



## 21st International Congress for Tropical Medicine and Malaria (ICTMM 2024)

Conjointly with:

60th MSPTM Annual Scientific Conference (MSPTM 2024)

10th ASEAN Congress of Tropical Medicine and Parasitology (10th ACTMP)

19th - 23rd September 2024 | Borneo Convention Center Kuching (BCKK), Sarawak, Malaysia

Theme: Global Responses and Interdisciplinary Research Towards Eliminating Tropical Diseases

# *P. falciparum* genomic intelligence in Mozambique for decision making

**Alfredo Mayor (on behalf of the GenMoz team)**

Centro de Investigação em Saúde de Manhiça (CISM), Mozambique

ISGlobal, Barcelona, Spain



Organised by:



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cism  
centro de  
investigação  
em saúde de  
manhica



ISGlobal



malaria  
consortium  
disease control, better health



University of California  
San Francisco



ID

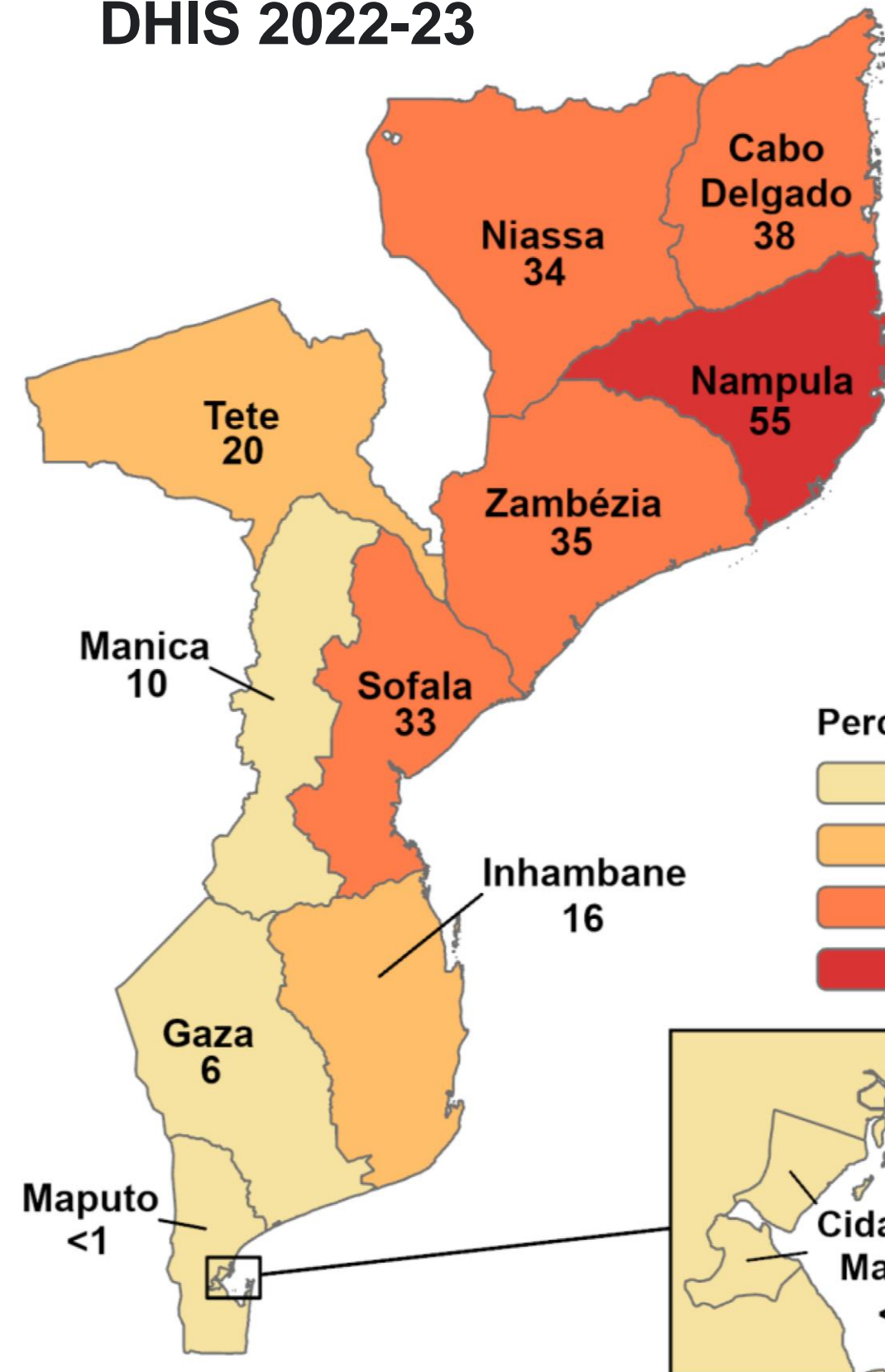
BILL &  
MELINDA  
GATES  
foundation



# Mozambique

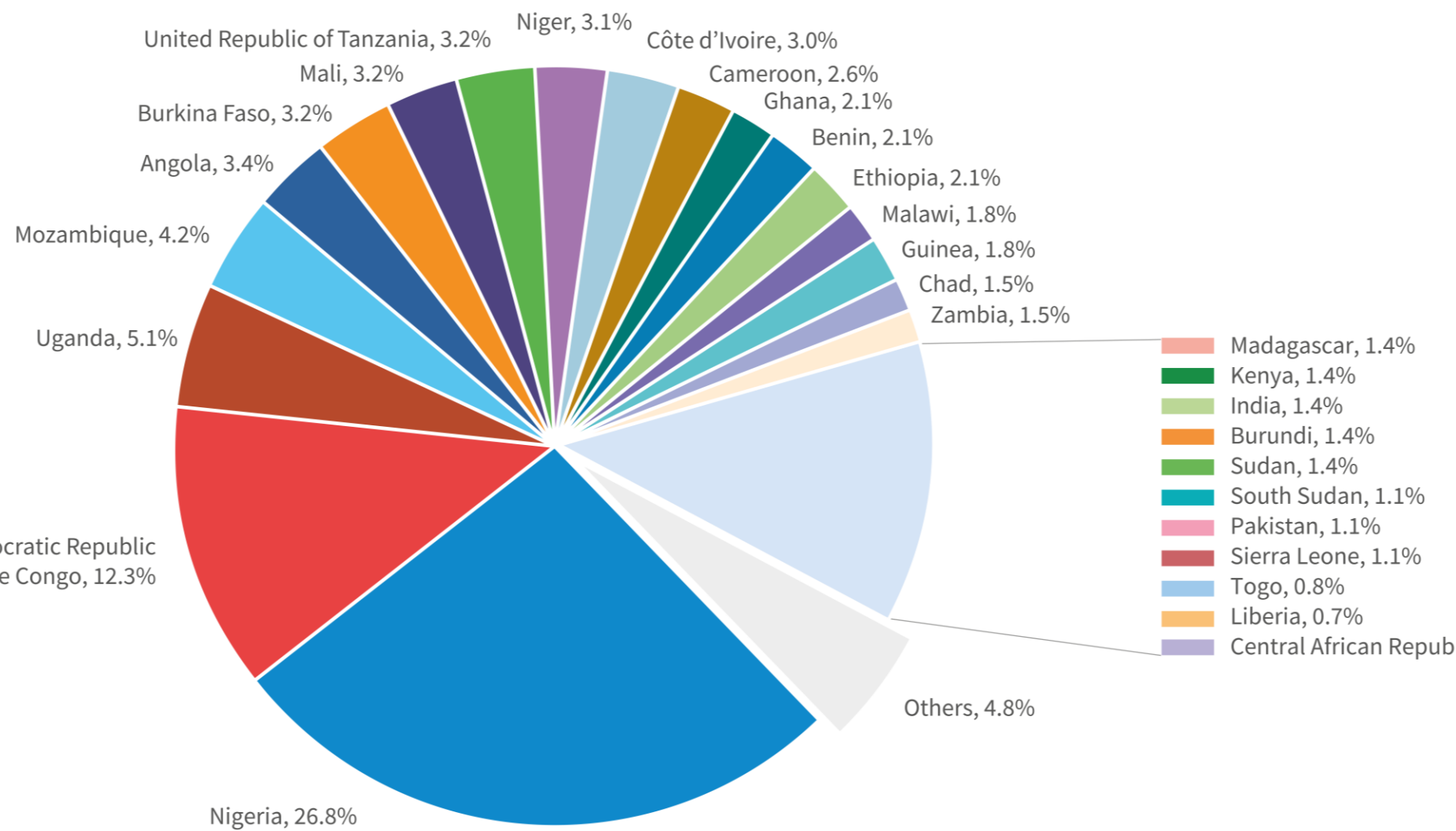
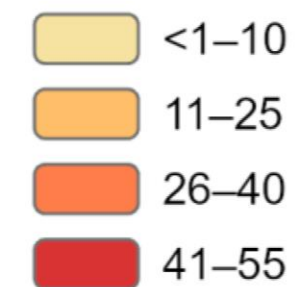


DHIS 2022-23



3 regions  
11 provinces  
154 districts  
~1600 health facilities

Percentagem (%)



World malaria report 2023

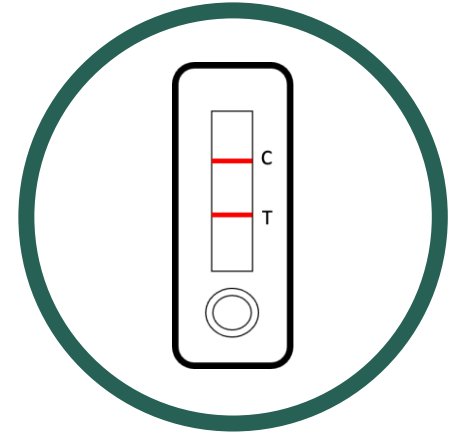
799.380 km<sup>2</sup>

32,08 millones (2021)

