



# GOVERNMENT OF SIERRA LEONE

## Ministry of Health

## National Malaria Control Program

**Concept of Sub National Tailoring of Malaria Intervention**

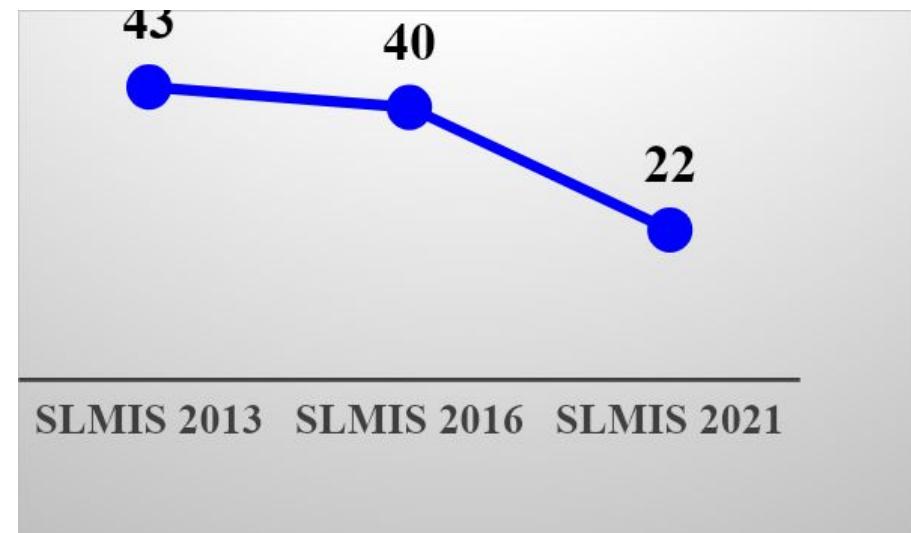
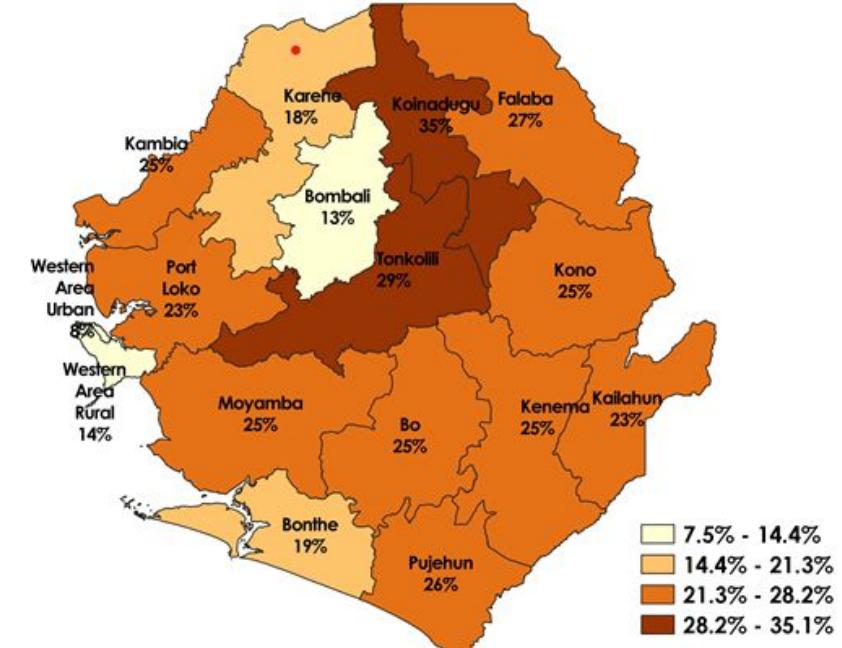
**Dr Abdul Mac Falama  
Program Manager**

# **Presentation Outline**

- **Background:** Malaria burden and National strategic plan  
Intervention mixes
- **Epistratification Process**
- **Intervention Targetting**
- **Final Intervention Mixes**
- **Conclusion**
- **Acknowledgement**

# Malaria Burden in Sierra Leone

- Malaria is endemic with stable and perennial transmission throughout Sierra Leone. .
- The entire population of Sierra Leone is at risk of malaria.
- Children under five, pregnant women and elderly are especially vulnerable
- Contributes to a considerable proportion of hospital consultations
- It is the leading cause of death and illness and is responsible for close to an estimated 20% of child mortality.
- In 2024 HMIS data, **2,028,106** reported malaria cases (presumed and confirmed)



*Percent of children 6-59 months who had a positive malaria microscopy test.* Source: SLMIS 2013, 2016 2021

# Malaria National Strategic Plan – Intervention Mix

**Vision** - is to accelerate the implementation of Malaria Control Interventions toward a Malaria-free Sierra Leone

**Goal** - by the end of 2025, to contribute significantly to the improvement of the well-being of the population by reducing the malaria burden

By end of 2025, reduce malaria mortality rates by at least 75% compared to 2015

By end of 2025, reduce malaria case incidence by at least 75% compared to 2015

By 2025, 90% of the population practice at least 3 recommended malaria prevention and control behaviours

To strengthen malaria surveillance and use of malaria information to improve decision making for programme performance

Ensure timely and adequate supply of quality-assured malaria commodities to public and private health facilities at all levels by 2025

By 2025, strengthen and maintain capacity for program management, coordination and partnership to achieve malaria programme performance at all levels

Improve mobilization of resources and maximize the efficient use of available resource for greater public health impact by 2025

## Integrated Vector Management

- ITN Distribution (mass and routine)
- IRS
- Insecticide Resistance Monitoring

## Case Management

- Prompt diagnosis with mRDTs, Microscopy
- Treatment-AL, AA, Inj AS; Pre Referral RAMS
- Therapeutic Efficacy Studies
- ICCM -CHWs

