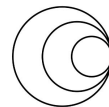


Day 1: Session 3: Practical approaches - translation of genomics into public health intervention

Tapfumanei Mashe,
Luria Leslie Founou,
Francis Chikuse



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Course roadmap

Mon 8 May
Day 1

Capacity Building

Sun 7 May
Introduction Day

Tue 9 May
Day 2
Specimen and
Sequencing

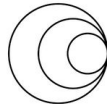
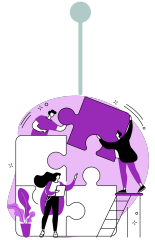
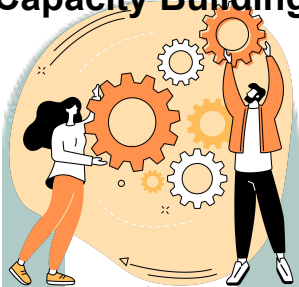
Thu 11 May
Day 4
Frameworks,
Guidelines, and
Decision-making

Next steps and
Beyond

Wed 10 May
Day 3
Data Tools and
Pipelines

Fri 12 May
Day 5
Projects Review and
Action Planning

Introduction
Overview of basic concepts
Case studies



Session objectives and outcomes

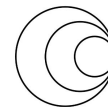
Objective

To showcase case studies about translation of genomics research into public health interventions including mass vaccination, disease surveillance and drug resistance monitoring

- Monitoring cholera outbreak and vaccination - Tapfumanei
- AMR surveillance - Luria
- The Africa CDC use cases for pathogen genomics - Francis

Outcomes

Awareness and discussions about how various countries are applying genomics in public health



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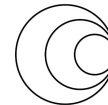
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Translating genomics research into public health interventions: A Case of Zimbabwe

Tapfumanei Mashe



**World Health
Organization**



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Course roadmap

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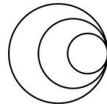
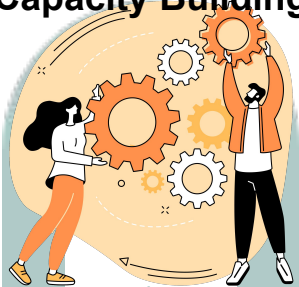
Thu 11 May
Day 4
Frameworks, Guidelines, and Decision-making

Next steps and Beyond

Wed 10 May
Day 3
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Fri 12 May
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Projects Review and Action Planning

Case studies: Zimbabwe



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Cholera: Case Study 1

Oral rehydration therapy



Antimicrobials



WASH



VACCINATION

Cholera (2018-19)

10,730 cases
69 deaths

CTXM15

sul1

strAB

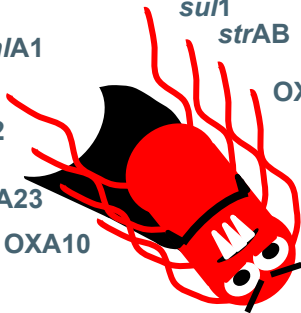
cmIA1

OXA1

sul2

dfrA23

OXA10



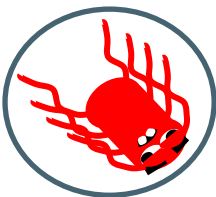
Cholera (2010-11)

2 162 cases
0 deaths

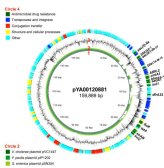
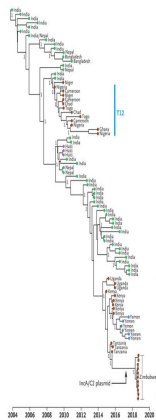


Cholera (2008-09)