# Malaria Genomic Use Cases



**Antimalarial resistance**



**Diagnostic resistance**



**Targeted responses**



**Stratification and impact**



# GenMoz: *P. falciparum* genomic intelligence in Mozambique

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MELINDA  
GATES  
foundation

1

Build NGS capacities at CISM

2

Generate data (sampling & sequence)

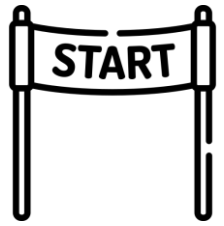
3

Promote MMS data use

# CISM & MoH/NMCP



# GenMoz... in six steps



May 2021

**2**

**Field activities**

January 2022

**4**

**MiSeq at CISM**

May 2022

**6**

**Dashboard**

October 2023

**1**

**Ethical Approval**

October 2021

**3**

**Training**

February 2022

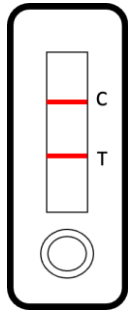
**5**

**First NGS run**

June 2022

**GenMoz2**

1



# HRP2 RDTs?

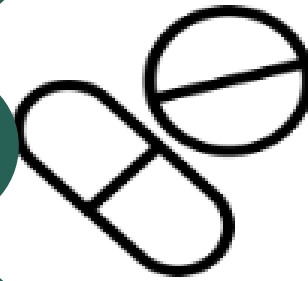


**Clemente da Silva**



**Dario Tembisse**

2



# ACTs?



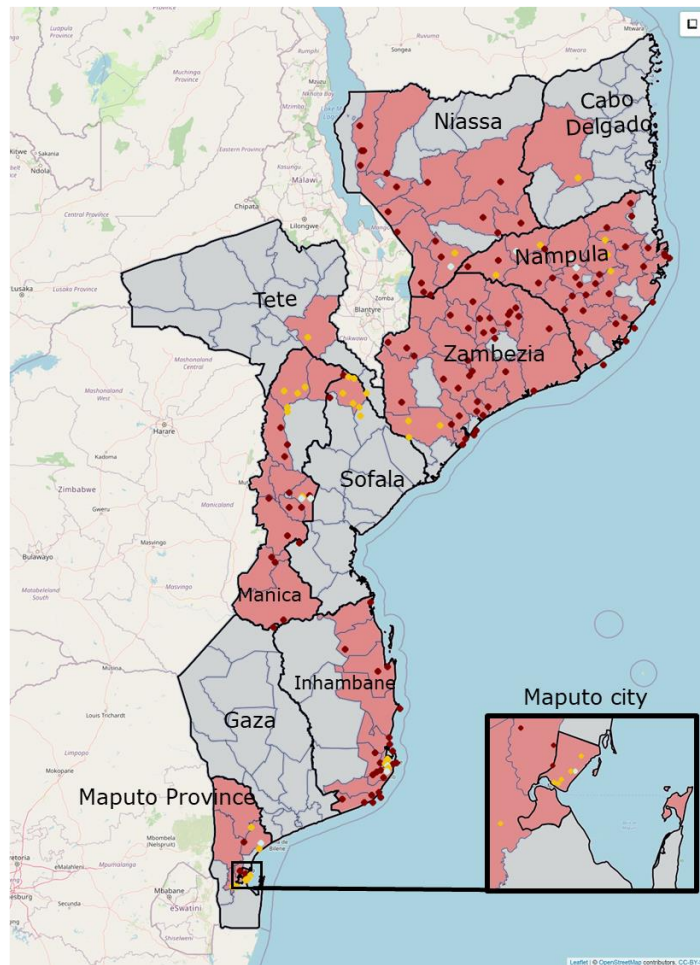
**Simone Boene**



**Eduard Rovira**



**Andres Aranda**



## *hrp2/3* deletions

**0.1%**  
(4/2617)

## *Kelch13*

**0%**  
(n=1110)

## Piperaquine

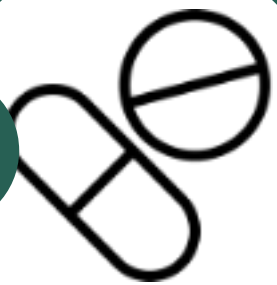
**0%**  
multiple *pfpm2*  
gene copies

## Day 28 efficacy (2022)

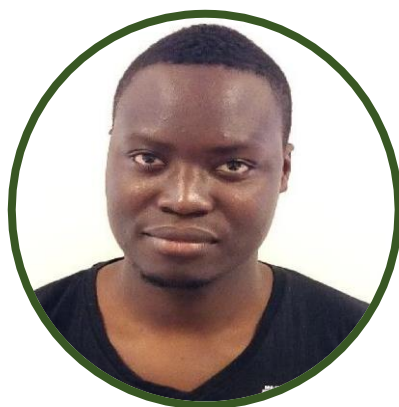
- AL: 98.2%** (97.6-99.8)
- ASAQ: 100%** (97.8-100)
- DHAp: 100%** (95.8-100)
- ASPY: 97.3%** (90.6-99.7)