## Prevention/Chemoprophylaxis

- IPTp
- IPTi (now PMC)
- Malaria Vaccine

## Training & Operational Research

### Surveillance Monitoring and Evaluation

- Routine HMIS reporting
- Household surveys
- Supportive supervision

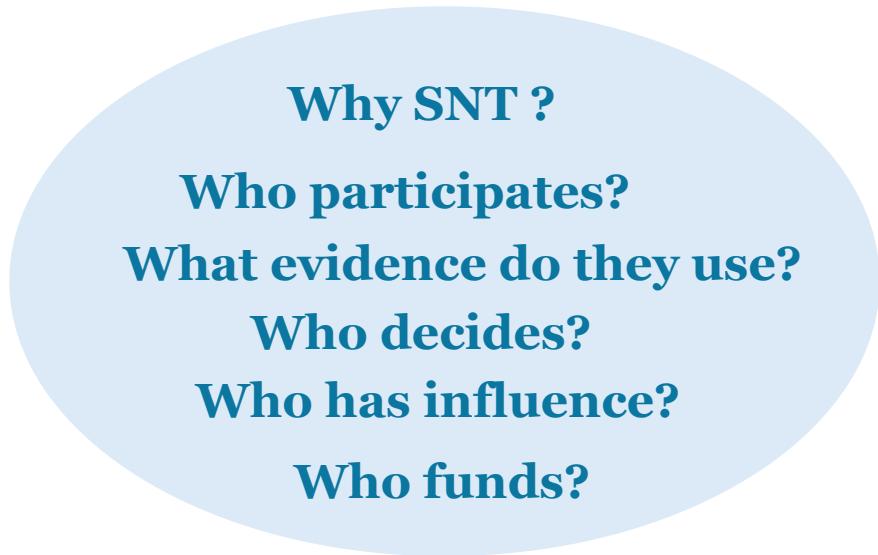
### IEC/SBCC

- Advocacy, Information,
- Education and communication

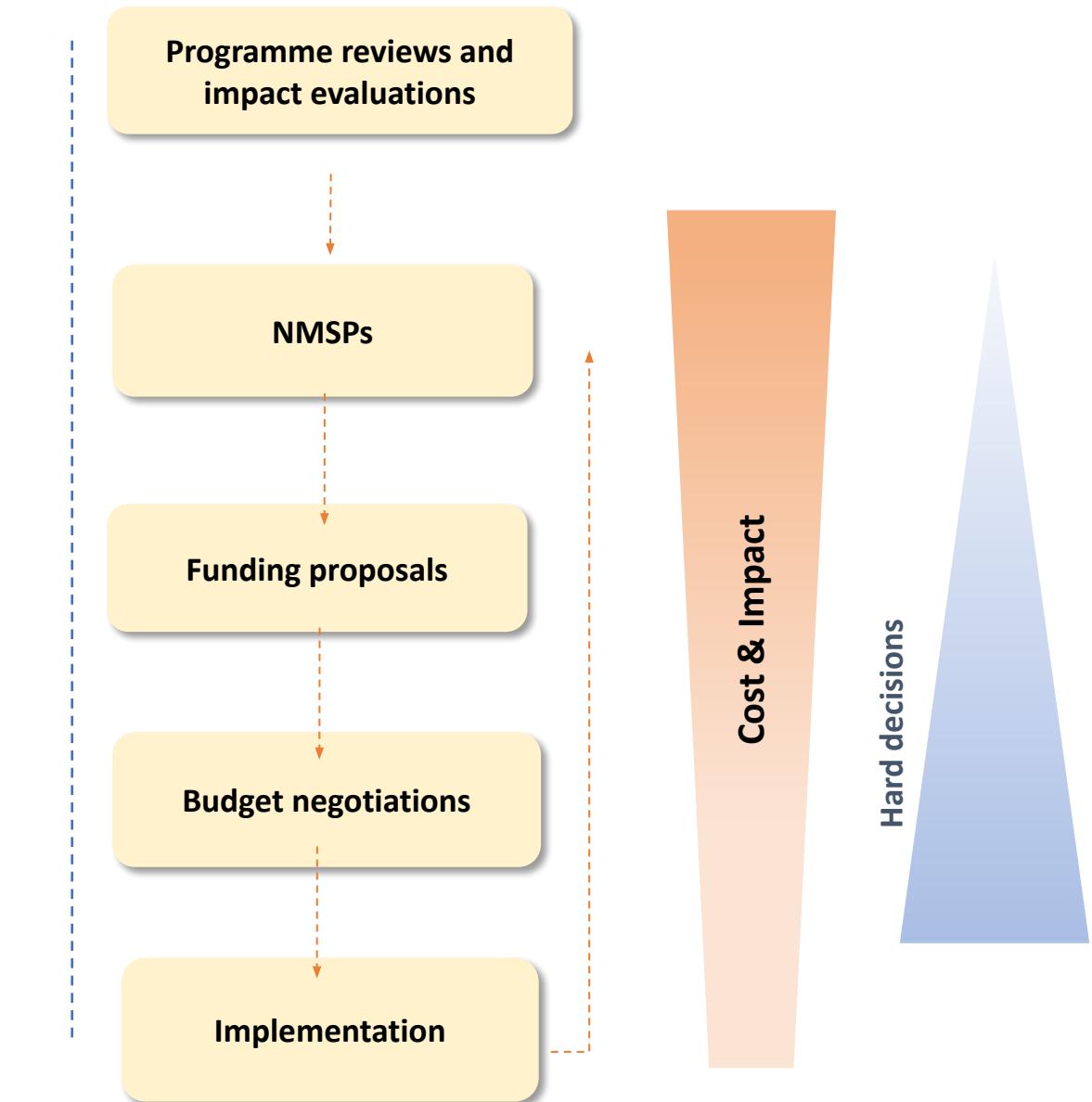
### Program Management

- Roll Back Malaria partnership
- Human Resource Development
- Procurement and Supply management

# EPISTRATIFICATION & SUB-NATIONAL TAILORING



- **heterogeneity:** Malaria risk varies widely based on local environmental, social, and epidemiological factors
- **Limited resources-** tailoring interventions helps avoid a one-size-fits-all approach, focusing efforts where they will have the greatest effect, ultimately saving more lives and moving countries closer to malaria elimination goals



# Epi-stratification and subnational tailoring process

## SUB NATIONAL TAILORING

Where do we intervene?

Which interventions (or strategies) should we use?

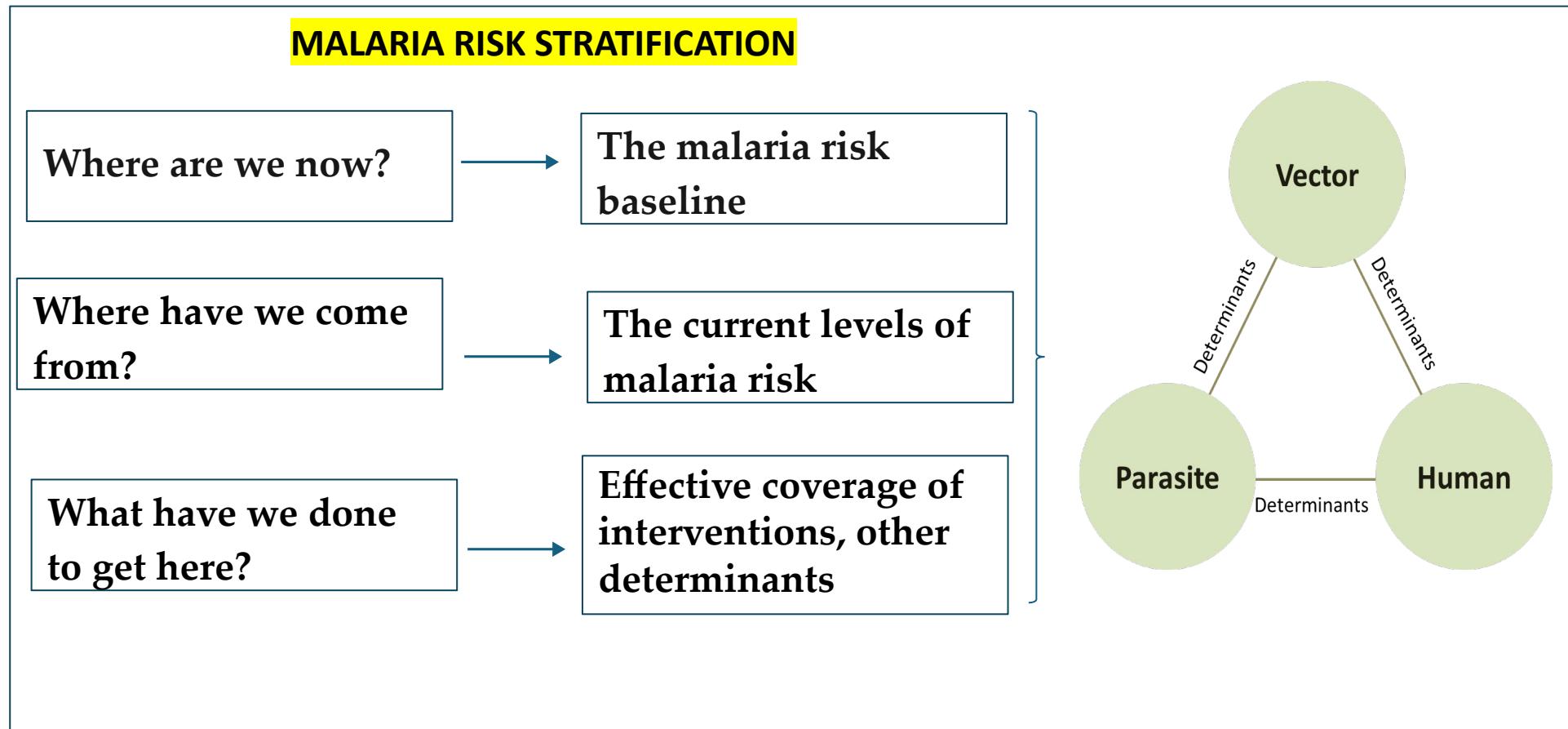
Which interventions can we afford and how do we prioritize?

