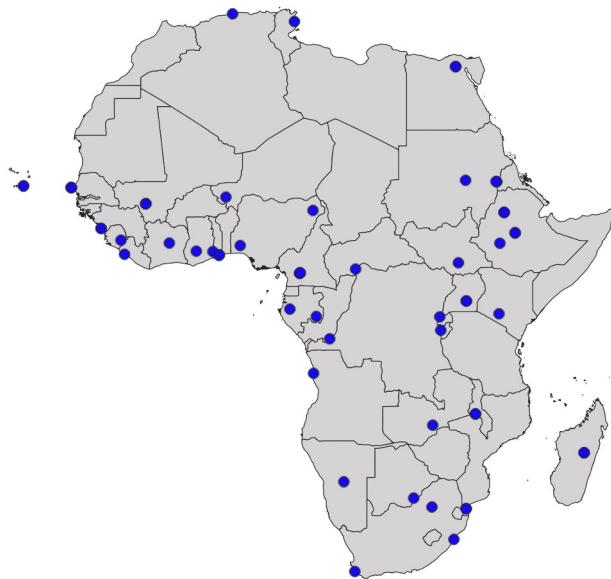
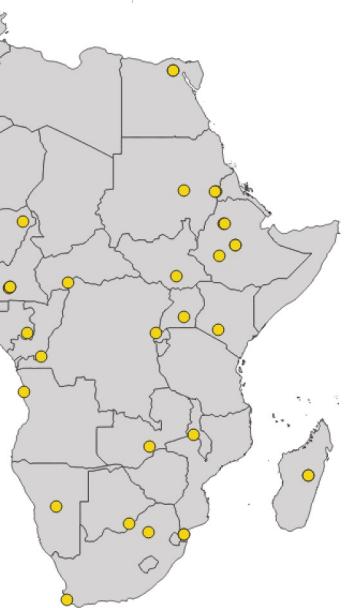
Hyalomma dromedarii



Wallménus, K., Barboutis, C., Fransson, T. et al. **Spotted fever Rickettsia species in *Hyalomma* and *Ixodes* ticks infesting migratory birds in the European Mediterranean area.** Parasites Vectors 7, 318 (2014). <https://doi.org/10.1186/1756-3305-7-318>

<https://www.afrivip.org/sites/default/files/Ticks-importance/hyalomma/>

Questionnaire responses - Institutions

Institutions**Currently sequencing****Access to stored samples**

Questionnaire responses - Country

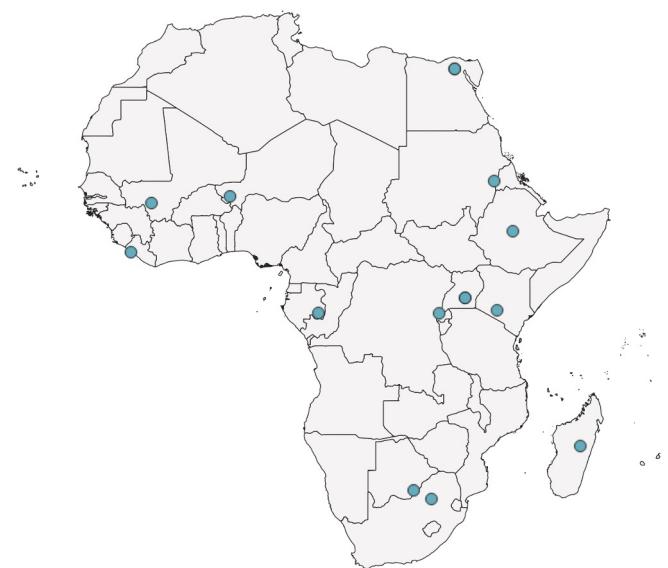
Human



Vector



Animal



Next steps

- Identify and contact institutions that are currently unable to sequence
- Identify and contact institutions with stored samples requesting sequencing
- Understand challenges and needs of institutes

Seroprevalence review data extraction Share

Seroprevalence review data extraction													
File Edit View Insert Format Data Tools Extensions Help													
E13													
Where						When						How	
Pubmed URL	DOI	Country	Region/province	City/Town	Year of publication	Year of sample collection	Host (Human/Animal/Vector) Write specific species name if animal/vector	If human: Population based or patient study	Type of study (cross sectional/ longitudinal)	If animal: were samples collected during an outbreak/ routine surveillance/ die off	Diagnostic/test used (IgM/ IgG/ RT-PCR/ metagenomics)	Results	
												Total samples	Number positive
												% positive	Range
												Samples negative for virus	Comments or extra notes

- Summarize genomic data from publications
- Source case data from country partners to complement WHO outbreak reports data

ACKNOWLEDGEMENTS

- Literature Review
 - Dr. James E. San, Yajna Ramphal, Martina Reichmuth, Dr. Marije Hofstra, Dr. Eduan Wilkinson
- WHO Outbreak Data Curation
 - Dr. James E. San, Yajna Ramphal, Akhil Maharaj
- Questionnaires
 - CLIMADE-Africa partners that have filled in the relevant questionnaire
- Groups in Africa that have made their genomic data available publicly on Genbank



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Thank you

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