3



# SP chemoprevention?



**Simone Boene**



**Gloria Matambisso**

*dhfr/dhps* quintuple mutants

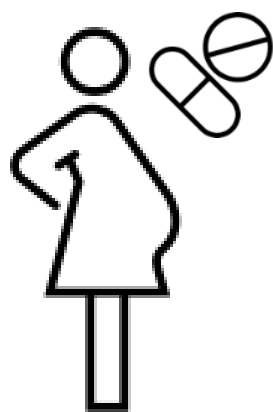
**89%**

(1021/1153)

*dhps-581*

**0.9%**

(10/1153)



3 x IPTp-SP

Higher clearance rate of *Pf* infections

Lower risk of low birth weight

4



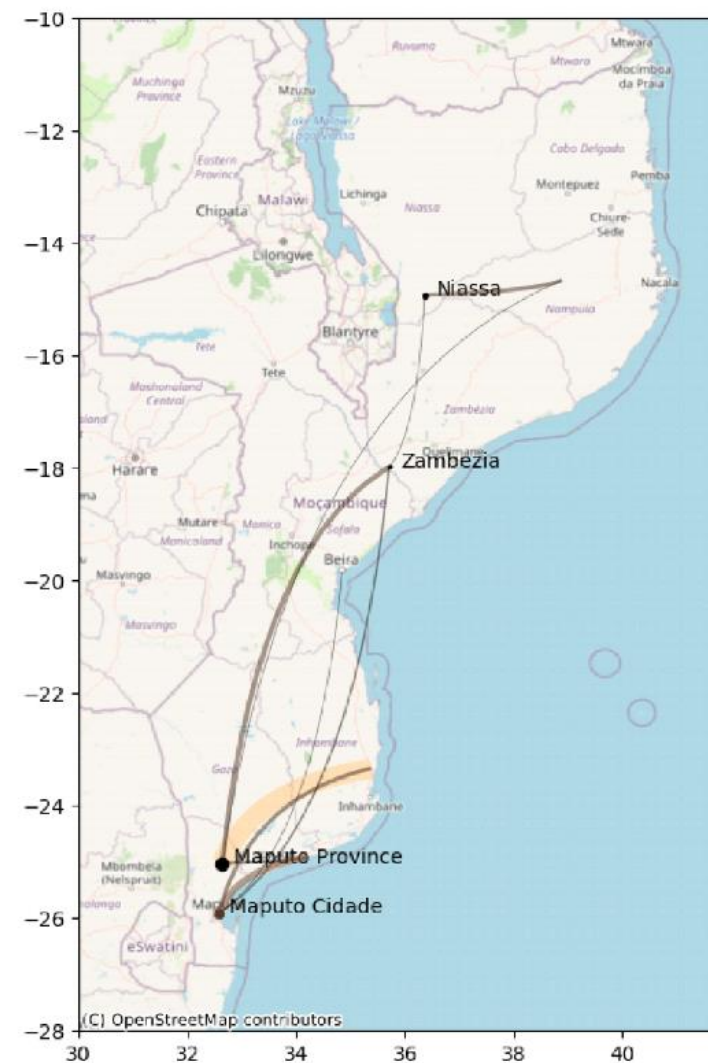
# Malaria sources?



**Arlindo Chidimatembue**



**Arnau Pujol**



Imported Cases

**26%**

in Matutaine  
(Most of them from Inhambane)