How and when do we deliver interventions?

How do we monitor their impact?

**SUB NATIONAL TAILORING**-The use of local data and contextual information to determine the appropriate mixes of interventions and strategies, for a given area, for optimum impact on transmission and burden of disease

**MALARIA RISK STRATIFICATION**-The process of geographically classifying malaria risk and its determinants into meaningful categories to inform the targeting of intervention under consideration



# SNT implementation

## SNT team members

**NMCP:** Dr. Abdul Mac Falama,  
Musa Sillah-Kanu

**MoH**  
WHO Country Office  
WHO AFRO  
WHO GMP

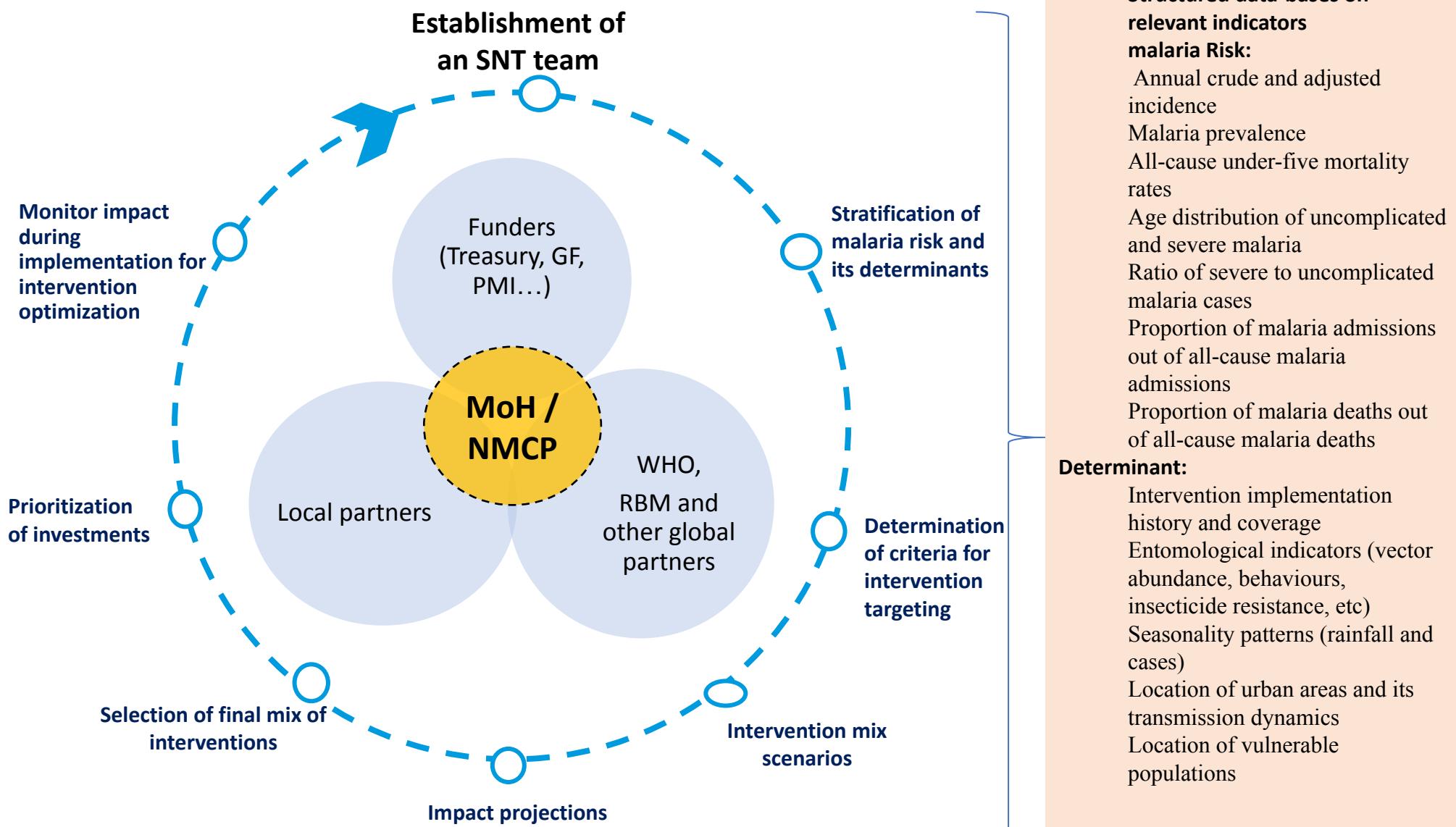
**CHAI**  
**Imperial College**

**PMI evolve**

Statistics Sierra Leone

**COHMAS-USL**

Multiply project  
Statistics Sierra Leone

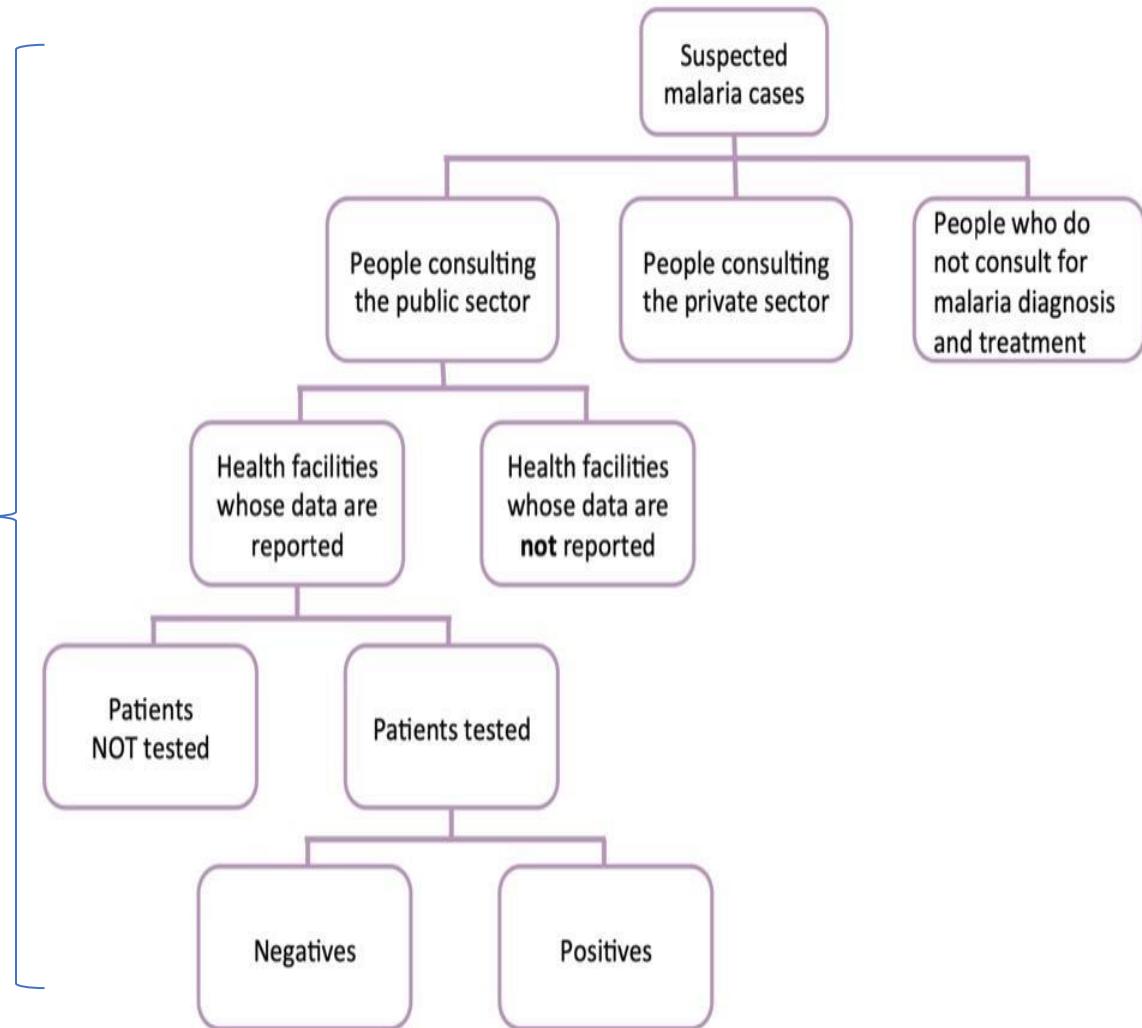


# Malaria Case Report

## Malaria Matrixes

- Suspected Malaria case
- Tested Malaria cases
- Confirmed Malaria Case
- Presumed Malaria Case
- Reported Malaria Case
- Crude Incidence
- Prevalence

Routine  
Surveillance  
System  
HMIS



## Categories of transmission

### Intensity-Annual Parasite Incidence (API)

**Very low transmission:** API of < 100 cases per 1000 population



**Low transmission:** API of 100–250 cases per 1000 population



**Moderate transmission:** API of 250–450 cases per 1000 population



**High transmission:** (API) of about 450 or more cases per 1000 population



# Malaria risk – Annual incidence

*Public sector*

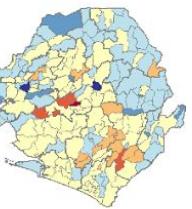
*Private sector & Community*

| Level of adjustment                 | Crude | Testing rates  | + Reporting rates   | + Care seeking behaviour (public / private not seeking care)  | Strengths of the approach  |
|-------------------------------------|-------|--|---|---|--|