98 592 cases
4 288 deaths



1.5 million people vaccinated



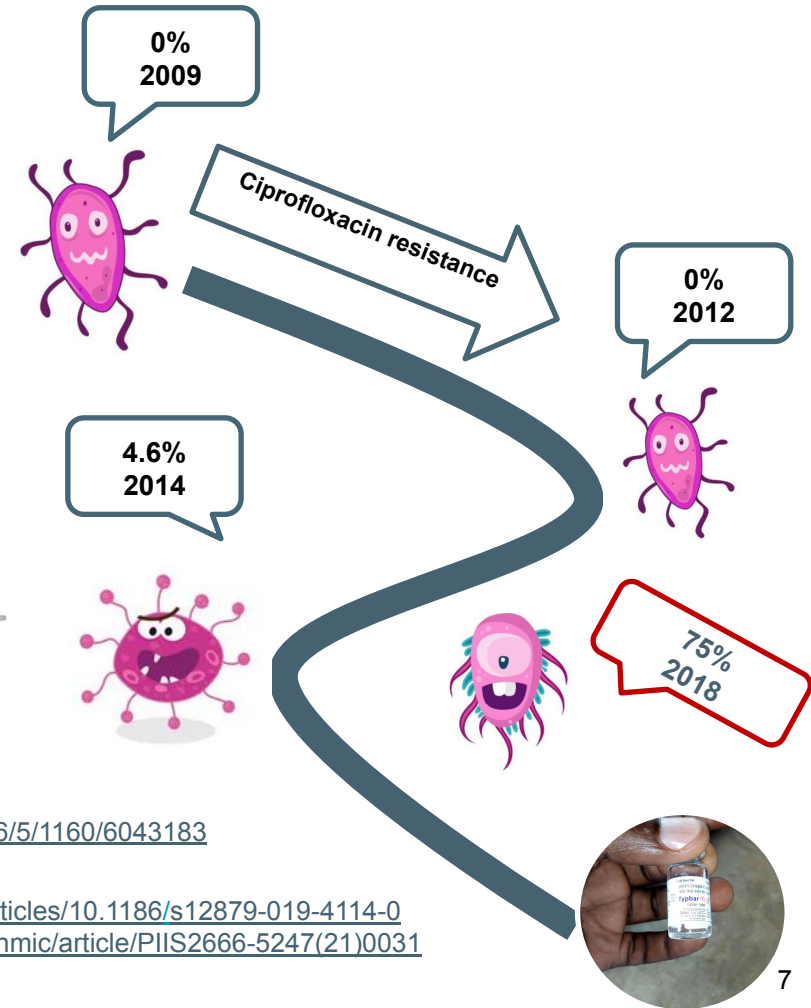
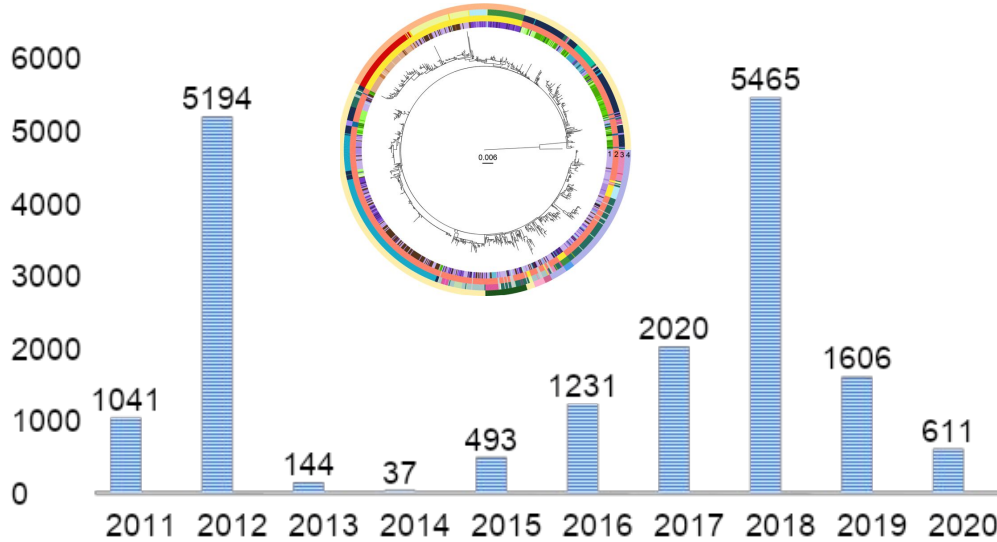
1. <https://www.nejm.org/doi/full/10.1056/NEJMc2004773>
2. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9887696/>

Zimbabwe Cholera outbreaks

Genomic sequencing

Mitigation measures

Typhoid: Case Study 2



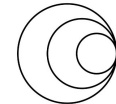
Mitigation measures

- Antimicrobials
- WASH
- Waste management
- **Vaccination**

1. <https://academic.oup.com/jac/article/76/5/1160/6043183>
2. <https://bmcinfectdis.biomedcentral.com/articles/10.1186/s12879-019-4114-0>
3. [https://www.thelancet.com/journals/lanmic/article/PIIS2666-5247\(21\)00311-6/fulltext](https://www.thelancet.com/journals/lanmic/article/PIIS2666-5247(21)00311-6/fulltext)