5



# ANC surveillance?



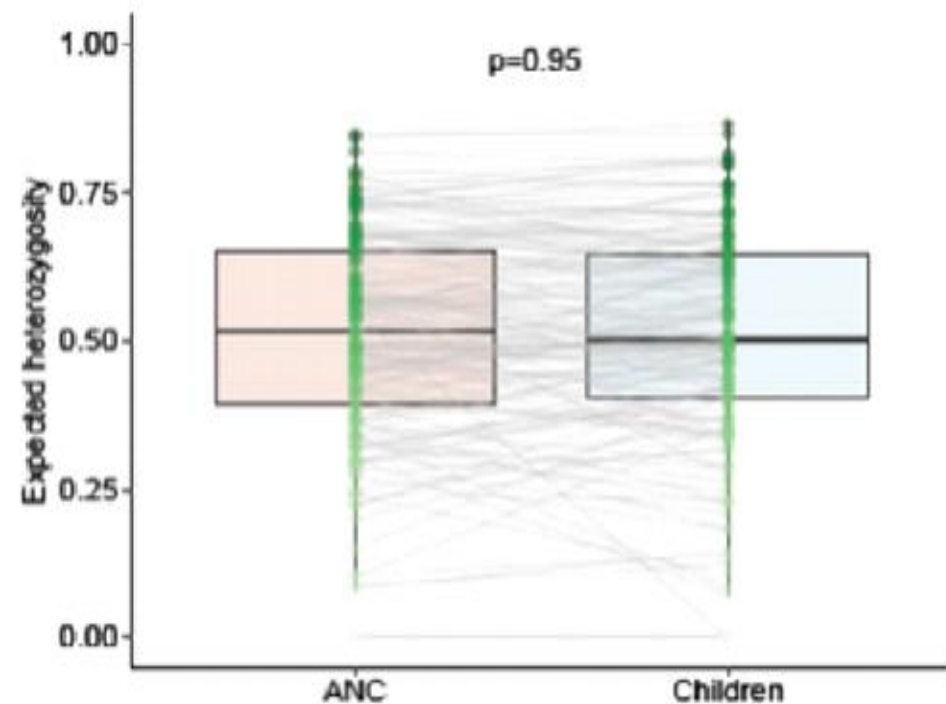
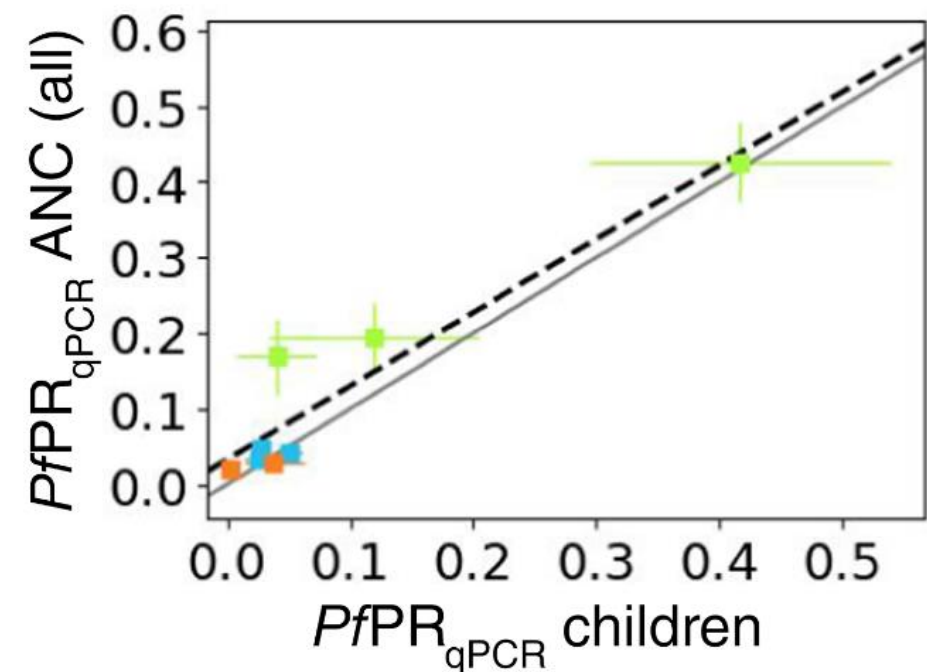
**Gloria**  
Matambisso



**Nanna**  
Brokhattingen

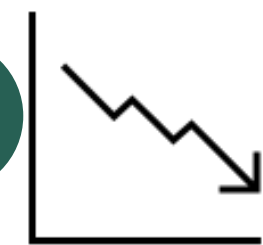


**Arnau**  
Pujol



Pregnant women reflect malaria trends & parasite genetic structure in the community

