Guidance on the prioritization of insecticide-treated nets in situations where resources are limited

CONTEXT

In the context of limited resources, national malaria programmes may need to decide on how to prioritize all WHO-recommended interventions *(1)*. This guidance document has been developed to support national malaria programmes in prioritization decisions, specifically on the deployment scope and product choice of insecticide-treated nets (ITNs). This guidance is to be followed when programmes do not have sufficient budget to deploy the most effective ITNs to all populations at risk.

This guidance does not address distribution channel decisions or other issues such as frequency of ITN distribution, nor does it cover every choice that a national malaria programme may need to make regarding ITNs. Rather, this guidance is intended to be a starting point for discussion and decision-making.

Routine distribution of ITNs to vulnerable groups, such as pregnant women and children under 5 years of age, remains critical. It is strongly recommended that these distribution channels are maintained in all areas, regardless of the plans for campaigns. This guidance document, therefore, focuses on ensuring coverage of vulnerable groups as the first step and then planning for high-volume, intermittent mass ITN distributions. While the term "campaign" is used throughout this document, the guidance is applicable to other high-volume, intermittent deployment approaches, such as large-scale school or community distributions.

Over the last three years, more than 50% of national malaria programmes have implemented a mass campaign with two or more ITN types (i.e. pyrethroid-only, pyrethroid-piperonyl butoxide [PBO], pyrethroid-chlorfenapyr or pyrethroid-pyriproxifen nets). The ITN types have been based, as far as possible, on local insecticide resistance data and targeted to specific geographical areas. Going forward, increasing constraints in available

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resources due to flatlined funding, high inflation, population growth and competing priorities exerted by other malaria interventions may require national malaria programmes to make prioritization decisions that balance net quantities and types, distribution channels, target populations and the relative value for money of these choices in order to optimize impact.

This guidance document aims at supporting programmes in the development of a prioritized deployment plan that balances efforts to optimize ITN effectiveness with the need to ensure coverage of the most at-risk populations. The proposed prioritization process is based on best practices generated in Africa in recent years but can be used by all countries deploying ITNs.

To summarize, the guidance establishes this first step:

1. Ensure access for vulnerable groups: commit funding for routine ITN distribution to vulnerable groups in all malaria risk areas.

Then, the document guides programmes through the following steps for campaign deployment planning:

2. Define scope of ITN deployment.
    - Identify and exclude areas with very low current and historical malaria risk.
    - List and rank the areas targeted for ITN campaigns according to malaria risk.

3. Maximize coverage in areas identified for ITN deployment: calculate the funding needed to ensure full coverage with pyrethroid-only nets.

If funding remains:

4. Maximize effectiveness: substitute pyrethroid-only ITNs (or, where applicable, pyrethroid-pyriproxyfen nets) with pyrethroid-PBO or pyrethroid-chlorfenapyr ITNs in areas of pyrethroid resistance by: i) replacing pyrethroid-PBO or pyrethroid-chlorfenapyr nets in areas that previously received them, and ii) substituting pyrethroid-only ITNs with pyrethroid-PBO or pyrethroid-chlorfenapyr ITNs in additional geographical areas in decreasing order of malaria risk.

5. Identify funding gaps that impede further effective coverage and make that information available to potential funders.

6. Ensure adequate funding for surveillance.

STEP 1. Commit funding for routine ITN distribution to vulnerable groups in all malaria risk areas

- Calculate the ITN needs for continuing routine ITN deployment to vulnerable groups (e.g. pregnant women and children under 5 years of age through antenatal care and Expanded Programme on Immunization distributions). Calculate the required funding for pyrethroid-only nets at this step. Funding permitting, these nets can be "upgraded" to more effective nets, area by area, at later steps in the prioritization process in line with the allocation of more effective nets to geographical areas for campaign deployment. Alternatively, programmes

may have already decided to use pyrethroid-PBO or pyrethroid-chlorfenapyr nets throughout the country for routine distribution, in which case the funding required to meet these needs should be calculated here.

Then, programmes should move to campaign planning.

STEP 2. Define ITN deployment scope

2a. Identify and exclude areas with very low current and historical malaria risk

- Identify areas where the current and historical risk of malaria is very low based on national programme data (including most urban areas). In Africa, *very low-risk areas* (e.g. a range of 1–3% malaria prevalence) are generally found in highly urbanized centres or in specific rural areas; the identification of "very low-risk" areas should consider the complexities below:

    - In large towns and cities, malaria transmission is often heterogeneous, and hotspots of transmission may exist. Identify any such areas of higher *local* transmission (i.e. excluding hotspots linked to imported cases) and ensure that these are not classified as "low risk" (as explained in the *Global framework for the response to malaria in urban areas (2)*).