| Numerator calculations              | C     | $N1 = C + [P * (C/T)]$<br><br>N1 = Adjusted cases<br>P= Presumed cases<br>T = Tested<br><br>C/T=Test positivity ratio  | $N2 = (N1/R)$<br><br>N2 = Adjusted cases<br>R= Reporting rates  | $N3 = N2 + \left( \frac{N2 \times CS_{Pr}}{CS_{Pu}} \right) + \left( \frac{N2 \times CS_n}{CS_{Pu}} \right)$<br><br>% of children with fever in the previous 2 weeks who sought care from the public ( $CS_{Pu}$ ) or private ( $CS_{Pr}$ ) sector, or who did not seek care ( $CS_n$ )   | <ul style="list-style-type: none"> <li>✓ A stepwise adjustment approach that allows for specific adjustments to be made according to the country context</li> <li>✓ Targets the main factors affecting routine data (e.g. completeness and testing rates)</li> <li>✓ Distinguishes between public, private and non seeking behaviour</li> <li>✓ Equations are parameterized using district-level data (or provincial-level estimates from surveys).</li> <li>✓ Equations are simple and can be easily modified according to country demands</li> </ul> |
| Assumptions & Points of uncertainty |       | Assumes TPR among P is similar to the TPR among the tested<br><br>P can be i) directly reported; ii) calculated as Suspected-Tested; or iii) calculated as Treated – Confirmed.<br><br>Depending on quality and reporting guidelines, P may be unreliable. | Assumes that data not reported follows a similar distribution to the data reported<br><br>Seasonal variations in reporting rates may not be captured if annual reporting rates are used. District-level reporting rates do not provide information on the absolute number and type of HFs that should be reporting through time | Assumes that i) the TPR among febrile children who sought care from the private sector or who did not seek care are the same as the TPR observed in the public sector; ii) care seeking behavior patterns in adults resemble those in children.<br><br>Care seeking behavior only available for <5 year-olds in surveys.<br>Survey estimates are powered to the regional level and further interpolations at the district level carry uncertainties of their own. |  |

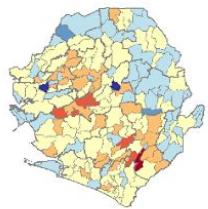
# Summary of incidence estimation- Crude and adjusted Incidences

Crude

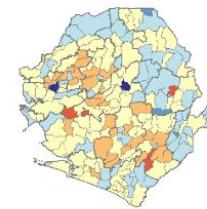
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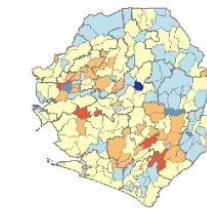
2016