6



# Interventions?



**Simone**  
Boene



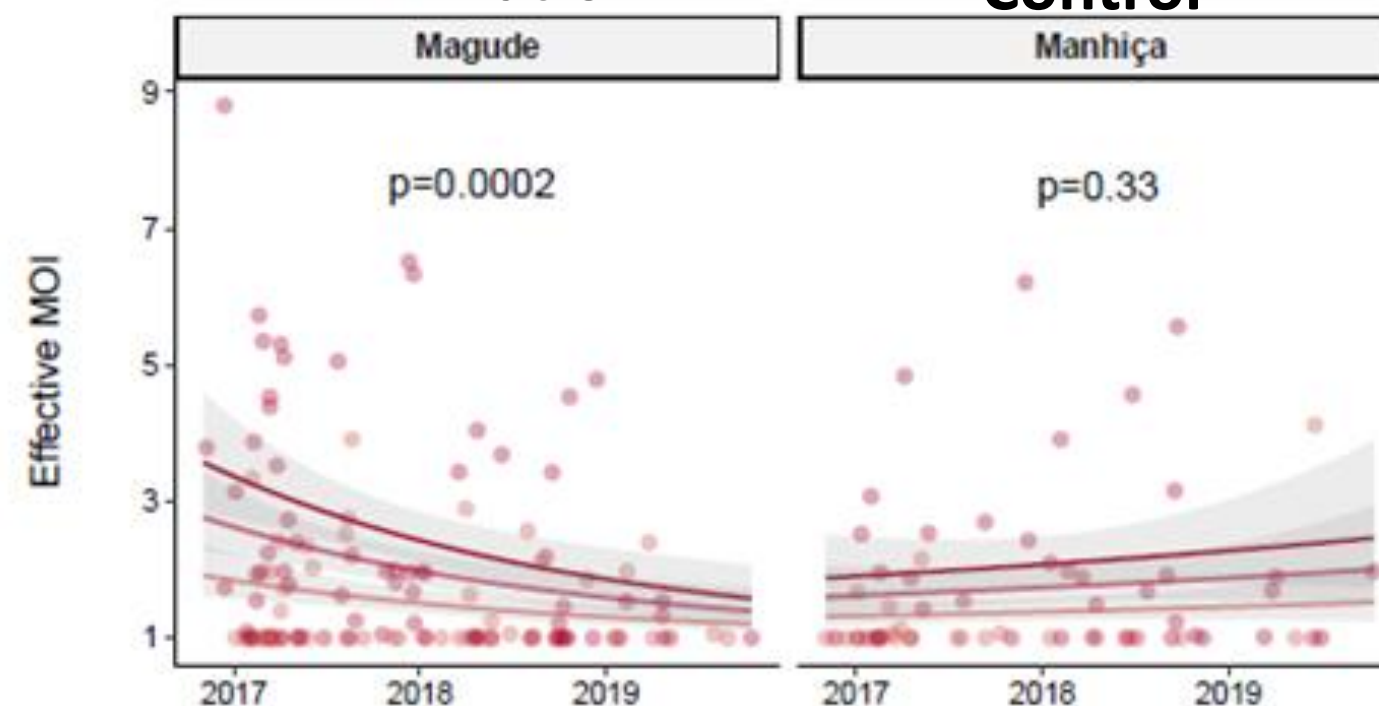
**Gloria**  
Matambisso



**Nanna**  
Brokhattingen

## Elimination

## Control



Genetic complexity reflects transmission declines during an elimination program

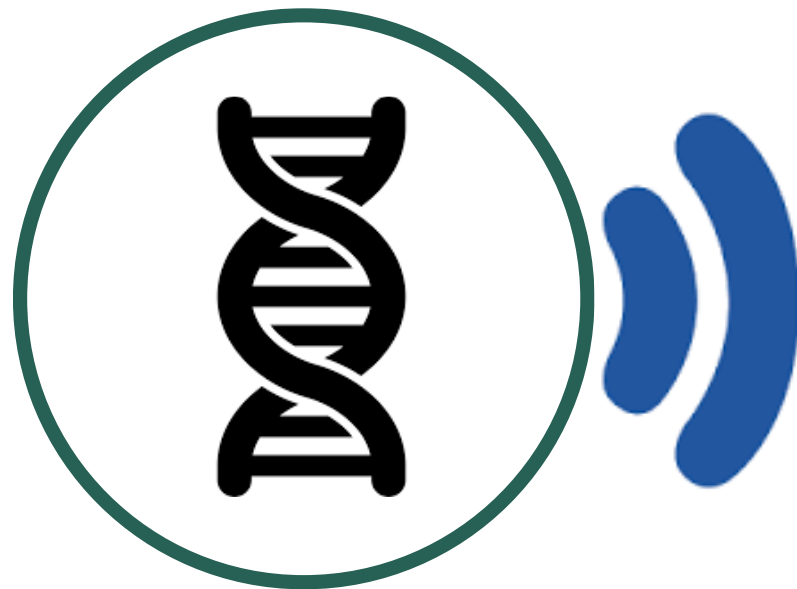
# Data use & Impact



Baltazar Candrinho

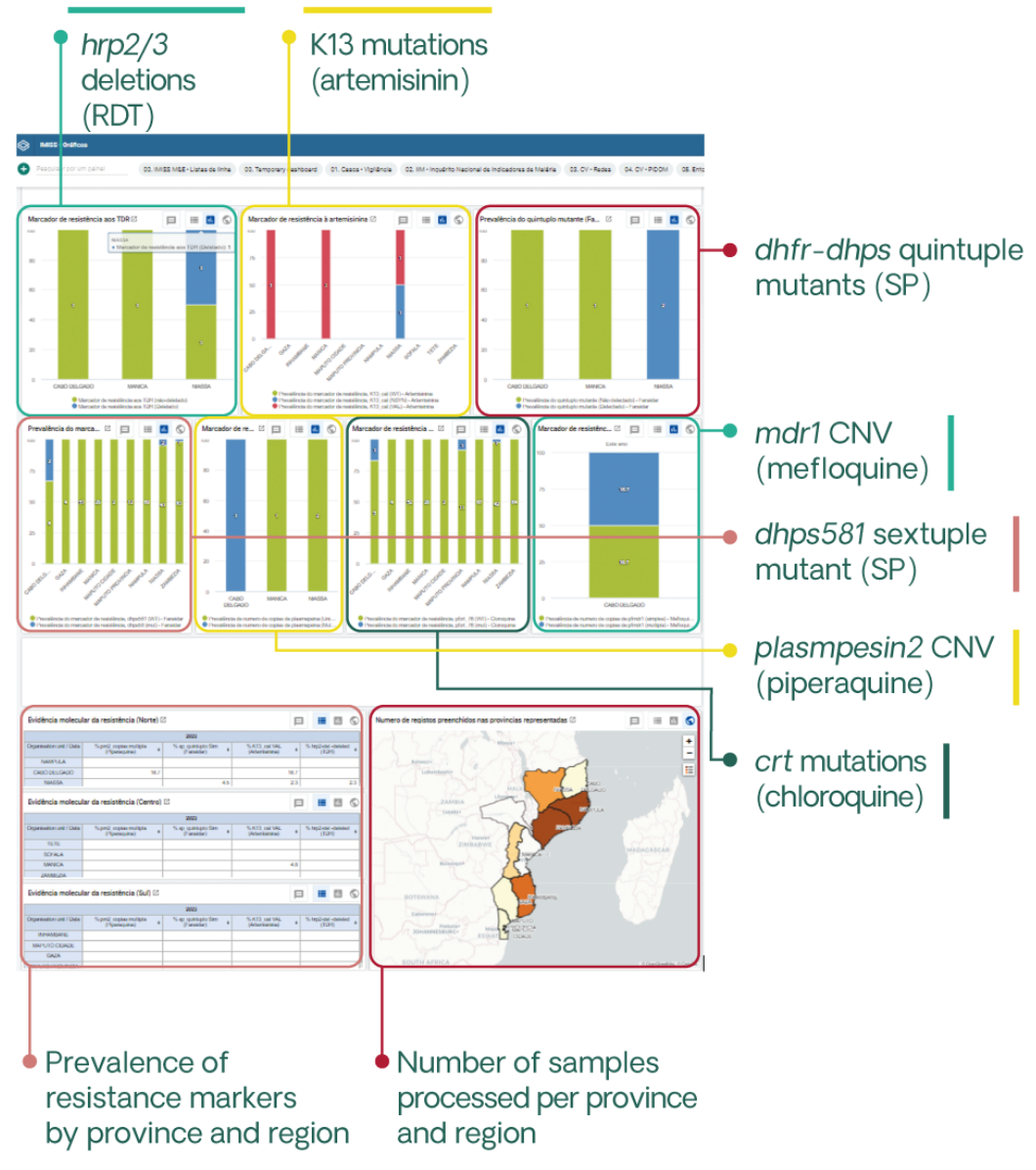


- NMCP Annual meeting (2021-2024)
- Strategic planning NMCP 2023-30
- Lusophone Workshop
- UEM PhD Program



Bernadete Rafael

## Genetic dashboard



## Trimestral brochure

### Vigilância genómica da malária em Moçambique

#### Geração de dados genómicos no laboratório

O presente boletim descreve a implementação do Sequenciamento de Nova-geração (NGS, do inglês Next Generation Sequencing) para a vigilância genómica do *Plasmodium falciparum* em Moçambique, estabelecida no Laboratório de Biologia Molecular do Centro de Investigação em Saúde de Manhiça (CISM).

As plataformas de NGS permitem a geração rápida de dados sequenciando grandes quantidades de DNA em paralelo mediante o uso de diversas tecnologias<sup>1</sup>. O princípio básico da técnica consiste na fragmentação do DNA seguida da sequenciação múltipla de cada base do genoma do parasita (completo ou parcial), o que permite maior acurácia dos dados gerados e uma visão sobre a variação do DNA<sup>1</sup>.

#### Processo de geração de dados genómicos

O processo de geração de dados genéticos no laboratório consiste em quatro etapas principais (Fig. 1): (i) recepção de amostras no laboratório, (ii) extração de DNA, quantificação da parasitemia e biobanco, (iii) preparação de bibliotecas e sequenciação no MiSeq da Illumina e (iv) análise de dados.

