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2. Acceleration needed for Malaria elimination:
   2.1 Active/reactive case detection
   2.2 pregnant women screening
   2.3 asymptomatic and pregnant women rapid testing
   2.4 surveillance
3. Accelerating Malaria Elimination in low transmission zones
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DISEASE BURDEN

Malaria remains one of the most infectious and deadliest diseases with 247 million cases and 619,000 deaths globally each year.

247 million estimated malaria cases across 85 endemic countries were reported in 2021.

619,000 estimated malaria deaths occurred in 2021, representing a case fatality rate of 0.3%.

The steady decrease of malaria related deaths since the 2000’s has stopped and, in some settings, even reversed.

DISEASE BURDEN

95% of Malaria cases occur in low-and-middle income African countries and cause the continent an estimated annual loss of $12 billion in GDP.

Malaria presents a major clinical and economic burden for some of the world’s lowest income countries.

- Nigeria: 64m cases\(^1\) (+17% since 2016)
- D.R. Congo: 29m cases\(^1\) (+26% since 2016)
- Uganda: 13m cases\(^1\) (+19% since 2016)
- Mozambique: 10m cases\(^1\) (+8% since 2016)

1.3% reduction in annual GDP growth in Africa because of malaria burden\(^2\)

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DISEASE BURDEN

A major ramp-up of global efforts is required to achieve the 2030 malaria milestones defined by the WHO in 2016

Current achievements toward malaria elimination remain significantly behind the targets set by WHO

Baseline | Previous Target | Today | Future WHO targets
---|---|---|---
2016 | 2020 | 2021 | 2025 | 2030
Reduction of malaria case incidence\(^1\),\(^a\) | 40% | 3% | 75% | 90%
Reduction of malaria mortality\(^1\),\(^a\) | 40% | 21% | 75% | 90%

a. Reduction vs. baseline case incidence/mortality reported in 2016
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ACTIVE/REACTIVE CASE DETECTION

Achieving complete malaria elimination presents a major challenge due to the risk of silent reservoirs of transmission.

In areas approaching elimination with few to no symptomatic patients, submicroscopic infections carrying the disease can remain undetected by conventional diagnostic method.

2.1

High transmission setting
managing malaria

Low transmission zones
approaching malaria elimination

Only ~20% of infections are submicroscopic\(^1,\!^a\)

20%

70-80%

Up to 70-80% of infections are submicroscopic, representing silent reservoirs of malaria transmission\(^2,\!^a\)


\(^a\) Submicroscopic infection defined as parasitemia below 100 parasites per μl of blood in approximately 5 μl of whole blood and hence not detectable by standard field microscopy.
Impact of asymptomatic *P. falciparum* infections on transmission and on malaria in a longitudinal cohort in Kenya

Steve M Taylor MD MPH
steve.taylor@duke.edu
1 November 2022

Asx infection → transmission

95% of infected mosquitos resulted
from asymptomatic human infections

Conclusions

- What are the relative contributions of asymptomatic and symptomatic infections to mosquito infections?

- What is the risk of symptomatic malaria following:
  - an asymptomatic *P. falciparum* infection?
  - a symptomatic RDT-negative (i.e. subpatent) *P. falciparum* infection?
In low transmission settings, prevention of new infections will be "guided by active case detection and case investigations as part of a malaria surveillance and response programme"\(^1\)

**Active case detection**

Involves mass parasitological testing of a population either in a specific geographic area or at higher risk of malaria infection, followed by treatment of positive cases (MTaT vs TTaT)\(^2\)

**Reactive case detection**

Involves parasitological testing of every person near or exposed to a person who has a confirmed malaria case, followed by treatment of positive cases\(^2\)

"RACDT becomes an essential component of surveillance when countries are nearing interruption of transmission to monitor progress towards elimination"\(^3\)


Reactive case detection can reduce onward malaria transmission and thereby contribute to malaria elimination in low transmission zones...

Reactive case detection has the potential to find malaria cases in proximity to the index case early, reducing further transmission of malaria.

4x higher likelihood of infection in individuals with proximity to an index case

- of households with RDT positive residents are likely not identified through passive case detection\(^2,a\)
- of RDT positive individuals missed through passive case detection can be identified with RACD\(^2,a\)

RACD = Reactive Case Detection. b. Simulation using survey results in low transmission setting – RACD involved testing all individuals residing within 500 meters of an index household


ACTIVE/REACTIVE CASE DETECTION

....but currently used RDTs cannot accurately detect asymptomatic patients in low transmission areas, limiting their value in such settings.

Asymptomatic individuals represent almost all cases and drive disease transmission in low-transmission areas but conventional RDTs miss most of them.