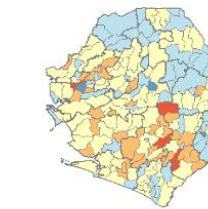
2017



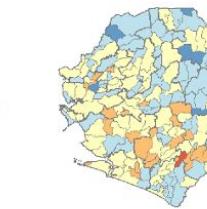
2018



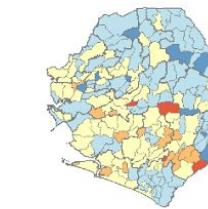
2019



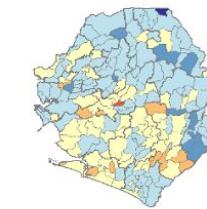
2020



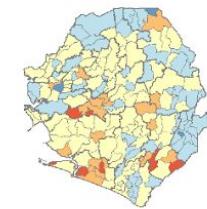
2021



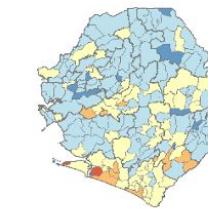
2022



2023

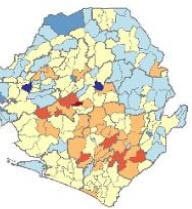


2024

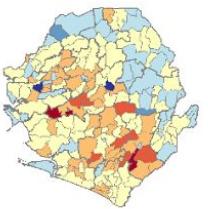


Adjusted for testing

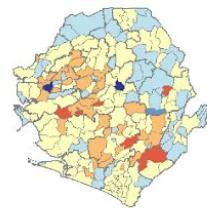
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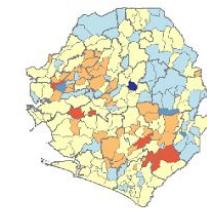
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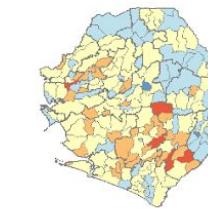
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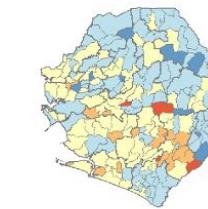
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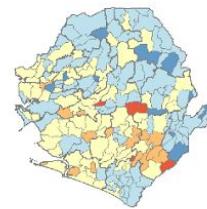
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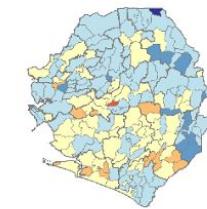
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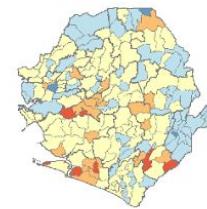
2021



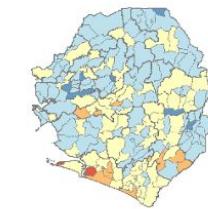
2022



2023

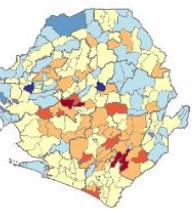


2024

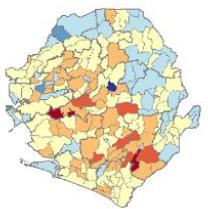


Adjusted for testing and reporting rates (only active HFs expected to report)

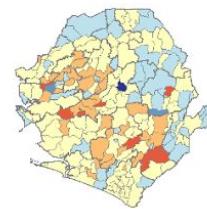
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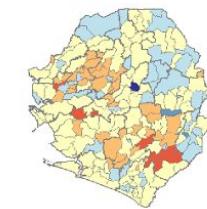
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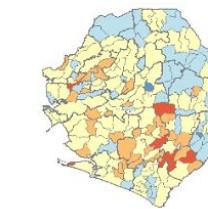
2017



2018

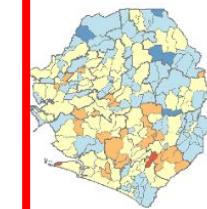


2019

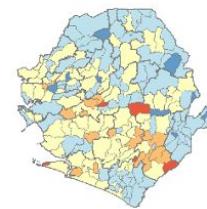


Option 1

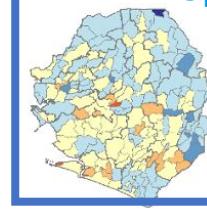
2020



2021

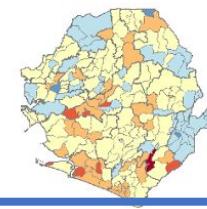


2022

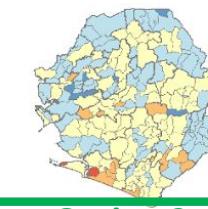


Option 2

2023



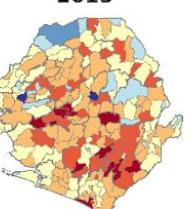
2024



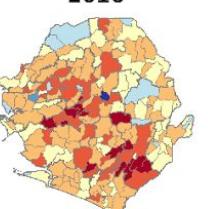
Option 3

Adjusted for testing, reporting, and care seeking rates rates

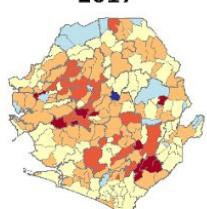
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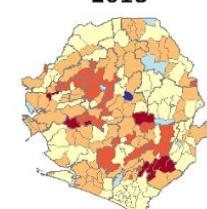
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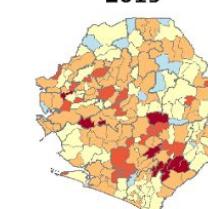
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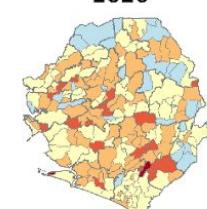
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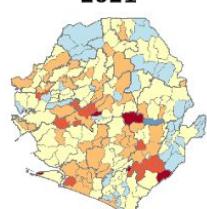
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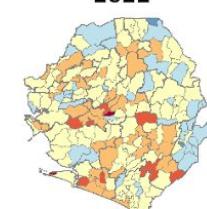
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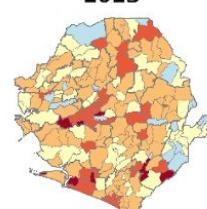
2021



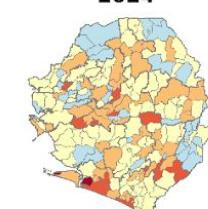
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2023