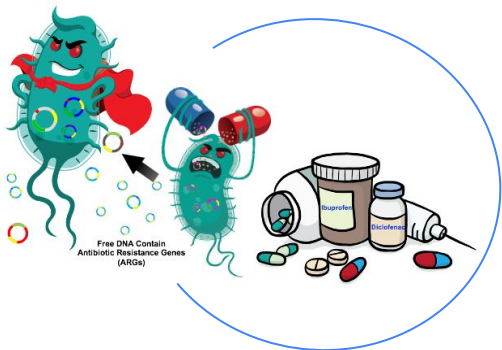
*Establishing Capacity for Pathogen Genomics
Addis Ababa, Ethiopia, May 2023*



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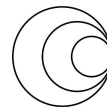


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Genomics for Antimicrobial Resistance Surveillance in Africa

Luria Leslie Founou



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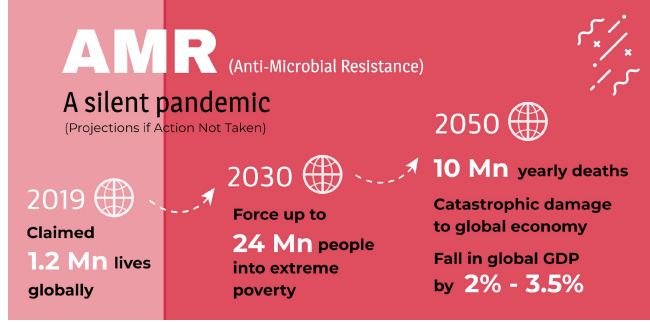


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Antimicrobial resistance – global public health threat

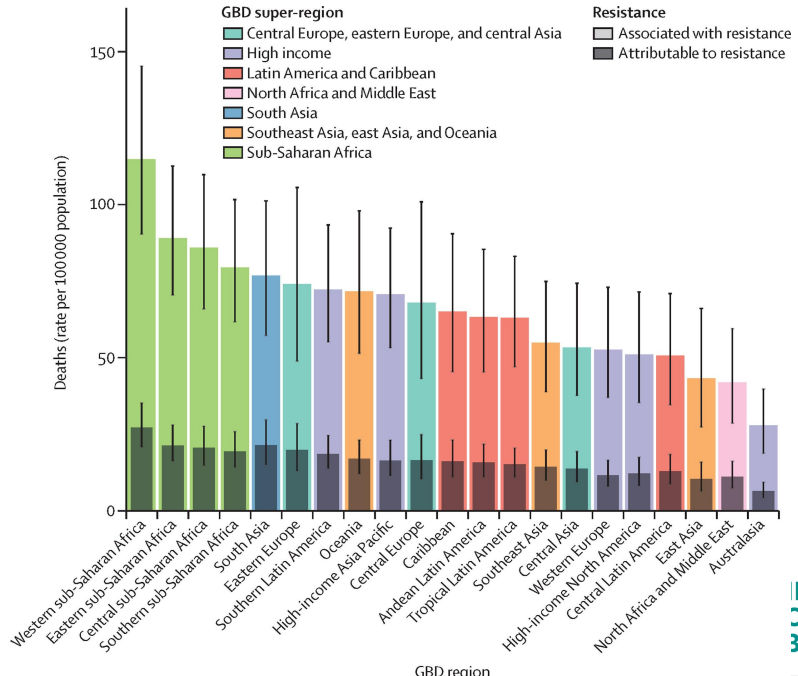


Establishing Capacity for Pathogen Genomics
Addis Ababa, Ethiopia, May 2023



- ❑ In 2019, leading cause of deaths worldwide
- ❑ **1.27 million deaths** directly attributable to bacterial AMR
- ❑ **AMR > HIV+Malaria**
- ❑ Affect animals, humans and the environment ❑ One Health issue

The Review on Antimicrobial Resistance. 2022.
Murray et al., 2022. Lancet.
[https://doi.org/10.1016/S0140-6736\(21\)02724-0](https://doi.org/10.1016/S0140-6736(21)02724-0)