    - The invasive vector *Anopheles stephensi* is being reported in an increasing number of locations, including urban areas. To effectively control this vector, urban areas that have been invaded by *An. stephensi* will require some form of vector control. Depending on the context, this could include ITN distribution.

    - In rural areas, very low-risk areas are only found at very high altitudes, in deserts or at the edge of malaria's geographical distribution or may be the result of intensive malaria control efforts. Alternatively, the receptivity of these regions may have changed due to other activities, such as irrigation, mining, infrastructure development and climate change. It is, therefore, critical to look at recent and historical epidemiological trends to determine whether an area is very low risk for malaria and would remain so in the absence of ITNs, which would justify the deprioritization of the area.

    - Use data from the Breakthrough ACTION and VectorWorks ITN access and use report, in addition to other data, to support decision-making on ITN campaign prioritization *(3)*. For example, consider whether ITNs may be more effective in urban areas than other vector control interventions.

- Use this analysis to determine areas to be excluded from campaign ITN deployment, considering the following guidance:

    - Cease campaign ITN distribution in areas with historical and current very low risk.

    - Cease campaign ITN distribution in areas with documented low ITN use, unless action to significantly increase usage has been identified and these activities have been included in the vector control budget.

    - Maintain ITN distribution in areas with persistently high or moderate malaria risk, including urban clusters of moderate to high local transmission.

    - Maintain ITN distribution in areas that are currently low risk but were historically moderate or high risk (i.e. low risk has only recently been achieved through vector control).

- Maintain ITN distribution in areas with historically low risk, but where risk is increasing due to climate change or other factors.

After appraising vector control options for *An. stephensi*, consider whether ITN distribution in areas where *An. stephensi* has been detected should be maintained or whether alternatives, such as larval source management, would be more cost-effective. This decision should not be affected by historical/current malaria risk.

Note: In areas where ITNs are scaled back due to low malaria risk, it is critical to ensure that robust surveillance is in place to detect epidemics and that there is adequate access to case management. Additional information can be found in both the *WHO guidelines for malaria*[1] and the *Global framework for the response to malaria in urban areas (2)*.

2b. List and rank the areas for campaign ITN deployment in order of malaria risk

- Divide the country into the lowest administrative levels at which different ITN types could feasibly be deployed (i.e. districts or other second-level administrative areas). Prioritization steps will consider malaria risk; therefore, at this stage, it is better to consider the *smallest* practical implementation areas (e.g. districts rather than provinces), as smaller areas are more likely to have similar levels of malaria risk. Epidemiological data plus other contextual factors, such as access to care, should be considered to help define risk.

- Rank these areas by malaria risk:

  - The aim is to assess the potential for transmission in the absence of vector control, especially the expected consequences if ITNs are **not** provided. Malaria programmes should use the best available indicators and data, and triangulate both current and historical data, including prevalence of infection in surveys, incidence of clinical malaria in health facilities, transmission intensity (from entomological studies), other contextual factors, and the best estimates of well informed and experienced staff.

  - One approach would be to draft an initial ranking based on an assessment of historical (i.e. pre-intervention or natural) transmission intensity. Note that in areas where vector control coverage is currently moderate or high, current levels of malaria incidence and prevalence should **not** be considered a reliable indicator of historical/natural transmission intensity. In areas with low burden due to vector control, the immunity in the population may be diminished and, if vector control is withdrawn, resurgence/epidemics may occur.

  - Once the initial ranking based on historical endemicity or background transmission intensity has been drawn up, it will then need to be adjusted to account for additional risk factors.

- For each location, calculate how many nets would be needed for full campaign coverage (with a quantification ratio of one net for every 1.8 persons or a modified ratio based on local data). Programmes planning to align the type of ITNs in their routine distribution system with the type used for campaign deployment should include an additional column stating the number of nets and associated funding required for routine distribution in each area over a period of three years.

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1 See the good practice statement "No scale-back in areas with ongoing local malaria transmission (2019)" *(1)*.

STEP 3. Maximize coverage: calculate the funding needed to ensure full coverage of these at-risk areas with pyrethroid-only nets

- For the points below, use the cost of a pyrethroid-only ITN and include deployment costs:
    - Starting with the area with the highest risk, assign the resources needed for full ITN coverage with pyrethroid-only ITNs.
    - Continue to assign resources down the list in order of malaria risk.
    - Continue until the available funding has been depleted. (It is best to end on a completely covered area, rather than on a half-covered area, which would create operational difficulties).

❖ If resources remain after Step 3, move to Step 4. If not, go to Step 5.