~90% of infections in low-transmission areas remain asymptomatic ...¹,²

... accounting for 91% of human-to-mosquito malaria transmissions³

Performance of conventional RDTs based on pool sensitivity

73% infections missed⁴

among asymptomatic individuals

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Malaria in pregnancy accounts for 575 maternal and infant deaths per day, the majority of which are preventable.  

Malaria infections disproportionally affect pregnant women, posing substantial risks not only to the mother, but also to the fetus and newborn.

<table>
<thead>
<tr>
<th>Pregnant women</th>
<th>Maternal outcomes</th>
<th>Fetal outcomes</th>
<th>Infant outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>125 million</strong> pregnant women at risk of malaria infection</td>
<td><strong>3.8x</strong> higher likelihood for pregnant women to be anemic due to malaria infection</td>
<td><strong>1.8x</strong> higher likelihood of stillbirth due to malaria infection in pregnant women</td>
<td><strong>2x</strong> higher likelihood of low birthweight among infants due to placental malaria infection</td>
</tr>
<tr>
<td><strong>3x</strong> more likely to suffer from severe malaria</td>
<td><strong>50%</strong> mortality rate in pregnant women due to severe disease from malaria infection</td>
<td><strong>25%</strong> risk of mother-to-child HIV transmission with underlying malaria infection</td>
<td></td>
</tr>
</tbody>
</table>
To tackle malaria in pregnancy, the WHO advises a packaged approach of prevention and prompt, effective case management, but systematic asymptomatic screening is not yet recommended.

**WHO guidance for prevention and treatment of malaria in pregnancy:**

1. **Insecticide-treated nets (ITNs)**
2. **Interruption preventative treatment (IPTp)**
3. **Quality diagnosis and treatment**

**Diagnosis**
- “Prompt parasitological confirmation by microscopy or alternatively by RDTs is recommended in all patients suspected of malaria before treatment is started.”

**Treatment**
- “Pregnant women in the first trimester with uncomplicated falciparum malaria should be treated with quinine plus clindamycin for seven days.”

A systematic malaria screening of pregnant women without symptoms is not yet recommended, despite the high number of asymptomatic patients and the substantial risks arising from malaria during pregnancy.

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Conventional RDTs and microscopy used in decentralized settings have poor accuracy in detecting malaria in pregnant women.

The diagnosis of malaria in pregnancy is challenging as the vast majority remains asymptomatic with parasitemia below the limit of detection of conventional test methods.

88% of pregnant women are asymptomatic due to both low parasitemia and parasites sequestered in the placenta.

Conventional RDTs: 44.2%¹

Microscopy: 29%³


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Ultra sensitive Malaria Pf RDT sensitivity is 114% higher in asymptomatic individuals and 72% higher in overall low transmission zones.

### Conclusion

The us-RDT test showed better performance than co-RDT test, and this characteristic is more evident in asymptomatic individuals and low transmission areas........

Comparison of diagnostic performance between conventional and ultrasensitive rapid diagnostic tests for diagnosis of malaria: A systematic review and meta-analysis | PLOS ONE
Ultra sensitive Malaria Pf RDT showed higher sensitivity in pregnant women vs conventional RDTs

A retrospective study was based on 942 blood samples collected in 327 women in 1st and 3rd trimesters

Publication showed significantly superior performance of ultra-sensitive Malaria Pf RDT vs conventional RDTs

Ultra-sensitive Malaria Pf RDT

+37%

Increase in sensitivity in pregnant women versus Conventional RDTs

Abbott ultra sensitive Pf RDT 05FK140 is WHO pre-qualified
Abbott ultra sensitive Pf RDT 05FK140 is intended to aid in the diagnosis of malaria infection to a general population including pregnant women.

https://extranet.who.int/pqweb/sites/default/files/PQDx_0349-012-00_NxTek_EliminateMalariaPf_v2.pdf
Abbott ultra sensitive Pf RDT is listed at Global Fund. 
GF to Support use for targeting low density parasite infections provided that additional evidence and WHO guidance are developed.
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The lack of broad and effective usage of surveillance solutions prevent optimized, data-driven decisions in malaria management.

Many countries with a high disease burden are not in a position to capture essential malaria data.

The lack of effective disease surveillance makes it difficult for national malaria programs to:

- Assess disease trends
- Respond to outbreaks
- Optimize responses

---

## Effective malaria case surveillance represents one of the three strategic pillars defined by the WHO with a number of potential use cases highlighted

<table>
<thead>
<tr>
<th>Strategic Pillar</th>
<th>Use Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tracking the progress of malaria control</td>
<td>Investigating case clusters to better understand risk factors and eliminate foci of transmission</td>
</tr>
<tr>
<td>Advocating for investment from domestic/international sources</td>
<td>Identifying and responding to threats</td>
</tr>
<tr>
<td>Identifying populations experiencing disadvantage and allocating resources</td>
<td>Certify malaria elimination and preventing re-establishment</td>
</tr>
</tbody>
</table>

“Irrespective of where countries are on the path to elimination, surveillance of malaria should be considered a central intervention in national and subnational malaria strategies”

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Capturing and transfer of data in near real time from decentralized sites enables monitoring from anywhere building transparency and fostering accountability.