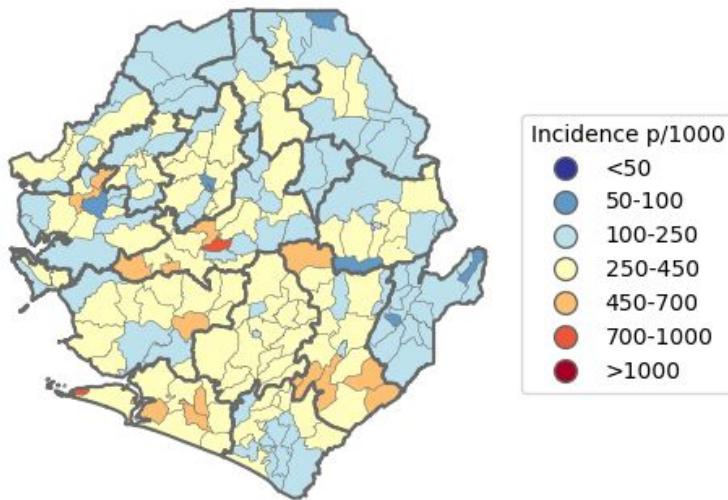


2024

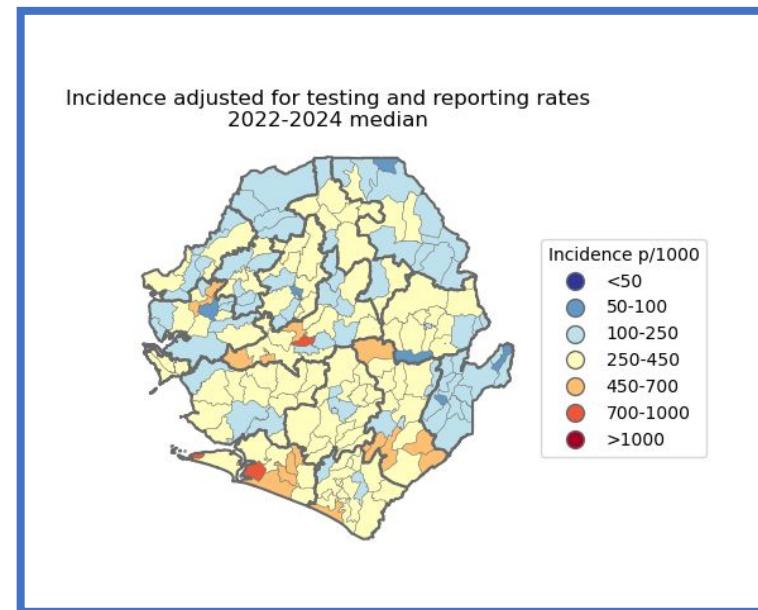


# Incidence Estimation for Decision Making

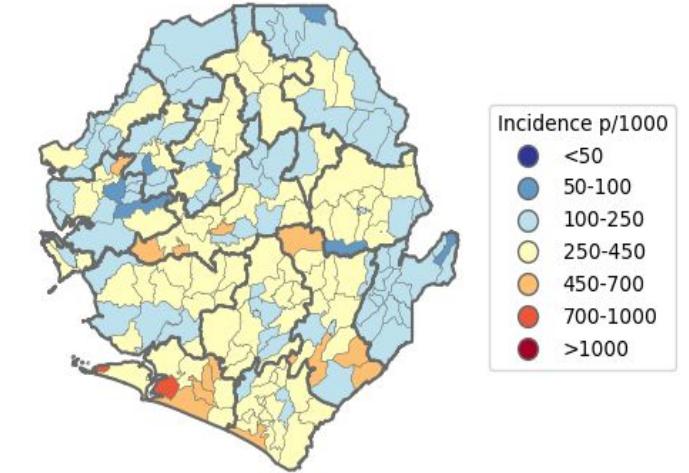
Incidence adjusted for testing and reporting rates  
2020-2024 median



Incidence adjusted for testing and reporting rates  
2022-2024 median



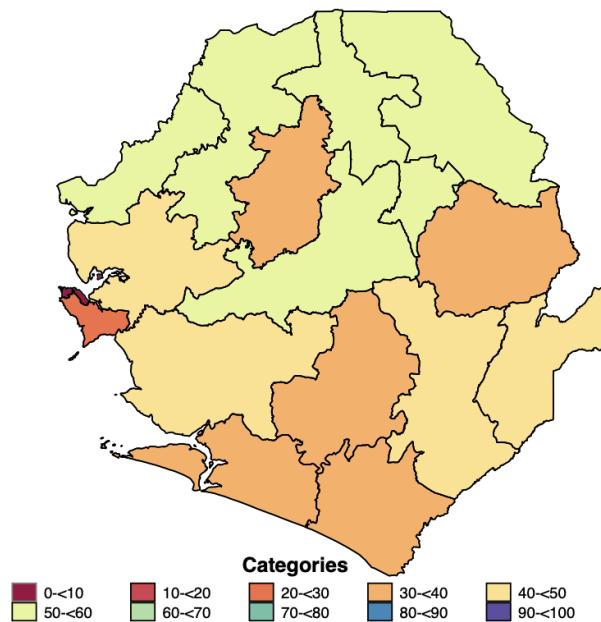
Incidence adjusted for testing and reporting rates  
2024



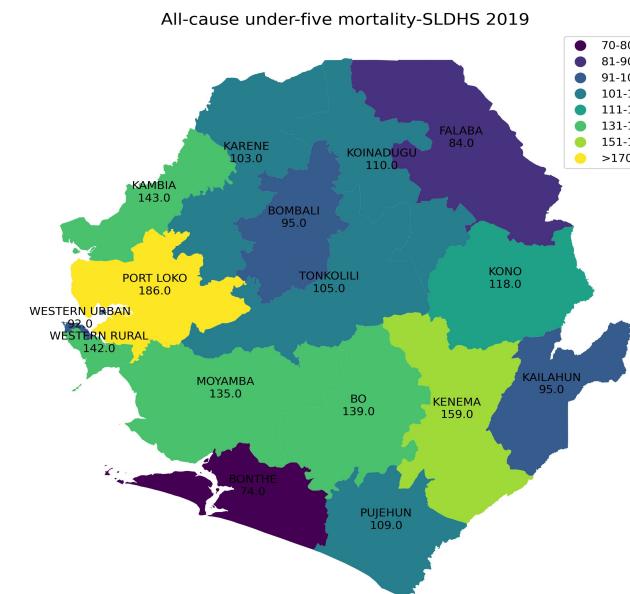
NMCP selected median from  
2022-2024 to be used for  
decision-making

# Malaria Prevalence Estimation (SLMIS-2021)

Prevalence of malaria according to the RDTs (6 - 59 mnths) - 2021  
Sierra Leone

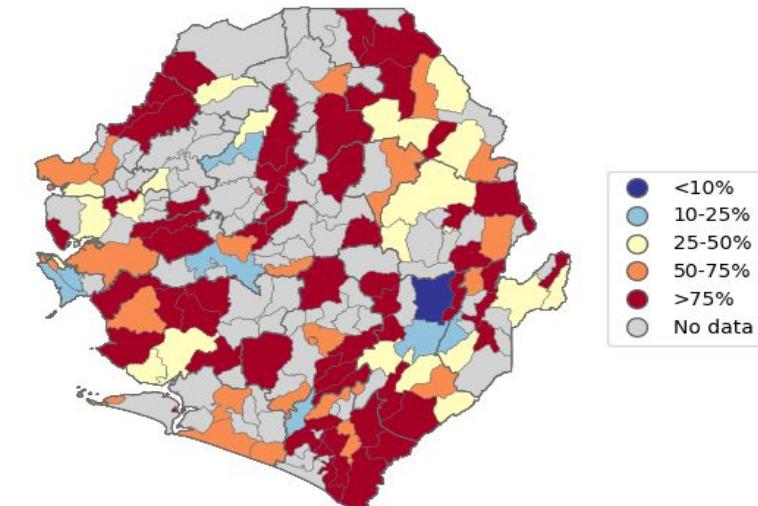


# All-cause under-five mortality (DHS-2019)



# Under Five Malaria deaths

2023  
Proportion of deaths, children u5



## Malaria Determinants stratification

### Intervention implementation history and coverage

- Case management: Access to care, CHWs, and HF quality of care
- Routine and mass ITN distributions targeting, coverage, usage and durability
- IRS coverage
- IPTP coverage
- IPTi (PMC) coverage
- Malaria vaccine scale-up plans

- Entomological indicators (vector abundance, behaviour, insecticide resistance, etc)
- Seasonality patterns (rainfall and cases)
- Location of vulnerable populations
- Location of urban areas and its transmission dynamics

# Determination of criteria for intervention targeting

- Intervention targeting criteria are set based on malaria risks, determinants and contextual factors.