AMR Surveillance in the food chain

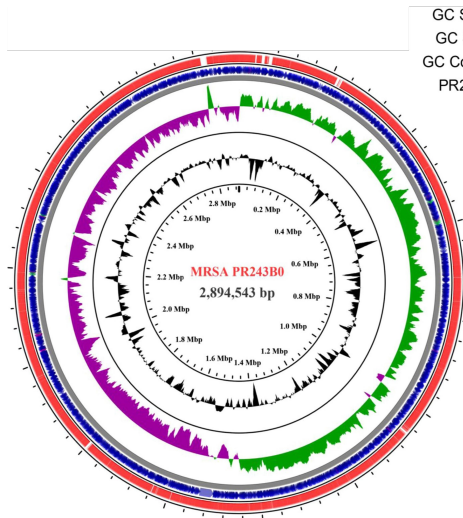
Establishing Capacity for Pathogen Genomics
Addis Ababa, Ethiopia, May 2023

1st report of LA-MRSA in Cameroon and South Africa

Founou LL, et al., 2019. Zoonoses Public Health
doi: 10.1111/zph.12586

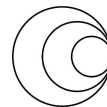


Credit: CEDBCAM-RI



MLST	ST398 (100%)
SCCmec & spa typing	SCCmec Vc (5C2&5) (100%) Spa t011 (100%)
Resistome	100% <i>mecA</i> , <i>tetM/K</i> , <i>ermB/C</i> <i>blaZ</i> (80%), <i>tetL</i> (20%)
Virulome	13 virulence factors <i>aur</i> , <i>hly</i> , <i>hlyA/B/C</i> , <i>seb</i> , <i>vWbp</i> , <i>clfA/B</i> , <i>fnbA/B</i> , <i>ebpS</i> , <i>lukS-PV</i>
Mobilome	<i>rep</i> (SAP101A), <i>repL</i> (pDLK1), <i>repC</i> (Cassette) MobE Intact prophage regions (60%)

- Pigs and exposed workers
- Methicillin resistant *Staphylococcus aureus*
- Abattoirs in Cameroon and South Africa



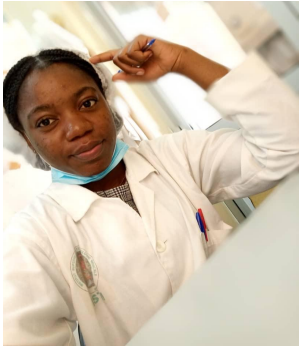
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MDR/ESBL *Enterobacteriales* in mothers and neonates

Transmission dynamics of *E. coli* and *K. pneumoniae* in a maternity ward in Cameroon



Axelle Njeuna
Master student
(2022)

Mothers

- **ESBL-PE: 47%** (183/389)
- *E. coli* (52%) & *K. pneumoniae* (47%)
- **ESBL-NF: 4.4%** (17/389)