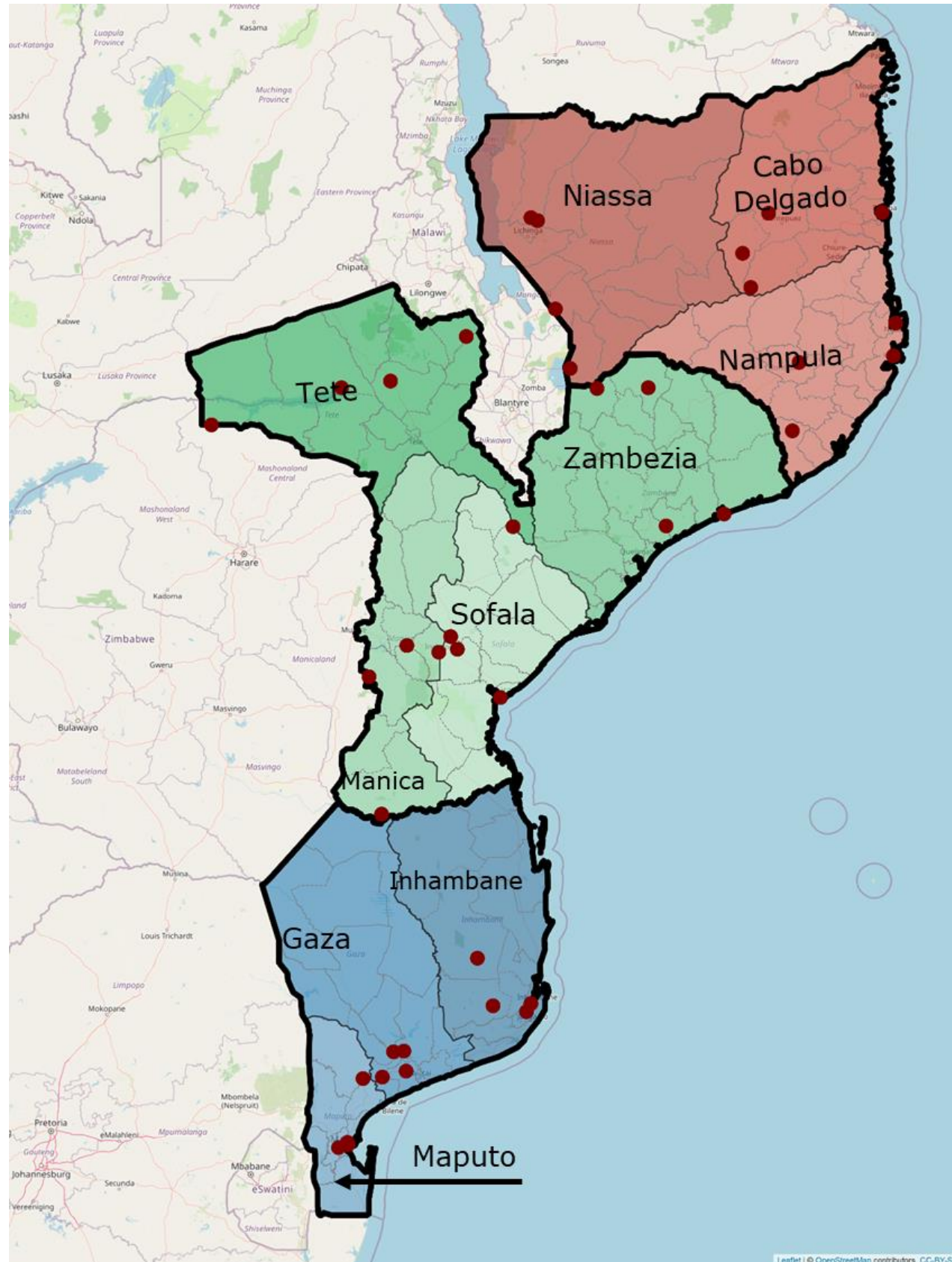
A análise inicial fornece informação acerca da qualidade da corrida e das amostras processadas. Porque o NGS produz grandes quantidades de sequências, na concepção da sua infraestrutura laboratorial também deve ser considerada tanto a capacidade de armazenamento de dados assim como um computador de alto rendimento para análise bioinformática de dados massivos.

Figura 1: Processo de geração de dados genómicos



<sup>1</sup> Prosk, R. (2016). Next Generation Sequencing-General Information about the Technology, Possibilities, and Limitations. Clinical Applications for Next-Generation Sequencing. 1-18. doi:10.1016/978-0-12-801739-5.00001-11

# Summary and next steps



- Malaria diagnostics and treatment in Mozambique is not compromised by antimalarial/diagnostic resistance
- High prevalence of markers of SP resistance, although chemoprevention still provides a benefit
- One every 4 cases in elimination settings in the south are probably imported: source control?
- MMS for NMPC New malaria strategic plan 2023-2030
  - Vaccine (R21)
  - PMC/SMC
  - ACT diversification

# Team