## Intervention for targeting

### Integrated Vector Management

- Mass ITN
- SBD ITN
- Routine ITN-EPI & ANC
- IRS
- Insecticide Resistance Monitoring

### Case Management

- Prompt diagnosis with mRDTs, Microscopy
- Treatment-AL, AA, Inj AS; Pre Referral RAMS
- ICCM -CHWs

### Prevention/Chemoprophylaxis

- IPTp
- PMC (IPTi)
- SMC
- Malaria Vaccine

# EPISTRATIFICATION & SNT PROCESS

## Malaria Stratification Process

Operational unit  
district , unit of analysis  
Chiefdoms

### Targeting criteria

Transmission setting, age group, seasonality, efficacy, access to care, hard to reach,

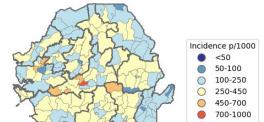
-  LLIN, IRS,
-  IPTp, IPTi/ PMC,
-  CM (Public HF,  
iCCM, private)

\*For each intervention, WHO has:  

- Recommendation
- Good practice statement
- Country adaptation
- Additional considerations for targeting

**Stratification:** Hierarchical ordering of one or multiple layers of information to make decisions

Incidence adjusted for testing and reporting rates  
2022-2024 median



Prevalence of malaria according to the RDTs (6-59 months) - 2021  
Sierra Leone



### Indicators

Epidemiology

Incidence  
Prevalenc

e

Mortality

Entomology

Climate &  
Seasonalit  
y

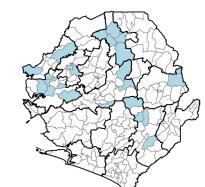
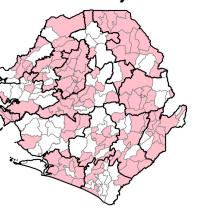
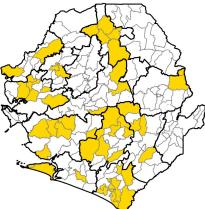
Urbanization

Access to care  
ITN Acess  
Insecticide  
resistance

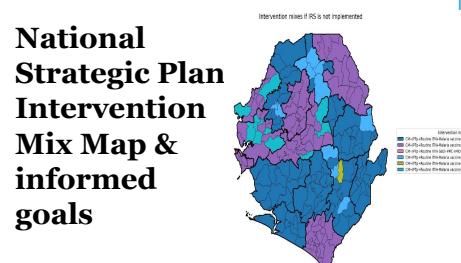
### Intervention targeting:

For each intervention, identify the operational unit that meets criteria + operational feasibility

**IRS**  
**Mass ITN, if IRS**



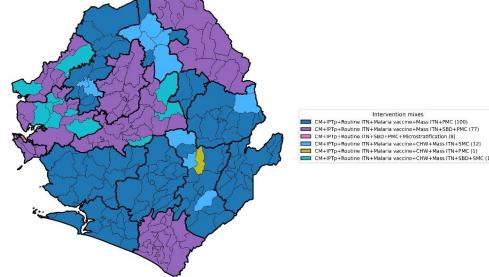
**Mathematical models** used to evaluate different scenarios and quantify impact of sub-nationally tailored intervention mixes



## Sub National Tailoring of Interventions

### Resource allocation and prioritization

Intervention mixes if IRS is not implemented



Funded  
Operationa  
l plan

Mathematical models may be used for resource prioritization through cost-effectiveness analysis of different scenarios

**Prioritization:** Prioritizing intervention to achieve maximum impact within a resource envelope

#### Implications:

- Reduces coverage targets,
- Higher efficiency threshold
- Equity

IRS

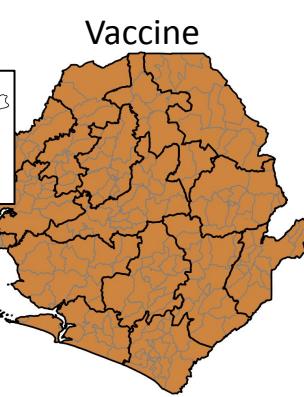
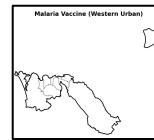
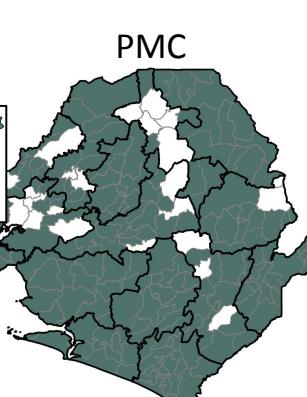
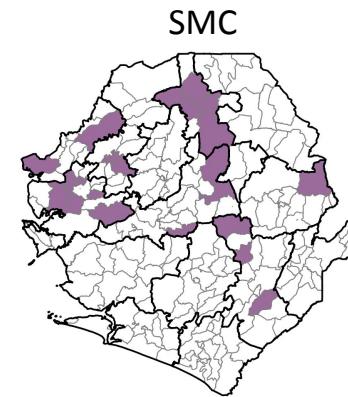
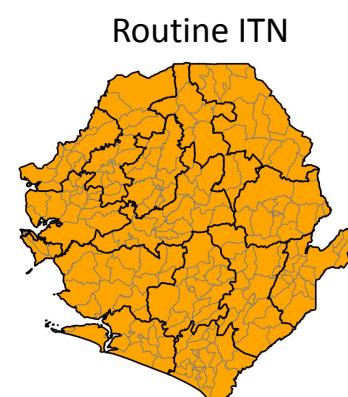
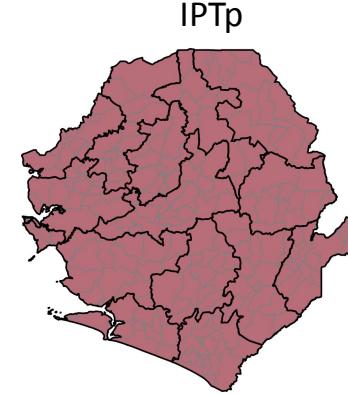
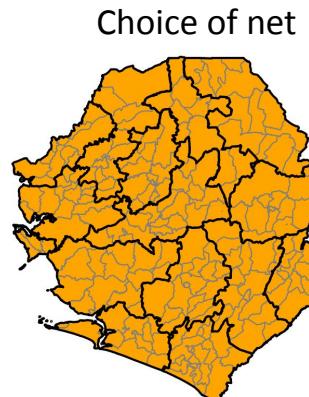
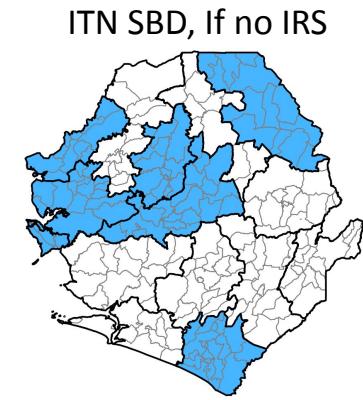
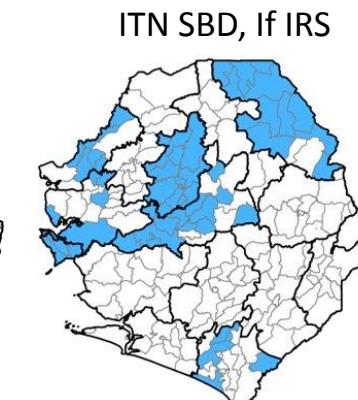
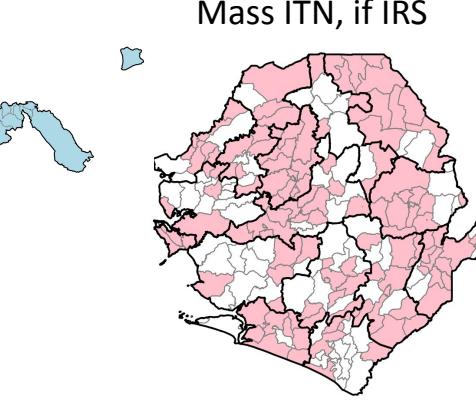
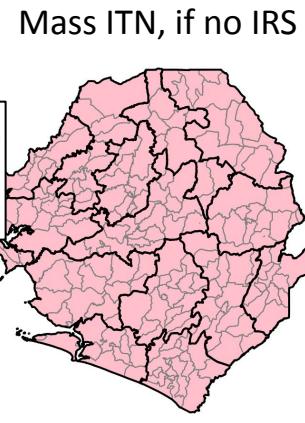
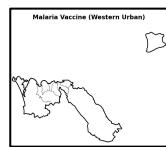
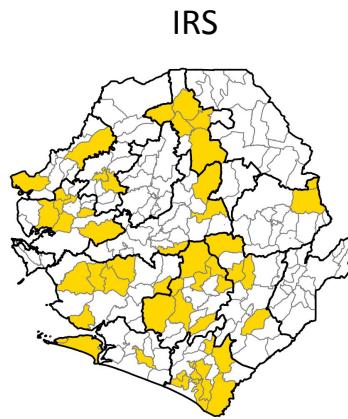
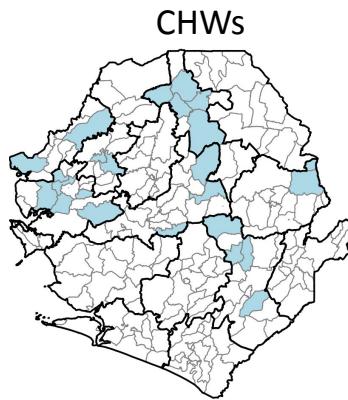
ITN