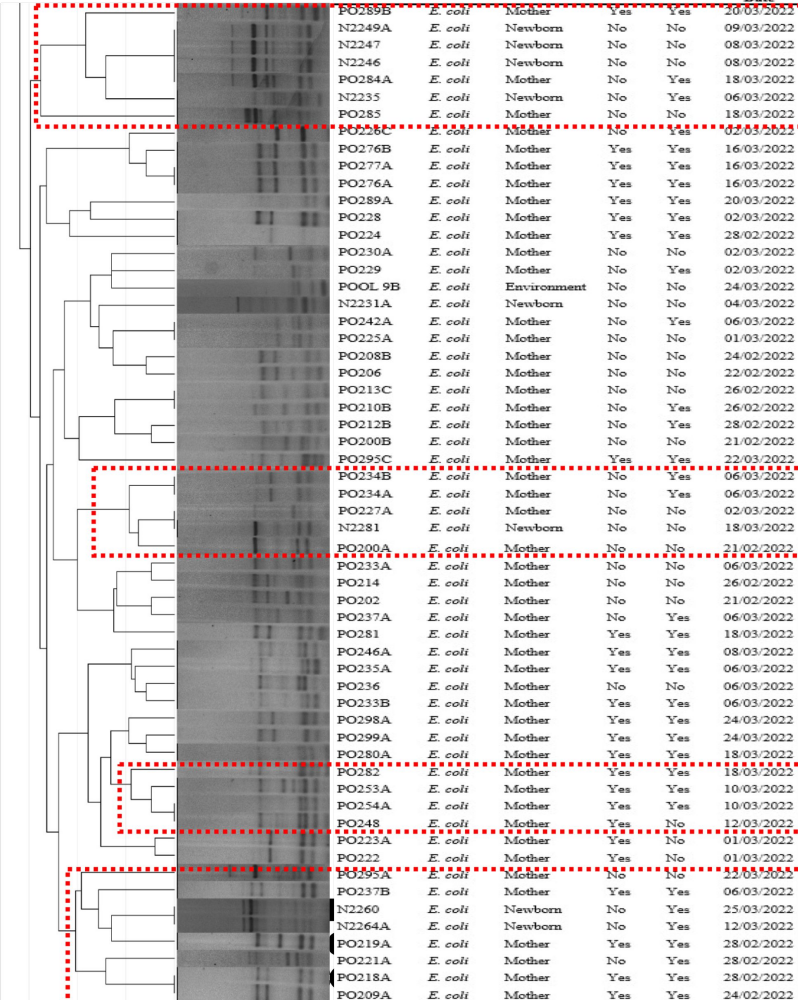
Neonates

- **ESBL-PE: 17%** (59/347)
- *E. coli* (63%) & *K. pneumoniae* (36%)
- **ESBL-NF: 9.8%** (34/347)

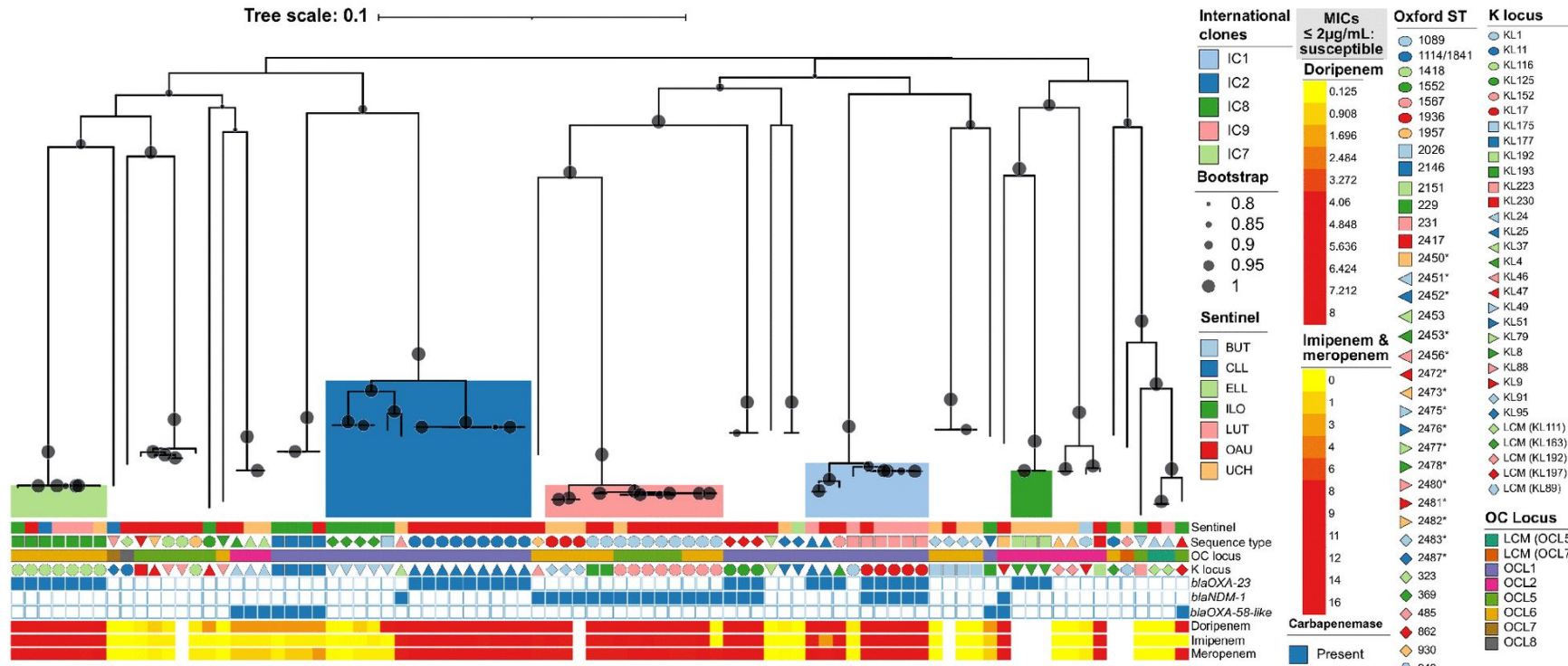
Horizontal transmission important transmission routes of ESBL-PE in maternity wards that should not be neglected