STEP 4. Maximize effectiveness: substitute pyrethroid-only ITNs with pyrethroid-PBO or pyrethroid-chlorfenapyr ITNs in areas of pyrethroid resistance as far as possible

- Consider which areas in your ITN deployment plan have pyrethroid resistance. Ideally, these areas will be provided with pyrethroid-PBO or pyrethroid-chlorfenapyr ITNs following the processes in steps 4a and 4b. Recognizing that no programme is likely to have insecticide resistance data for all deployment areas, some extrapolation from adjacent areas is appropriate, including from adjacent areas of neighbouring countries where relevant.
- Allocate the resources remaining after step 3 to substitute pyrethroid-only ITNs in the deployment plan in the following stepped process.
- Note that, based on the recent WHO recommendation on pyrethroid-pyriproxifen nets, the currently higher procurement cost and their low geographical coverage/number distributed to date, these types of nets are not explicitly included in this prioritization guidance which focuses specifically on contexts of insufficient resources. In such settings, countries should consider distribution of pyrethroid-PBO or pyrethroid-chlorfenapyr nets in areas that were previously covered by pyrethroid-pyriproxifen nets when the opportunity arises.
- For the process below, consider the incremental cost to substitute pyrethroid-only ITNs with pyrethroid-PBO or pyrethroid-chlorfenapyr ITNs, noting that the costs of deploying ITNs to end users have already been accounted for in steps 1 and 3 above.

4a. Replace pyrethroid-PBO or pyrethroid-chlorfenapyr nets in areas that previously received them

- Allocate the *additional* available resources needed to replace pyrethroid-PBO or pyrethroid-chlorfenapyr ITNs in areas that previously received these net types, starting from the areas with the highest risk. Programmes planning to align the type of ITNs in their routine distribution system with their campaign deployment

plan should allocate the additional resources needed to substitute the pyrethroid-only ITNs for routine distribution with the net type to be used for the campaign.

- Continue area by area until resources are depleted.

❖ If resources remain after step 4a, move to step 4b. If not, go to Step 5.

4b. Substitute pyrethroid-only ITNs with more effective ITNs in additional areas in decreasing order of malaria risk

- Allocate the *additional* resources needed to substitute pyrethroid-only ITNs with pyrethroid-PBO or pyrethroid-chlorfenapyr ITNs in additional areas, starting with the next highest risk areas with pyrethroid resistance and expanding to neighbouring high-risk districts without pyrethroid resistance data.

- Programmes planning to align the type of ITNs in their routine distribution system with their campaign deployment plan should allocate the additional resources needed to substitute the pyrethroid-only ITNs for routine distribution with the net type to be used for the campaign.

Continue area by area until resources are depleted.

Step 5. Identify funding gaps that impede further effective coverage and make that information available to potential financers

- If programmes cannot achieve optimal coverage either with any ITN or with the most effective ITN with the available funding (considering all external and domestic sources), then a prioritization exercise among all interventions will need to be considered. If gaps persist, these additional funding needs should be identified and codified, and this information should be provided to potential financers, such as the government or the President's Malaria Initiative, and/or included in a prioritized above allocation request to the Global Fund to Fight AIDS, Tuberculosis and Malaria.

STEP 6. Ensure adequate funding for surveillance

- A robust surveillance system is needed to ensure appropriate monitoring of malaria indicators in order to provide timely signals of potential resurgence in areas no longer receiving ITNs, as well as for routine programmatic decision-making. Allocate sufficient funding to address any surveillance strengthening and system maintenance needs.

METHODS AND ACKNOWLEDGEMENTS

This guidance was developed alongside new World Health Organization (WHO) recommendations on dual active ingredient ITNs, with a view to supporting WHO Member States in national decision-making processes on ITN deployment in the increasingly complex area of malaria vector control. Draft prioritization guidance was developed in collaboration with malaria partners brought together by the Alliance for Malaria Prevention (AMP) and the RBM Partnership to End Malaria. The draft guidance was presented to the WHO Guideline Development Group (GDG) for malaria vector control content in November 2022 and to the associated Evidence Review Group (ERG) in January 2023 for their review and inputs. WHO's original intention was to include this guidance alongside the new ITN recommendations in the WHO Guidelines for malaria; however, it was eventually decided that the level of detail of this guidance exceeds that of the Guidelines and it should be published separately. Declarations of any competing interests (DOIs) were received from all invited experts of the GDG and ERG. WHO processes were used to assess the declared interests and manage any conflicts identified. Three members of the GDG declared potential interests. Based on the detailed assessment of the information provided to WHO, the interests of one member were deemed not relevant, while those of two members were deemed relevant; these two members were recused from the decision-making processes and reviews of recommendations regarding dual active ingredient ITNs. Five members of the ERG declared potential interests, all of which were deemed not relevant to the recommendations and other guidance concerning dual active ingredient ITNs, after WHO Secretariat review and due diligence. This final version of the document was produced after incorporating the inputs from the GDG and ERG in January 2023.

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