Costing of national strategic plan

How much it costs  
\$\$\$

How much there is available  
\$

# Intervention plan



■ CHW (23)  
■ No CHW (185)

■ IRS (48)  
■ No IRS (160)

■ >1 (208)

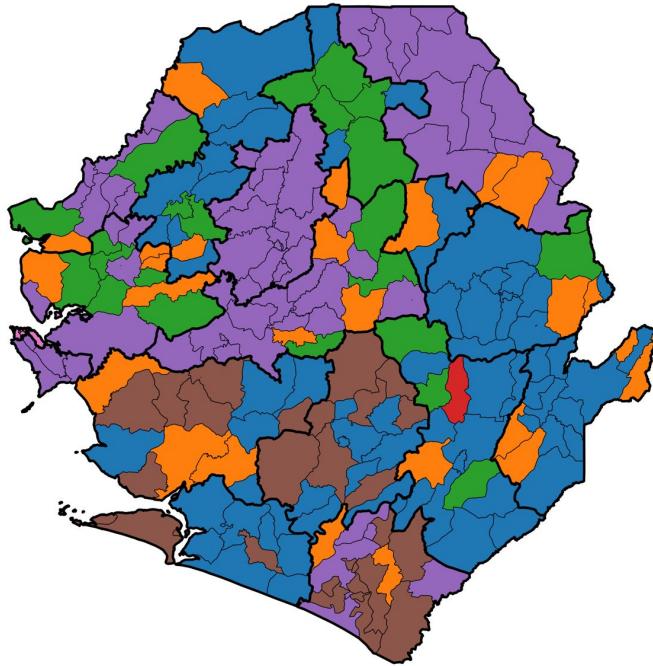
■ SMC (22)  
■ No SMC (186)

■ PMC (186)  
■ No PMC (22)

■ Malaria vaccine (200)  
■ Microstratification (8)

# Selection of final mix of interventions

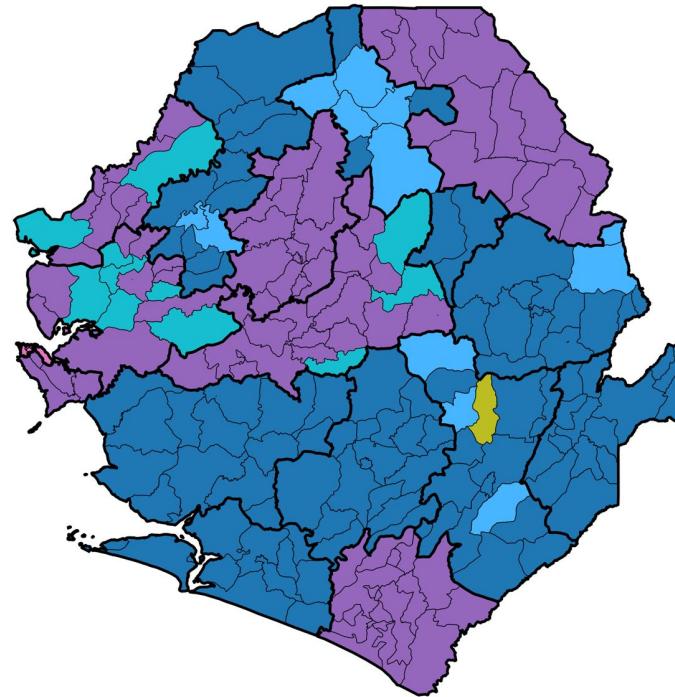
Intervention mixes if IRS is implemented



Intervention mixes

- CM+IPTp+Routine ITN+Malaria vaccine+Mass ITN+PMC (69)
- CM+IPTp+Routine ITN+Malaria vaccine+PMC (26)
- CM+IPTp+Routine ITN+Malaria vaccine+CHW+SMC+IRS (22)
- CM+IPTp+Routine ITN+Malaria vaccine+CHW+PMC+IRS (1)
- CM+IPTp+Routine ITN+Malaria vaccine+Mass ITN+SBD+PMC (57)
- CM+IPTp+Routine ITN+Malaria vaccine+PMC+IRS (25)
- CM+IPTp+Routine ITN+SBD+PMC+Microstratification (8)

Intervention mixes if IRS is not implemented



Intervention mixes

- CM+IPTp+Routine ITN+Malaria vaccine+Mass ITN+PMC (100)
- CM+IPTp+Routine ITN+Malaria vaccine+Mass ITN+SBD+PMC (77)
- CM+IPTp+Routine ITN+SBD+PMC+Microstratification (8)
- CM+IPTp+Routine ITN+Malaria vaccine+CHW+Mass ITN+SMC (12)
- CM+IPTp+Routine ITN+Malaria vaccine+CHW+Mass ITN+PMC (1)
- CM+IPTp+Routine ITN+Malaria vaccine+CHW+Mass ITN+SBD+SMC (10)

# Conclusion

- The National Malaria Control Programme (NMCP) has increasingly embraced data-driven approaches to enhance the effectiveness of malaria interventions.
- This shift towards utilizing data for decision-making involves several key processes and strategies:
- Stratification of Malaria Risks and Determinants: This involves collecting and analysis of epidemiological, entomological, environmental and intervention data
- With a comprehensive understanding of malaria risks and determinants, we develop criteria to target intervention strategies.
- Among these strategies include malaria case management at HF and community (CHWs), deploying choice of insecticide-treated nets, mode of ITN distribution and conducting indoor residual spraying, specific preventive interventions (IPTp, PMC, SMC & MV)
- Next step- consensus building on final intervention mixes, NSP and operationalize NSP



MOH

# Thank you



BILL & MELINDA  
GATES foundation

The RBM Partnership logo, featuring a blue circle with the letters "RBM" in white, followed by the text "Partnership To End Malaria" in blue.

AMMnet  
NW un

AHADI