Njeuna, Founou et al., Unpublished data

Establishing Capacity for Pathogen Genomics Addis Ababa, 2022



Acinetobacter ICU Outbreak



Investigating hospital outbreaks of
resistant bacteria in Nigeria

Erkison Ewomazino Odih et al. 2023. mSphere

Doi: <https://doi.org/10.1128/msphere.00098-23>

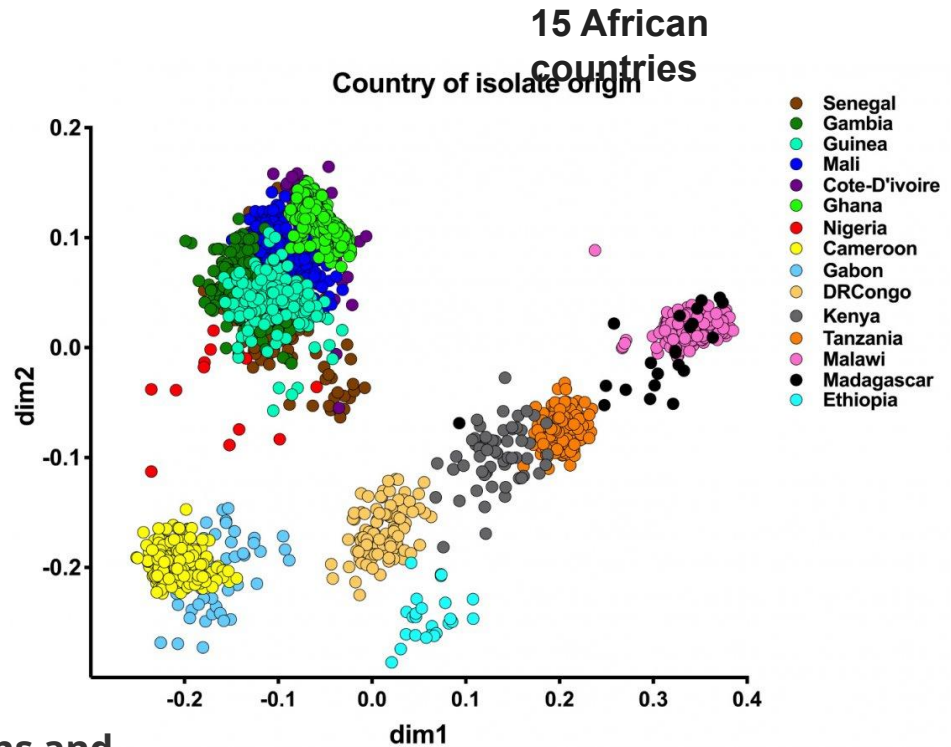
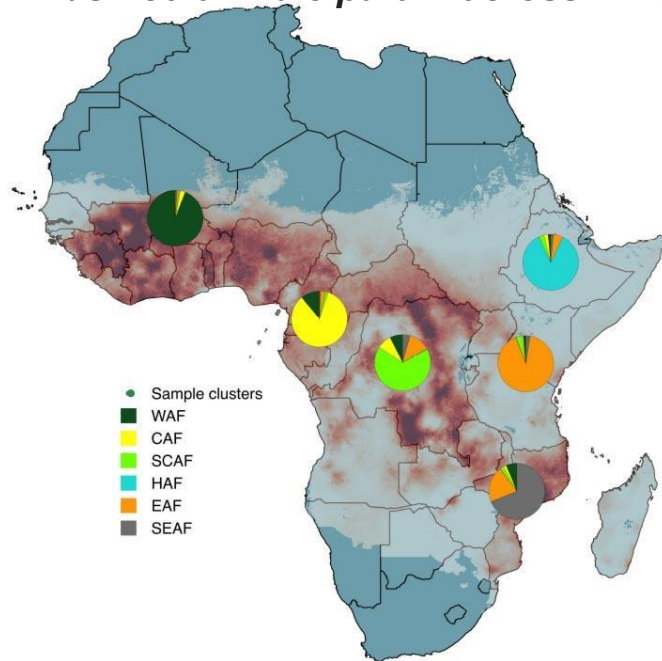
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Malaria — Tracking drug resistance in Africa

Understanding genomic variation and population structure of *Plasmodium falciparum* across Africa



Drug resistance is emerging in different locations and moving by various routes across Africa

Alfred Amambua-Ngwa et al., 2019.
Science. doi: 10.1126/science.aav5427.



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