Effective disease monitoring leveraging advanced analytical and data visualization capabilities as a critical component for evaluating performance of test programs.

Supports offline data capture in locations with limited to no connectivity to broaden the reach to decentralized services.
Opportunity to optimize the management of RDT stock, supporting the avoidance of stock outs

Empowering stakeholders at different levels to accurately monitor and manage RDT consumption to optimize stock management and logistics

Monitoring and reporting of stock levels
- Enables adding/removing/reconciling stocks at sites
- Tracks stock levels at all testing sites in terms of stock utilization

2D barcode and accuracy with a mobile solution
- 2D barcode enables quickly scan of product information
- Avoid common errors associated with paper-based records

Data security and encryption
- Industry-grade encryption security (e.g. ISO 9001 and ISO 27001 data security requirements)
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ACCELERATING MALARIA ELIMINATION

There are low malaria transmission zones even within high burden countries
There are low malaria transmission zones even within high burden countries.

Source: PMI MOP 2022
https://www.pmi.gov/resources/malaria-operational-plan-mops/
US Partners NLNG To End Malaria, HIV Scourge In Bonny Island | Sahara Reporters
ACCELERATING MALARIA ELIMINATION

Summarizing the power of screening and surveillance in decentralized settings to enable a swift response from malaria case identification and control

Ultra-sensitive rapid testing and digital connectivity can help support 1-3-7 strategy to bend the curve to elimination in low transmission zones

- Rapid malaria detection for suspected cases
- Abbott’s digital solutions allow easy reporting and tracking of positive cases, including triggering deployment of resources for positive case detection

INVESTIGATION OF CASES AND DEPLOYMENT OF TREATMENT AND SUPPLIES FOR CONTAINMENT

- Testing in asymptomatic populations, which supports index testing of household members
- Partnership between Abbott solutions and local implementation resources to support quick response to control the outbreak

REACTIVE CASE DETECTION, HEALTH EDUCATION, DEPLOYMENT OF SUPPLIES

- Prevents malaria outbreaks from gaining momentum
- Reactive case detection and index testing of household members prevents additional potential infections from spreading
- Screening, surveillance and response is essential for controlling the outbreak

Decision-makers gain deep insights in near real time & plan response

Transfer data in near real time to central repository

HCP Capture using mobile devices

ALL SUSPECTED CASES ARE TESTED, AND POSITIVE CASES ARE REPORTED

Rapid response using insights collected
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China’s “1-3-7” strategy is at the core of its successful malaria elimination effort

“China’s “1-3-7” strategy is at the core of its successful malaria elimination effort. The strategy refers to the diagnosis, investigation and follow-up of cases that must occur within 1, 3 and 7 days. On Day 1, any malaria case, confirmed by a rapid diagnostic test or microscopy and treated, must be reported to the local CDC. By the end of Day 3, the county CDC must confirm and investigate the case and determine if there is a risk of spread. By the end of Day 7, the county CDC manages any malaria risks in the areas where the person with malaria has spent time, including testing and treating community members; identifying the malaria type; raising awareness in the community; investigating the species of mosquitoes and reducing their numbers, including through indoor spraying of insecticides.”

https://www.who.int/china/news/commentaries/detail/china-certified-as-malaria-free-by-who
1-3-7 STRATEGY FOR ELIMINATION

1-3-7 surveillance strategy helped reduce 81% of the Malaria cases in Thailand

https://www.rti.org/sites/default/files/related-content-files/1-3-7_infographic_final35.pdf
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CONCLUSION

Abbott is committed to helping bend the malaria curve to reduce incidence and mortality rates by at least 90% by 2030

Abbott has invested to provide the Global Malaria Community with the tools to help win the fight against malaria

Years of innovation, experience and greater understanding of malaria prevention and treatment enable us to support a new paradigm to reset malaria elimination

Scaling up diagnostics are critical to bend the curve and accelerate progress of malaria elimination, as progress has slowed down recently and even reversed in some places

Bending the curve

Global annual malaria parasite incidence

RESURGENCE
SUSTAIN PROGRESS
ACCELERATE TO ZERO

① : NEW STRATEGIES USING CURRENT TOOLS
② : NEW STRATEGIES USING NEW TOOLS
Thank you!

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